RESILIENCE, E-LEARNING AND CHANGE IN TERTIARY EDUCATION

A thesis submitted in partial fulfilment of the requirements for the Degree

of Doctor of Philosophy in Education

in the University of Canterbury

by Kofi Ayebi-Arthur

University of Canterbury

2015

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DEDICATION

To my parents for being an absentee son,

To my sisters for being an absentee brother,

To my wife for being an absentee husband,

and to my children for being an absentee father.

ACKNOWLEDGEMENTS

Several individuals in various ways have made important contributions to this research. I am grateful for the input of my supervisors, Distinguished Professor Niki Davis and Associate Professor Una Cunningham, who have worked tirelessly to guide me through the completion of this work.

I acknowledge University of Canterbury University of Canterbury College of Education for the award of PhD scholarship in e-Learning and Digital Technologies over the three year study period which enabled me to undertake and complete the study. I also wish to express my indebtedness to the participants of the study without whom the research would not have been possible.

I am equally grateful to the support group in Ghana: Professor P. Grant, Dr D. Aheto, Dr P. Osei-Kuffuor, Dr B. B. Campion, Dr D. B. Aidoo and Dr. E. Y. Tenkorang for their advice and encouragement when the going got tough. Likewise, my New Zealand support group: Dr K. Owusu, Dr B. Otinpong and family, house mates Dr I. Buabeng, Dr P.K. Darbi, and postgraduate students at the College of Education, UC for encouraging me that there was light at the end of the tunnel. I thank all my virtual friends, especially those on *Facebook.*

I also wish express my sincere and profound gratitude to the parental figures in my life for their advice, wisdom and support all these years. Above all, I wish to express my heartfelt gratitude to my understanding wife and children who have been by me virtually and in real time as I went half-way across the world to pursue my study. “In everything give thanks: for this is the will of God in Christ Jesus concerning you”. (1 Thessalonians 5:18 King James Bible).

ABSTRACT

When disasters and crises, both man-made and natural, occur, resilient higher education institutions adapt in order to continue teaching and research. This may necessitate the closure of the whole institution, a building and/or other essential infrastructure. In disasters of large scale the impact can be felt for many years. There is an increasing recognition of the need for disaster planning to restructure educational institutions so that they become more resilient to challenges including natural disasters (Seville, Hawker, & Lyttle, 2012).The University of Canterbury (UC) was affected by seismic events that resulted in the closure of the University in September 2010 for 10 days and two weeks at the start of the 2011 academic year

This case study research describes ways in which e-learning was deployed and developed by the University to continue and even to improve learning and teaching in the aftermath of a series of earthquakes in 2010 and 2011. A qualitative intrinsic embedded/nested single case study design was chosen for the study. The population was the management, support staff and educators at the University of Canterbury. Participants were recruited with purposive sampling using a snowball strategy where the early key participants were encouraged to recommend further participants. Four sources of data were identified: (1) documents such as policy, reports and guidelines; (2) emails from leaders of the colleges and academics; (3) communications from senior management team posted on the university website during and after the seismic activity of 2010 and 2011; and (4) semi-structured interviews of academics, support staff and members of senior management team. A series of inductive descriptive content analyses identified a number of themes in the data. The Technology Acceptance Model 2 (Venkatesh & Davis, 2000) and the Indicator of Resilience Model (Resilient Organisations, 2012) were used for additional analyses of each of the three cases.

Within the University case, the cases of two contrasting Colleges were embedded to produce a total of three case studies describing e-learning from 2000 - 2014. One contrast was the extent of e-learning deployment at the colleges: The College of Education was a leader in the field, while the College of Business and Law had relatively little e-learning at the time of the first earthquake in September 2010. The following six themes emerged from the analyses:

Communication about crises, IT infrastructure, Availability of e-learning technologies, Support in the use of e-learning technologies, Timing of crises in academic year and Strategic planning for e-learning. One of the findings confirmed earlier research that communication to members of an organisation and the general public about crises and the recovery from crises is important. The use of communication channels, which students were familiar with and already using, aided the dissemination of the information that UC would be using e-learning as one of the options to complete the academic year. It was also found that e-learning tools were invaluable during the crises and facilitated teaching and learning whilst freeing limited campus space for essential activities and that IT infrastructure was essential to e-learning. The range of e-learning tools and their deployment evolved over the years influenced by repeated crises and facilitated by the availability of centrally located support from the e-Learning support team for a limited set of tools, as well as more localised support and collaboration with colleagues. Furthermore, the reasons and/or rate of e-learning adoption in an educational institution during crises varied with the time of the academic year and the needs of the institution at the time. The duration of the crises also affected the adoption of e-learning. Finally, UC's lack of an explicit e-learning strategy influenced the two colleges to develop college-specific e-learning plans and those College plans complemented the incorporation of e-learning for the first time in the University's teaching and learning strategy in 2013.

Twelve out of the 13 indicators of the Indicators of Resilience Model were found in the data collected for the study and could be explained using the model; it revealed that UC has become more resilient with e-learning in the aftermath of the seismic activities in 2010 and 2011. The interpretation of the results using TAM2 demonstrated that the adoption of technologies during crises aided in overcoming barriers to learning at the time of the crisis. The recommendations from this study are that in times of crises, educational institutions take advantage of Cloud computing to communicate with members of the institution and stakeholders. Also, that the architecture of a university's IT infrastructure be made more resilient by increasing redundancy, backup and security, centralisation and Cloud computing. In addition, when under stress it is recommended that new tools are only introduced when they are essential.

CHAPTER 1

INTRODUCTION

This chapter outlines the scope and focus of the research upon which the thesis is based. This research takes place in a context in which, at the start of the 21st century, there has been rapid growth in the range of technologies available to support learning in universities. A more specific context is the experience of disasters and crises, which have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. These contexts have influenced the decisions taken by individual academics and their institutions about introducing, developing and sustaining new learning technologies to support learning and teaching practices in universities. However, there has been little research into the evolution of e-learning in a university that has been subjected to a disaster. A case study of one such university, exposed to a recent series of earthquakes, is the focus of this study.

Background of the study

The background of the study begins with an overview of Higher Education (HE) in New Zealand. An international perspective on the rapid growth of ICT and e-learning in education is then offered, followed by a closer focus on e-learning within the New Zealand context. The final section draws on these perspectives to review the challenge of e-learning developments in contexts subject to shocks or crises, and the consequent need to build resilience.

Higher Education in New Zealand

In New Zealand, the term tertiary education is used to describe all aspects of post school education and training (New Zealand Council for Educational Research, 2004, p. 3). New Zealand was a British colony and this has had historical influences on Higher Education such as the University of Canterbury.

New Zealand's tertiary education sector makes a wide range of learning available, from foundation skills to doctoral studies. Within tertiary education, "higher" education refers to study at bachelor-degree and postgraduate levels. Universities are the main providers of higher education, although polytechnics and colleges of education, private training establishments (PTEs), industry training organisations, and adult and community education providers are also available.

Higher education institutions serve as a place for the development of a searching, probing, investigating, questioning, critical frame of mind. Participants at higher education institutions range from skilled technicians to future researchers through the mass workforce of graduates. Higher education institutions also serve as primary producers of basic research which can be translated into commercially valuable or socially useful goods and services. Institutions that offer HE bring together students from a variety of backgrounds. Workers with higher education qualifications command a significant wage premium and are much less likely to become unemployed than less educated workers (OECD, 2011).

The changing demands being made on HE resulting from the changing nature of work and knowledge, the student population, and the emergence of new information and communication technologies have resulted in HE evolving to meet these demands. Higher education has had to innovate in teaching practices because of the realization that traditional teaching methods are relatively ineffective for many students (Harman, 2010). Change is influenced by knowledge driven teaching, pedagogical awareness and the financial needs of universities.

The university within which this research is set is one of eight universities in New Zealand, which provide extensive degree and postgraduate education of international quality (Universities New Zealand, 2011). The universities are mainly located in cities and spread across the regions of New Zealand.

The University of Canterbury (UC) is a research intensive university which is well-regarded internationally. Established in 1873 as Canterbury College, it was the first constituent college of the University of New Zealand. It became the second institution in New Zealand to provide tertiary-level education (following the University of Otago, established in 1869), and the fourth in Australasia (University of Canterbury, 2003). It is well known for engineering and sciences and, following merger with the former Christchurch Teachers College in 2007, it has one of the largest programmes of initial teacher education in New Zealand (University of Canterbury, 2007). That merger also brought considerable expertise and practice in e-learning, including an award-winning nationwide programme with a fleixible learning option (FLO) accessible to students nationwide and occasionally overseas (Mackey, Davis, & Dabner, 2012). The College of Education, one of five Colleges within the University, has an established reputation for distance education and was amongst the pioneers of online learning in New Zealand, with a fully online teacher education course offered in 2001(Mackey, Breeze, Buckley, Dabner, & Gilmore, 2011). As part of FLO (originally Primary Open Learning Option (POLO)) the College had also developed a very effective learning management system (LMS) called *StudentNet*, which was discontinued when the University opted for *Moodle* in 2008. Many courses use *Moodle* (called *Learn* within UC) as an adjunct to teaching in lectures and tutorials, and as a delivery tool for distance teaching materials and audio and video lectures (University of Canterbury, 2013a).

The University of Auckland is New Zealand's largest and most comprehensive university (Universities New Zealand, 2009b). The University encourages and promotes the development of flexible modes of teaching and learning, the use of new teaching technologies and computer assisted learning management systems. The proprietary *CECIL* (from CSL - Computer Supported Learning) Learning Management System, developed by University staff and students in the Faculty of Business and Economics, provides electronic course-centred

information and communication support for some students and academic staff (The University of Auckland, 2013).

Lincoln University is New Zealand's specialist land-based university with land-based sciences and related areas comprising the majority of its core business (Universities New Zealand, 2009a). Lincoln University's main campus is in a rural setting on the Canterbury Plains, not far from UC. There is a formal Tertiary Accord between Lincoln, UC and Christchurch Polytechnic Institute of Technology (CPIT). This developed a shared qualification in e-learning that was discontinued in 2009 (N. Davis, Personal Communication, May 22, 2013). In January 2011, Telford Rural Polytechnic located in Balclutha merged with Lincoln University. The merger aimed to create a single institution with a strong base to support education, research, and knowledge transfer across the land-based sector. *Moodle* is the learning management system of Lincoln University (Lincoln University, 2013).

Massey University is one of New Zealand's largest universities with more than 35,000 students, including 3,500 international students, from over 100 countries. Massey University has campus sites at Palmerston North, Wellington and the North Shore in Auckland. The reach of its provision also extends beyond these sites through its extensive range of distance programmes and international partnerships underpinning research. The online learning environment at the University is called *Stream.* At the core of *Stream* is the Virtual Learning System (VLS) (*Moodle*) but the online environment includes a range of other leading edge electronic tools such as podcasts, online presentations, interactive exercises and activities, and tests and quizzes (Massey University, 2013).

The University of Otago is New Zealand's oldest university and specialises in health sciences, as well as offering qualifications in the Arts and other Sciences. The University of Otago operates with a main campus in Dunedin, specialist health science-focused campuses in Christchurch and Wellington, a teacher education facility in Invercargill, and a small base

in Auckland City. E-learning tools at the University of Otago include *Blackboard* - a learning management system; Otago Blogs; Otago Podcasts; Otago Wikis and Otago Connect - a web conferencing system provided by the University of Otago (The University of Otago, 2013). The Centre for Distance Learning (directed by Kwok-Wing Lai) within the College of Education has also employed *Moodle* for their postgraduate programmes (N. Davis, Personal Communication, May 22, 2013).

Victoria University of Wellington has four campuses based throughout Wellington city in Kelburn, Karori, Te Aro and Pipitea. Victoria University of Wellington uses *Blackboard* as a learning management system. Other e-learning tools used are *Vstream* (Victoria's system for recording, editing and publishing video resources for learning and teaching) and Mahara *ePortfolio* (a digital tool for storing, reflecting on and sharing skills, achievements and experiences) (Victoria University of Wellington, 2011). The Mahara *ePortfolio* may have since been discontinued in teacher education (N. Davis, Personal Communication, May 22, 2013).

The University of Waikato (UW) is located in Hamilton. It also has a campus co-located with the Bay of Plenty Polytechnic in Tauranga. In 2006 UW selected *Moodle* as the centrally supported Learning Management System and implemented version 1.9 to replace *Class Forum*. In 2007 the Waikato Centre for eLearning (WCEL) was established to provide effective support and leadership for the continuing development of eLearning at the University. *Moodle's* open source licence allowed the university to modify some of the behaviour and features of the software to fit the needs and requirements of its staff. In November 2010 the *Moodle* community released a major new version, *Moodle* 2.0. The University eLearn *Moodle* site was upgraded on 25th October 2011 (The University of Waikato, 2013).

In 2000, the Governor General, by order in council, established the Auckland University of Technology (AUT). AUT is the youngest of the eight New Zealand universities and the only one to be established since the 1960s. Auckland University of Technology uses *AUTonline* which incorporates *Blackboard* as the flexible learning system to deliver its courses. AUT online supports students' and lecturers' learning and teaching in a way that best meets their needs of time, place and learning effectiveness (Auckland University of Technology, 2013).

This brief overview of higher education in New Zealand, including some contextualization of e-learning, is now complemented with an international overview of digital technologies in education, before research into e-learning is briefly reviewed.

ICT and e-learning in education

The rapid growth in Information Communication and Technologies (ICT) has brought remarkable changes in the twenty-first century, one of which is the adoption of ICT in education. This has made ICT an essential requirement for schools, universities and other educational institutions, which have identified potential benefits from these changes to improve teaching and learning environments as well as to cope with an increasing demand for education and training (Al-Qahtani & Higgins, 2013). One of the ways in which ICT is used in education is e-learning.

The definition of e-learning for this study was drawn from Fletcher, Nicholas and Davis (2011), specifically "learning that is facilitated by using computer-related technologies" (p. 18). E-learning occurs in a wide range of teaching and/or learning activities where technology of one form or another is involved. Mason and Rennie (2006, p. xiv), citing The Open and Distance Learning Quality Council of the UK, defined e-learning as "the effective learning process created by combining digitally delivered content with (learning) support and services". ICTs are being deployed in university settings all over the world, from the use of

computers as “assistants” to teaching to offering online pedagogy (Nawaz, Khan, & Miankheil, 2011).

Bates (2001) set out an e-learning continuum based on the locational aspects of learning. At one end is “no online learning,” in the case of face-to-face classroom teaching and, at the other end, “fully online learning”, in the case of distance education. Between these opposites, Bates considered a range of mixed learning approaches that are useful in understanding what e-learning has to offer. A modification of Bates’s continuum by Hussin (2008) replaces “distance education” with “virtual learning”. A second modification by Hussin is the removal of the distributed learning option as a separate, intermediate category and the recognition that it is part of a mixed mode application. A further modification of Hussin’s revision reveals a three-aspect continuum model where there is “face-to-face”. Hussin’s mixed mode application can be considered as “blended or technology-enhanced learning” and “fully online”. Online learning often replaces or provides an additional mode to existing face-to-face courses in on-campus learning. Allen, Seaman, and Garret (2007) define online learning as a form of e-learning that is enabled by web-based technologies, does not require the teacher and the learner to be available at the same time and place, and constitutes 80% or more of learning/teaching activities conducted through web-based ICT. This might (but does not have to) require the student to be physically present in a classroom to participate in the course. Students might work with course materials at their own convenience, and they might work collaboratively on class projects using online tools such as chat and discussion forums.

Blended technology-enhanced learning involves any form of digital technology that includes a combination of online and conventional face-to-face classroom-based teaching and learning. Online learning may occur in the classroom and/or at a distance from the teacher. For example, the pedagogy of the “flipped classroom” depends on students’ online learning to complement increased classroom engagement (Lage, Platt, & Treglia, 2000). Blended

learning has a significant online component, in contrast to other forms of technology-enhanced learning. E-learning can be synchronous (involving real time interaction) and/or asynchronous (interaction that takes place at different times), taking advantage of a variety of communication methods such as online chat, email, audio and video conferences, podcasts and vodcasts. E-learning is often facilitated by a Learning Management System and/or ePortfolio system that serve as electronic repositories as well as directing activities that encourage cross-cultural communication.

de Wolf, Garrison, Verduin and Clark (as cited by New Zealand Council for Educational Research, 2004) explain that distance education was developed to provide education for those who are unable to attend a conventional classroom-based programme. It is seen as a cost-efficient and effective tool for providing education and training at all levels and for a variety of disciplines and professions (Harman, 2010). Distance education methods can be successfully used to cater to groups who, for geographical, economic or social reasons, are unable or unwilling to make use of traditional class-room based provision (Kaye, 1985). Online learning can be applied to facilitate distance and flexible learning.

Online education is established, growing, and "here to stay" (Mayadas, Bourne, & Bacsich, 2009, p. 1). Given its benefits and advantages, e-learning is often considered as one of the best options among the range of approaches for the expansion of higher education (Al-Qahtani & Higgins, 2013, p. 222), although the challenges to the university infrastructure are often less visible to faculty (Marshall, 2010b). Marshall's e-maturity framework (eMM) (Marshall, 2010a) (see E-Learning Maturity Model Capability Assessment, Theoretical framework of the study in Chapter 2) is useful to conceptualise the range of organisational development with e-learning that has occurred in the first decade of the 21st century in many tertiary institutions, and his research provides valuable case studies, including one of the University in this study (Marshall, 2009a).

E-learning in tertiary education in New Zealand

The New Zealand Ministry of Education defines e-learning as learning that is enabled or supported by the use of information and communication technologies (Ministry of Education, 2009), which is a broader definition than that proposed for this study. E-learning can increase the relevance and efficiency of tertiary education by allowing it to be more flexible in terms of where, when and how learning occurs (Ministry of Education, 2009). E-learning also increases relevance by assisting students and teachers to acquire relevant skills for the 21st century workplace and society.

The Government has committed to providing 97% of New Zealand schools with access to ultra-fast broadband within the next six years. It is likely that these and other similar ultra-fast broadband initiatives will produce significant numbers of school leavers accustomed to ICT supported learning and expecting a similar environment when they enter the tertiary system (Guiney, 2011). More than ever, education is taking place in a time of rapid social, cultural, economic, technological, and global change.

The early 2000s have seen a wave of digital tools and content being designed to facilitate the learning process. Tertiary organisations are increasingly including these components in the programmes of study they offer their students (New Zealand Ministry of Education, 2004), by supporting campus-based courses, and bringing new dimensions to distance education. E-learning does not herald the demise of bricks and mortar institutions. Rather, there might be an expanded role for providers to use e-learning to enrich traditional classroom-based learning, at all levels of education, as well as to meet the needs of students who cannot travel to a local campus (Higgins, 2002). The Interim Tertiary e-Learning Framework, developed in 2004 by the Ministry of Education in consultation with other government agencies and the tertiary education sector, has provided high level direction for the development of New Zealand's tertiary sector e-learning capability (New Zealand

Ministry of Education, 2004). The Interim Tertiary e-Learning Framework is to be superseded by an integrated, pan-sector e-learning strategy that will encompass schools, the early childhood and tertiary sectors. E-learning is now widely available in tertiary education in New Zealand. This is especially the case in courses at degree level and higher, where around three-quarters of all courses make provision for e-learning (New Zealand Ministry of Education, 2013).

Lifeline utilities that provide essential infrastructure services to the community such as water, wastewater, transport, energy and, of relevance to this study, telecommunications are required by the Civil Defence Emergency Management Act 2002 and National Civil Defence Emergency Management Plan to ensure that they are able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency. Higher education institutions are therefore, evolving to be resilient to carry out their mandate of teaching, research and community service.

Resilience of higher education institutions with e-learning

Natural disasters such as earthquakes, flooding, and snow storms can interrupt the activity of an academic institution. This may necessitate the closure of the whole institution, a building and/or other essential infrastructure. In disasters of large scale and scope, formal plans break down in unexpected ways as the disaster unfolds and the impact can be felt for many years. There is increasing recognition of the need for disaster planning and to restructure educational institutions so that they become more resilient to challenges including natural disasters (Seville, Hawker, & Lyttle, 2012).

Disaster management is the creation of plans through which communities reduce vulnerability to hazards and cope with disasters (Drabek, 1991). Hills (1998) suggests, from an emergency planning perspective, that disasters are sudden and overwhelming events which occur for a limited duration in a distinct location. Although a disaster may be limited by time

and location it may take a significant amount of time after a disaster to recover. In New Zealand, Disaster Management is known as Civil Defence Emergency Management (CDEM). The Civil Defence Emergency Management Act (CDEM Act) 2002 provides a framework for The National Civil Defence Emergency Management Strategy. Among others, the purpose of the Act is to improve and promote the sustainable management of hazards in a way that contributes to the social, economic, cultural and environmental well-being and safety of the public and the protection of property. In addition, the Act seeks to "provide for planning and preparation for emergencies and for response and recovery in the event of an emergency" (Ministry of Civil Defence & Emergency Management, 2002, p. 3). The National Civil Defence Emergency Management Strategy sets out the overall direction for CDEM in New Zealand. The National Civil Defence Emergency Management Strategy offers long-term direction for CDEM in New Zealand. The Strategy aims to "set a direction for the reduction of, readiness for, response to and recovery from the risks in New Zealand in terms of disasters" (Department of Internal Affairs, 2007, p. 3). The simple framework of readiness, response and recovery in disaster management is used internationally in several countries and sometimes has other phases such as mitigation and prevention added to the framework.

However, as will be clarified in the literature review chapter, there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts.

Although it is challenging to undertake research while also coping with a disaster that has occurred (occasionally, including research by faculty in the University), the focus of the study aims to dertmine how the University has evolved with e-learning in the aftermath of the seismic events of 2010 and 2011. In reviewing the literature to introduce their self-study research, Mackey, Gilmore, Dabner, Breeze, and Buckley (2012) noted that flexibility,

creativity, resourcefulness, and resilience are recurring themes, especially in relation to using technology to do things differently in crisis situations. E-learning provides a platform by which an affected institution can recover from such crises. Innovative uses of technology have provided resilient solutions to combat disruption and enable people to work, socialize, and communicate virtually by replacing face-to-face interaction with online interaction in times of crisis (Mackey, Gilmore, et al., 2012).

Mark and Semaan (2008) found that people in a disrupted environment which affected their normal routines switched from relying on physical resources (e.g. cars, workplaces) to using information technologies as a primary resource to carry out action. When the physical environment constrained people, information technologies provided people with alternatives to continue to act in both their physical and virtual environments. Majchrzak, Jarvenpaa, and Hollingshead (2007) reported how, within hours of Hurricane Katrina's landfall in Louisiana and Mississippi, a KatrinaHelp Wiki emerged. The Wiki provided lists of shelters, government resources, animal rescue resources, the latest health and safety information, and a people-finder service that helped to coordinate rescue, recovery, and relief efforts. Dabner (2012) described how the University of Canterbury was successful and responsive in the use of web environments and social media to provide information and support following a natural disaster, illustrating the ways the University effectively utilised the tools, features and resources available through their web site and the social networking site *Facebook*, for information and support purposes. Qu, Huang, Zhang, and Zhang (2011) conducted a case study in China to investigate how Sina-Weibo, a popular Chinese micro-blogging system, was used immediately after a major disaster – the 2010 Yushu Earthquake.

This limited review of e-learning and related research into responses to crises provides some evidence that changes to e-learning make an interesting and valuable topic of research

to inform greater resilience in future. A fuller literature review will be presented in Chapter Two.

Statement of the problem

Higher education institutions are evolving with digital technologies to become more resilient as a response to the many natural and social crises experienced in the 21st century. These crises include earthquakes in New Zealand, tsunami in Sri Lanka and Japan, floods in Australia, and hurricanes and shootings in the USA. Responding to such events stimulates change within a university and its networks, which can be viewed as an acceleration of the co-evolution of education with digital technologies (N. Davis, Eickelmann, & Zaka, 2013). While similar changes may have occurred over time, it is likely these crises lead institutions to develop resilience and may also have accelerated the co-evolution of education and digital technologies. A disaster might be seen as an unplanned phenomenon producing data about the system concerned. The issue is then to benefit from the unplanned phenomenon, and thus gain cognitive, technological, and organizational benefits (Cowan, Fauchart, Foray, & Gunby, 2000, p. 3).

Digital technologies and e-learning are an integral part of universities in New Zealand in the 21st century. Bates (2010) notes,

> information technology is no longer just a useful tool that supports university and college administration and to a lesser extent teaching and learning; rather it is now an integral and essential component of almost all core higher education activities, and as such needs to be used, managed and organised accordingly (p. 1.).

E-learning has evolved alongside distance education with the adoption of digital technologies into campus offerings.

Higher education institutions have to be able to respond to the occurrence of crises that may result in the closing down of the tertiary institution for a period of time, thus interrupting the academic year. Willingness to use digital technologies is an important factor in enabling

people to adapt creatively and flexibly to virtual environments when normal patterns are disrupted (Mackey, Gilmore, et al., 2012). E-learning has the potential to help higher education overcome crises, yet there has been limited work on the experience of higher education with e-learning following crises. ICTs have been used for communication and to support planning during crises; their use for supporting learning during and following crises also needs to be investigated. This research has sought to provide insight into the long term evolution of e-learning following a large scale natural disaster and its impact on one university.

Purpose of the study

The purpose of the study was to research the evolution of e-learning in a research intensive university that was in a region subjected to severe earthquakes. It aimed to strategically inform institutions of higher education and their stakeholders about relevant developments of e-learning to support resilience and enhance the quality of higher education following natural disasters and crises. Given the acceleration of evolutionary processes following a crisis, the study has also provided an opportunity to better understand these processes.

Research question

The following question guided the study:

How has the University changed with e-learning in the wake of seismic activities?

Significance of the study

The thesis provides insights into how the university, that is, teachers, support and administration staff, and students, reacted to change with respect to e-learning following the crises.

Delimitation

The study was delimited to unplanned change in the use of *Learn*, the learning management system, by teachers and students of the University and the use of University supported e-learning technologies of *Echo 360*, *AdobeConnect*, Multimedia, manual lecture capture and DVDs, as a result of earthquakes that occurred in Christchurch.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter reviews existing literature on e-learning in higher education and its application during crises. In this chapter literature on the following themes are reviewed: Crises and higher education, Communication about crises, IT infrastructure, Availability of e-learning technologies, Support in the use of e-learning technologies, Timing of crises in academic year and Strategic planning for e-learning. The e-learning Maturity Model Capability Assessment which formed the baseline of the study is included within the discussion of strategic planning. The theoretical frameworks adopted for the study are also discussed. The chapter begins with the methodology for the literature review for the study.

Methodology for the literature review

The review process followed the three main steps of literature reviews as articulated in Galvan (2006) which include searching, reviewing and writing the literature review. Literature for review was obtained through a desktop search of Google Scholar with the key words 'crises+resilience+higher education' and 'disaster and learning and technology'. From the search results obtained and the synopsis displayed on each file in the search, a decision of relevance was made whether to read further. Only peer-reviewed sources were considered at this stage, to ensure quality of the review. The links of those selected were right-clicked and read. When a file was not available, a *MultiSearch* in the University of Canterbury library was made. *MultiSearch* lets one quickly search across a range of the Library's resources in one place, including the library catalogue, most library databases, and some digital collections. If a file was still not found then an Inter-loan request was made from the library. Further searches were accomplished through backward referencing. Abstracts of the

publications found were read and if a publication was relevant to the research then it was marked for further reading.

Further searches and reviews were planned as the research progressed. The following themes: Communication about crises, IT infrastructure, Availability of e-learning technologies, Support in the use of e-learning technologies, Timing of crises in academic year and Strategic planning for e-learning emerged from the discussion of the findings. Further literature review was then conducted.

It was deduced from the search of literature that several authors used different synonyms to mean e-learning. Guri-Rosenelt (2009) identified more than twenty terms that were synonymously used with the term *e-learning*. In particular, she noted that the term *e-learning* is widely used synonymously with the term *online learning* among other terms. These synonyms 'e-learning', 'elearning', 'online learning', 'blended learning' among others were used to search for literature for the research as the work progressed, to improve the literature review.

Crises and higher education

There is not much research and/or literature which specifically addresses disaster preparedness for most tertiary educational institutions especially in teaching and learning with respect to earthquakes. Literature found was mostly empirical studies which used case study methodology, self-report methodologies, interviews and some surveys. Purposive sampling was used in selecting respondents for most of the surveys. In addition, it was noted that few studies were informed by appropriate theoretical perspectives. It should also be recognised that the conduct of research in an immediate post disaster situation is challenging and it may take good fortune to be set up in time to gather data ethically (Dabner, 2012).

From the analysis of literature the role of e-learning technologies for higher education institutions (HEI) in times of emergencies and crises fell into six categories: its use for disaster planning, to facilitate communication with students and staff, IT infrastructure,

Availability of e-learning technologies, Support in the use of e-learning technologies, Timing of crises in academic year and Strategic planning for e-learning. The role of e-learning technologies for higher education institutions (HEI) in times of emergencies and crises is now described.

Disaster Planning

SchWeber (2008), in a theoretical-based paper, explored characteristics commonly associated with resilient organizations which were reflected in Empire State College (ESC) in Lebanon and Xavier University (XU) in New Orleans when they were faced with crises. These were "Adapt to the situation and problem-solve", "Expand upon existing resources", "Quickly make and implement decisions" and "Manage effectively in uncertain and unexpected situations". SchWeber contended that in adhering to principles associated with resilience and survival as listed above, ESC and XU communicated quickly and honestly with the various stakeholders; they built upon existing technological systems and the digital environment such as online learning, a strong information technology infrastructure, multimedia, and chat to provide new or varied services in the immediate and longer-term aftermath; they collaborated with or expanded upon existing support networks; they moved quickly in deciding upon and implementing actions, and revised or developed creative solutions as the situation unfolded.

SchWeber (2008) argued in a study of two higher education institutions that were affected by disasters that since access to learning as well as to the support systems could be interrupted by various circumstances, the possibility of providing continuity despite external dangers by using online distance education offered an intriguing and valuable option. SchWeber explored how institutions in higher education organised and implemented an e-learning strategy for dealing with their disaster, enabling the students to continue their education. However, the crises that affected educational organisations described in the

research did not include earthquakes. SchWeber (2008) observed that organisations faced with crises adopted certain characteristics appropriate to the particular crisis, such as "adapt to the situation and problem-solve" (p. 41).

Communication

Spicer (2008) in a theoretical-based paper dicussed the role of IT in disaster recovery in higher education. Spicer subscribed to the view that in an emergency, the ability to communicate internally and externally became a key service for an organization. Spicer, did not, however, support this view with empirical data. Spicer was of the opnion that online learning, which is an Internet-based service in most instances, could be sustained more readily than place-based teaching and learning, if the delivery system was designed with potential emergencies in mind. Spicer (2008) declared that in long lasting emergencies, the issue is likely not to be about reconstituting business services but rather about maintaining the mission activities. Thus for higher education, the focus would be how to preserve the teaching, learning, and research programs. Spicer (2008) outlined an evolution of thinking regarding the role of Information Technology Services in enterprise emergency response. He stated that, in an emergency, the ability to communicate – internally and externally – becomes a key service for an organization. The organization's website would then become the vehicle of choice for general information regarding status of the situation and tactical issues related to a response.

Palen (2008) notes in research conducted after the 2007 Southern California Wildfires that people in the affected region used social media to learn critical information about the fires. An online research questionnaire and face-to-face interviews were conducted and of the 307 people who accessed the questionnaire, 279 completed it. She found that 76% of the respondents reported that they had consulted information portals and websites advertised in traditional media.

Palen, Vieweg, Sutton, Liu, and Hughes (2007) reported that in the aftermath of the Virginia Tech shooting in 2007, ICT enabled people - disaster survivors, curious observers, and those who wished to help victims – "to connect to one another and to participate in events, including through seeking and providing information peer-to-peer" (p. 76). 7. Five days after the shooting researchers conducted 56 face-to-face interviews with students and staff of Virginia Tech as well as Blacksburg community members. The rest of the research team monitored newsfeeds and began to investigate social networking sites. Palen et al. (2007) discovered that worldwide participation in online social media sites using distributed online collaboration correctly identified the victims on the Virginia Tech campus before the university released their names to the public.

In a theoretical-based paper, SchWeber (2008) described Xavier University's use of ICT for communication and e-learning after Hurricane Katrina hit the gulf coast in 2005. SchWeber claimed that this was successful as a result of Xavier University setting up an emergency website three months earlier. The emergency website provided basic information since staff and students left the Xavier grounds a few days before the storm touched down. DiCarlo et al. (2007) in a theoretical paper about challenges in the aftermath of Hurricane Katrina in 2005 at Louisiana State University (LSU) School of Medicine reported that communication with dispersed faculty, staff, students, and residents was considered to be essential so the IT staff were mobilised and immediately established an emergency website with daily messages from the Chancellor and Vice chancellors.

Sutton, Palen, and Shklovski (2008) claimed that peer-to-peer communications through social media, such as social networking sites, text and instant messaging applications, blogs, wikis and other web forums, were growing as a means for supporting additional, often critical and accurate, dissemination of information within the public sphere. In 2015 however, there are several devices that access the Internet through cell towers which may be overloaded

especially during crises, when users attempt to use them to access social media websites. Also, landline services may be disrupted during a crisis. The authors collected empirical data using the qualitative methods of observation, interview, and collection of on-line texts by those affected by the wildfires as a means of conducting "quick response research". An on-line questionnaire about ICT use and information gathering and to capture a broad base of experiences by those affected by the wildfires was developed. The questionnaire was disseminated to people in their personal and professional networks and solicitations were posted on local forums and online newspapers in the affected communities as well as the appropriate discussion groups on *Craigslist* (a classified advertisements website), *Facebook* and *Flickr*. Three hundred and seven respondents accessed the questionnaire with 279 completing it. Sutton et al (2008) concluded that social media supported backchannel communication, allowing for wide-scale interaction between members of the public that had qualities of being collectively resourceful, self-policing and generative of information that could not otherwise be easily obtained.

Beggan (2010) reported in a study that as a result of the impact of Hurricane Rita, Lamar University was offline and a blog site was set up at the University of Texas in Austin so as to communicate with the dispersed group of faculty, staff, and students. The study combined survey data analysis with interviews and a case-study approach to evaluate the impact of Hurricane Rita on Lamar University. Four hundred and seventy-seven students and 116 faculty members responded to the survey. A high percentage of faculty and students reported that they had relied on the internet to acquire information after the storm. Beggan pointed out "it seems prudent that academic administrators should consider carefully which particular media sources to target to disseminate information after a disaster" (p. 101). Beggan reported that mis-communication problems were made worse by a hacker whose main aim was to take

advantage of the dire circumstances and disrupt communication further by distributing false information on the blog site that contributed to false rumours and unfounded conjecture.

Bird, Ling, and Haynes (2012), noted that a lesson learnt during the Queensland and Victorian floods in Australia was that social media were a good way to disseminate emergency information, as they were effective and fast, because they were part of everyday life in that region. Bird, Ling, and Haynes conducted a survey of people who were members of a number of *Facebook* communities including Central Queensland and Victorian Floods community group pages. An online questionnaire was developed and advertised through a posting on various *Facebook* community group pages. An invitation to participate was open to anyone who accessed these *Facebook* groups. In total, 432 people responded to the survey. Many users relied on these pages for flood-related information during the worst phases of the disaster and nearly two-thirds of respondents used the *Facebook* groups to gain information about their own community. The authors found out that there was an increasing trend of accessing social media via smartphones. Social networks were therefore useful particularly, during a disaster when power disruptions may eliminate traditional media of television and radio.

A report by Seaton, Seaton, Yarwood and Ryan (2012) on the earthquake disaster in Christchurch at Christchurch Polytechnic Institute of Technology showed that access to teaching/learning resources and lesson plans was extremely limited as a result of the earthquakes in 2011. The research by Seaton et al. (2012) used descriptive/exploratory case study design. A sampling framework was used and it captured data from electronic/documents and staff in the institution. Seventeen people were interviewed and documentary analysis from official communications and learning management systems was also used. Seaton et al. (2012) noted that communication was seen as critical and the degree of disruption and uncertainty immediately following the earthquake significantly impacted on

the ability of individuals, and the organisation as an entity, to communicate both within and outside the organisation. There was a decision to use text messaging, a web 2.0 tool – *Facebook* and a temporary website, as the original website was down for communication. The *Facebook* page provided a crucial means of communicating with students in the community. It also informed staff of the most pressing student concerns and issues. The authors reported that although the institution had a disaster plan, very few students and staff were aware of the disaster plan. The authors reported that although they were not prepared for the February 2011 event they became better prepared after each major event

IT infrastructure

DiCarlo et al. (2007) were of the opinion that all administrative units and schools within a tertiary institution must have their own disaster plans that include communication systems and data back-ups. The authors were motivated to do the study so as to provide lessons about organisational preparedness for a disaster. Beggan (2010) also identified the need for institutions to have contractual arrangements with utility providers and consultants whose services are necessary to enable the provision of teaching and learning. Schmidtlein and Taylor (2000) illustrated the need for more wide-ranging research on the costs of instructional technology in higher education. They advocated a provision of a framework for examining these costs.

Schmidtlein and Taylor (2000) were of the opinion that the advocates for rapid adoption of these technologies in colleges and universities assumed that "institutions must quickly use them in their instructional programmes if they are to avoid being supplanted by newly emerging 'for profit' and non-profit organisations" (p. 290). The advocates were however, not identified by the authors. The authors were of the opinion that if instructional technology applications were perceived to produce values exceeding those of other competing investments of resources and time, then faculty and staff would adopt them. In analysing the

productivity of instructional technology, Schmidtlein and Taylor (2000) pointed out that the costs that relate to education needed to be acknowledged when analysing the productivity of instructional technology. The costs were described as including a communications network and associated equipment to link classrooms, buildings and dormitories together.

Availability of e-learning technologies

An E-Learning Advisory Group was established by the government of New Zealand in July 2001 to provide advice to the Ministry of Education on innovative ways to achieve a strategic direction for e-learning in New Zealand's tertiary education sector. In a report of the E-Learning Advisory Group, Butterfield et al. (2002) noted that technology was opening up new learning pathways and making it possible for people to undertake tertiary education in new ways from home, work, as well as traditional campus-based study. The authors were of the opinion that "e-learning will not replace campuses but it will change the way students learn when they are on campus" (Butterfield et al., 2002, p. 5). The Advisory Group recommended the phased implementation of a tertiary e-learning consortium comprising institutions with appropriate expertise in the area. In addition, they recommended the creation of a single electronic point of entry, a portal, for people to gain access to a wide range of information, services and resources offered by New Zealand's tertiary education sector at that time. Furthermore, Butterfield et al. (2002) added that New Zealand would require educators who hadthe skills to work confidently in an internet environment as well as a lecture theatre. Butterfield et al. (2002) observed that a new generation of students was emerging from New Zealand secondary schools who were technologically-capable and would expect e-learning to be part of their educational experience and that professional development would bes a priority throughout the tertiary sector so that academic staff would have the abilities required for this new medium.

In a theoretical-based paper, Watkins (2005), expressed the opinion that since many distance education programmes in colleges and universities operated on web-based delivery

systems that were typically not maintained on-campus, their access and operational requirements were less likely to be impacted by the ravages of a disaster. Such web-based delivery system could provide colleges and universities with a stable environment in which to provide students, faculty, and staff with essential two-way communication channels throughout a disaster and the subsequent recovery efforts. However, it seems the impact of such disasters on the conditions of the learners, particularly when there were likely to be learners who reside in the affected region were ignored by Watkins.

Hinson, LaPrairie and Carroll (2007) addressing the U.S. Department of Education and Department of Health and Human Service's recommendations for school closures offered a set of preparedness guidelines for operating schools as online learning communities until a disaster has passed. Hinson et al. (2007) suggested that to support online learning, some type of infrastructure and procedures for locating instruction should be in place. The authors futher proposed that all schools [K-12] needed to adopt blended learning as a stepping stone to online learning to sustain instruction during school closures.

Meyer and Wilson (2011) discussed the response to the H1N1 crisis and emergency preparedness plan of flagship universities in the United States. The sample was constructed of the 50 public "flagship" universities in the 50 states. All the universities sampled made vague references to the use of e-learning or other synonyms of e-learning during crises. Meyer and Wilson concluded that only a third of these universities had incorporated statements about academic continuity in the face of an emergency, largely urging technological solutions. However, technological solutions when mentioned, seemed to be in the form of suggestions that faculty could consider. In addition, in no case did an institution state a policy that courses would change mode of delivery to online in the event of an emergency, although the University of Alabama came very close. A conclusion can therefore be made that these higher education institutions in the United States were not well prepared with strategies to use for teaching during crises.

Seaton et al.'s (2012), exploratory case study design of the 2011 seismic event in Christchurch at Christchurch Polytechnic Institute of Technology (CPIT) reported that after the earthquake disaster in Christchurch, there was an increased use of the electronic delivery modes for teaching already available in the learning management system, *Moodle*. The *Moodle* LMS had been in place within the School of Nursin at, CPIT prior to the disaster, but was previously used only in a limited way for small groups of students. Some staff used *Moodle* as a teaching medium and others as a repository for course-related information. Seaton et al. (2012) described how staff found they needed alternatives to face-to-face teaching to act as a medium for communication, both for announcements and for teaching itself, in addition to a repository for the subject material or content as a primary resource (p. 84). The teachers were more concerned with finding a medium/site to teach from/out of rather than for sourcing content. The authors reported that the teachers were registered nurses and had an embedded repository of knowledge to work with thus there was less reliance on external resources such as textbooks or reading material.

Support in the use of e-learning technologies

In a qualitative study that investigated the experiences of distance learners beginning online Master of Education programme at University of Manchester, Motteram and Forrester (2005) discussed the opportunities and constraints provided by the technology in terms of introducing students to their online studies and the online environment. They reported that online environment brought its own benefits, limitations, and challenges to students. The authors found out that some students were frustrated by their early encounters with the technology either because of their own inexperience or the unpredictable local infrastructure. The authors recommended from their study that an induction was needed to equip the distance student with the requisite access and retrieval skills as initial enthusiasm for learning could quickly be thwarted by unfortunate early encounters with technology.

Brown, Anderson, and Murray (2007) identified a discernible pattern to the development of e-learning policy. They also asserted that to support the objective of building and ensuring

quality in e-learning there should be: provision of support, information and guidance for learners; professional development and support for tertiary teachers; leadership development; and development of high quality e-learning content. Brown et al. (2007) pointed out that "buy-in" by staff and institutions was slow and considerable investment in time and people was essential.

In a report of a national survey in Technology Enhanced Learning (TEL) in UK higher education (HE) institutions, Walker, Voce, and Ahmed (2012) found out that the availability of TEL support staff remained the leading factor in encouraging the development of TEL, followed by central university and school/departmental senior management support, However, the top two barriers to TEL development, the authors argued, were lack of time from academics and money in higher education institutions. Similarly, Walker et al. (2014) in a report from a national survey in Technology Enhanced Learning (TEL) in UK higher education (HE) institutions expressed the opinion that enhancing the quality of learning and teaching was the primary driver for considering using TEL. Lack of time remained the leading barrier to TEL development as found in the 2012 survey. Lack of academic staff knowledge was found to be a barrier to using TEL in the 2014 survey. Lack of support staff/specialist skills/resources and staff development remained key challenges.

Haggerty (2015) illustrated in research using a mixed methodology approach in a tertiary institute of technology in New Zealand into available professional development focused on technological and presentation aspects, rather than pedagogy in practice. Haggerty expressed the opnion that the workloads of academics therefore increased and add complexity without the understanding of the pedagogy of teaching. Haggerty argued that academics become empowered to better understand and manage their workloads through the implementation of targeted professional development.

Law (2010) identified that in pre-tertiary education "the skills and knowledge that teachers need to have differ depending on the perceived purpose and anticipated impact of technology integration in the curriculum" (p. 211). Law added that the teachers' ability to

make appropriate selection and use of ICT tools in different curriculum contexts for different pedagogical purposes was the most crucial determinant of actual ICT use in instruction. Law (2010) stressed that the requisite teacher competencies included technical and pedagogical competence for ICT integration in subject teaching and assessment as well as using ICT for managing classroom data and for supporting their own professional development.

Timing of crises in academic year

Pearson and Mitroff (1993) sought to explain how organisations may surprisingly contribute to their own crises, as well as what can be done to avert human-induced disasters, and to manage those that do occur. The authors conceded that organisations had little control over natural catastrophes and upheld that an incident or event must pose a threat to the organization's reputation and viability to be considered a crisis. Pearson and Mitroff (1993) indicated that the survival of the whole organisation could be in jeopardy when a crisis imposed severe strain on the organisation's financial, physical, and emotional structures. The sample of organisations used for the study did not, however, include any educational institutions.

Strategic planning for e-learning

McNaught and Kennedy (2000) in a study of a tertiary institution in the Australia were of the opinion that communication and information technologies would be a major part of future university planning. The authors outlined some general principles for effective staff development in that institution. The authors reported that flexible modes of delivery had been widely viewed as the prime way of meeting the challenges posed by a diversity of more part-time students and students from a greater variety of backgrounds in universities. McNaught and Kennedy (2000) concluded from their study that good educational design was the key to successful flexible learning and that there was a need for a combination of policy, culture and support factors if significant adoption of TEL strategies is to occur. The combination could include an alignment of policy throughout the organization, the direction of policy change

and personal motivation of staff to use TEL, as well as particular aspects of funding, staff rewards and time, and instructional design support for academic staff. McNaught and Kennedy (2000) warned that difficulties involved in innovation and change should not be underestimated. Kennedy added that careful work planning to ensure that staff have time to learn new skills and manage new processes was seen as essential.

In 2002, the Government of New Zealand released the Tertiary Education Strategy 2002/07 (Ministry of Education, 2004). That strategy laid out a series of proposed changes to New Zealand's tertiary education system, to better support national development goals, and respond to the challenges of globalisation, accelerating technological change, and the knowledge society. E-learning was seen as having a key part to play in this as it was already bringing significant changes to the education sector. It was envisioned that e-learning would lead to better quality teaching and improved learning outcomes and that a national tertiary e-learning framework would help ensure that these changes advanced the Government's overall strategy for tertiary education in New Zealand (New Zealand Ministry of Education, 2004). The Ministry of Education clarified that e-learning offered neither a replacement of, nor a simple adjunct to the then existing educational system. Instead, e-learning had the potential to transform the then current practice. The Ministry of Education in 2006 repeated the view that e-learning would help remove barriers to educational opportunity and success, leading to increased participation at all levels in the tertiary system. Although a national strategy is different from an organisational strategy with regards to e-learning, the national had an influence on an organisational strategy. Guiney (2011) reported that in New Zealand e-learning was widely available at higher qualification levels but much less so at lower levels of tertiary education. Also, e-learning was more widely available in some parts of the sector than others.

Conole and Oliver (2006) considered the impact of e-learning on institutional change, particularly changes to roles and organisational structure in higher education and upheld that organisations are complex and multi-faceted, and thus had a direct impact on the degree to which learning technologies are successfully taken up. The authors underscored that part of the difficulty of understanding and implementing e-learning was that there was no one unique description for "e-learning". Conole and Oliver (2006) however, described e-learning as a catalyst for change, precisely because it was seen as cutting across institutional structures and impacts on all aspects of practice. The authors outlined some of the interventions associated with the increased impact of e-learning such as concentration on the technical or educational aspects, whilst others focussed on policy developments, staff developments and changing organisational structures.

Salmon (2005) challenged what she saw as a common belief among managers, policy-makers and strategists that, by encouraging academics to post some notices or PowerPoint slides on an LMS, "an e-learning process emerges that will benefit learning, and that in some magical way such academics will 'cross the divide' and understand motivating online learning systems or even remote knowledge construction" (p. 203). Salmon noted that the costs of e-learning attracted much more attention and challenge than the investment in more conventional learning infrastructure. Salmon claimed on-campus costs were often in legacy systems and buildings. Also, costs associated with e-learning included the capital and direct costs of the technology itself but also the development of resources involving a number of professionals and considerable academic and technical staff development, to increase the chances of success. Salmon (2005) observed that most HEIs were still struggling to engage a significant percentage of students and staff in e-learning. Salmon claimed all HEIs were vulnerable to a wide variety of pressures but had a high resistance to change and much of the focus has been into the development of technologies or top-down policy aspirations, and not

on the human dimensions, scaling-up and embedding of innovation and the associated management of change. Salmon's opinion in 2005 was that there were two main ways in which e-learning can be introduced into traditional teaching, whether on campus or at a distance. One was through large-scale centralization and provision of professional services. The second was more incremental, perhaps a little slower and more challenging, but gradually involving all members of staff to make their contribution. She also noted that an e-learning strategy needs to sit within wider national frameworks and directions.

The e-Learning Maturity Model Capability Assessment of UC (Marshall, 2009b) has been designed to inform institutional strategy by adopting a benchmarking process. The assessment of this capability is explained in the following section.

E-Learning Maturity Model Capability Assessment

The utilisation of e-learning in educational institutions has become important. In New Zealand, tertiary organisations are increasingly including these components in the programmes of study they offer their students (New Zealand Ministry of Education, 2004). However, an e-learning environment should involve more than deploying a technical solution, "e-learning has to provide the learner with qualitative content and services, support the learning process lifecycle and provide the platform for assessment as well as communication between students and teachers" (Penicina, 2011, p. 88). Several frameworks have been developed to measure an organisation's capability to implement e-learning, such as the E-Learning Capability Maturity Model (Penicina, 2011), the e-Learning Maturity Model (eMM) (Marshall, 2006b) and the e-Learning Process Capability Maturity Model (Zhou, 2012) which extended the eMM by developing a quantitative model to measure the capability and maturity of an educational institution. The e-learning Maturity Model has been used to provide detailed information on the e-learning activities of educational institutions in Australia (Marshall, 2009a) and New Zealand (Marshall, 2012a). Marshall's (Marshall,

2010a) eMM is useful to conceptualise the range of organisational developments with e-learning that have occurred in the first decade of the 21st century in many tertiary institutions, and his research provides valuable case studies, including one of the university in this study (Marshall, 2009a) as shown in Chapters 4, 5 and 6 of the thesis.

The capability of the University of Canterbury to deliver e-learning of high standard and sustainability was evaluated using the e-Learning Maturity Model (Marshall, 2009a) in late 2008/early 2009. In UC, thirteen courses across UC Colleges were assessed. The sample size for the report was small in comparison to the number of courses offered in UC. The report did not give an indication whether the sample was purposefully or randomly selected. Some academics might feel anxious that their engagement with e-learning is criticized in a negative way. In addition, there may also be good practices in some courses that may have not been selected due to the method of selecting the sample for the report and this has implications when extrapolating the analysis from the sample to represent practices in a College. Marshall (2009b) noted that "existing approaches for teaching and learning were being carried over to technology without reflection and planning" (p. 6) and that students were not adequately prepared to use e-learning in their courses. An observation was made in the report that although support in the use of e-learning existed, academics were not provided opportunities to improve their skills in e-learning. Marshall (2009b) reported that assessment tasks were not explicitly staged. The next section describes the theoretical framework of the study.

Theoretical framework of the study

Two models, Indicators of Resilience Model (IRM) and Technology Acceptance Model2 (TAM2) (Venkatesh & Davis, 2000) were selected to inform the study. The IRM was used to describe the resilience of the University and the Colleges with respect to e-learning and the TAM2 was used to describe academics' engagement with e-learning in the aftermath of the seismic events of 201 and 2011.

Indicators of Resilience Model

Chang-Richards, Vargo, and Seville (2013) defined organisational resilience as "the ability of an organisation to survive a crisis and thrive in a world of uncertainty" (p. 117). It also refers to how organisations improve their ability to respond to and quickly recover from catastrophic events such as natural disasters and terrorist attacks. The IRM posits there are 13 indicators that can be used in assessing the resilience of an organisation (Resilient Organisations, 2012). These 13 indicators are grouped into three categories: Leadership and Culture; Networks; and Change Ready. The IRM was developed to determine the resilience of organisations to disasters. Therefore, the IRM was selected for this research into the use of e-learning as a result of the seismic events of 2010 and 2011. The IRM had constructs that could be applied to the data collected for the study, as discussed later in chapters 4, 5 and 6 of the thesis.

Technology Acceptance Model

Factors that lead to user acceptance or adoption of a particular information technology are commonly presented in terms of depicting models of technology acceptance. The Technology Acceptance Model (TAM) as originally proposed by Fred D Davis, Bagozzi, and Warshaw (1989) has been claimed to explain 40% of users' acceptance of technology as reported by Venkatesh and Davis (2000). TAM classifies two major influences that determine technology acceptance: perceived usefulness and perceived ease of use. Venkatesh and Davis (2000) extended the original TAM model to describe perceived usefulness and usage intents in terms of social influence. TAM2 incorporates "additional theoretical constructs spanning social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use)" (Venkatesh & Davis, 2000, p. 187).

Researchers have attempted to develop the model further. Most of these efforts have "constituted a broadening of TAM in the sense of introducing additional predictors for either perceived usefulness or intentions" (Bagozzi, 2007, p. 244). As explained by Faqih and Jaradat, the TAM3 model places a heavy emphasis on involving an array of core issues such as "individual differences, system characteristics, social influence and facilitating conditions" (Faqih & Jaradat, 2015, p. 38). There are 41 independent variables for predicting intentions and at least eight independent variables for predicting behaviour in the Unified Theory of Acceptance and Use of Technology which further extends the TAM. The TAM2 had constructs that could be applied to the data collected for the study, as discussed later in Chapter 5.

Summary and conclusions

Literature was reviewed across the themes: Communication about crises, IT infrastructure, Availability of e-learning technologies, Support in the use of e-learning technologies, Timing of crises in academic year and Strategic planning for e-learning. There was not much research and/or literature which specifically addresses disaster preparedness for most tertiary educational institutions especially in teaching and learning with respect to earthquakes. Deductions from the literature review showed that immediately after a disaster, especially in an academic institution, communication with students and staff and other stakeholders is important. Having a functional IT infrastructure in the aftermath of a disaster was revealed through the literature to be of importance to an institution. In addition, the use of e-learning technologies requires support to set up and manage the technologies. Furthermore, the time of the academic year when crisis occurs was found to determine the e-technology required to overcome the crisis. Literature on strategic planning for e-learning was also reviewed. The literature showed that there had been research on the use of e-learning during crises but very few on the use on e-learning as a result of seismic events.

The research reviewed in this chapter will guide this study in ways that may validate, contrast and extend those findings. The limitations of those studies will also be applied so that those limitations may be avoided. The studies reviewed used both qualitative and quantitative methodologies; those methodologies will serve to guide the methodology for this study. The next chapter describes the methodology employed to address the research question for the study.

CHAPTER 3

METHODOLOGY

The purpose of this chapter is to provide a description of the design and procedure used to address the research question and gain insights into how the University has changed with e-learning from 2010 to 2014 as a result of the seismic activities in 2010 and 2011. The chapter is organized under the following sub-headings: research design; population and sampling; sources of data; ethical considerations; data collection procedures; and data analysis.

Research Design

A qualitative intrinsic embedded/nested single case study design was chosen for the study (Gray, 2009; Patton, 2002; Stake, 1995; Yin, 2008). Yin (2008) defines the case study as… "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). Case studies explore subjects and issues where relationships may be ambiguous or uncertain and also try to attribute causal relationships rather than just describing a situation (Gray, 2009). The case study method requires the use of multiple sources of evidence. This might include the use of structured, semi-structured or open interviews, field observations and document analysis. In this case study, there were multiple sources of data, including documentary analysis of the university policy statements, and reports and interviews of management and academics. Yin (2008) explains that "a single case can represent a significant contribution to knowledge and theory building" (p. 40). The case study does not aim at generalisation of the findings. As noted by Gray (2009), "the case study method is ideal when a 'how' or 'why' question is being asked about a contemporary set of events over which the researcher has no control" (p. 124).

Gray (2009; Yin, 2008) suggest the use of single case, embedded study design when there may be a number of different units of analysis. Patton (2002) refers to "nested" and "layered" case studies. A "nested" case study is a single case within its context. A layered case study consists of various smaller case studies, all of which yield information for answering the evaluation. Neither Patton nor Yin's distinction is concerned with the number of cases, but with the number of units of analysis. A nested or embedded case study encompasses one unit of analysis, while a layered or holistic case study encompasses several units of analysis (Guest, Bunce, & Johnson, 2006).

Stake (1995) asserts that the intrinsic case is often exploratory in nature, and the researcher is guided by his or her interest in the case itself rather than in extending theory or generalizing across cases. The focus, however, is in offering a reader thick description of the case so that the reader can draw his or her own interpretations about the particularities of the case and the transferability of the findings to other cases (Grandy, 2010). Yin (2008) explains that the case study approach has not been universally accepted by researchers as reliable, objective and legitimate. One problem is that it is difficult or impossible to generalize from a specific case. In defence of case studies, Yin points out that most scientific enquiry has to be replicated by multiple examples of the experiment. Although case studies too can be based upon multiple cases of the same issue or phenomenon, each is likely to be a unique phenomenon rather than a representative sample.

A major pitfall of the embedded design occurs when the case study focuses only on the subunit level and fails to return to the larger unit of analysis. I overcame this pitfall by reporting the findings on the nested case studies. This enabled me to distinguish data from the participants of the study that were specific to a College and data that was general and thus more suited for the larger unit of analysis which was the University case.

Population and Sampling

The population of the study was the management and educators in the University of Canterbury. The University of Canterbury was purposively selected because it is a research-based higher education institution in New Zealand that was affected by seismic activities. As described in the introductory chapter, the institution had adopted e-learning in its teaching, with very little distance education outside the College of Education.

Nonprobability purposive sampling was employed to select the sample for this study. With this technique, a researcher purposely chooses subjects who, in his opinion, are relevant to the project (Sotirios, 2013). Cohen, Manion, and Morrison (2007) assert that a nonprobability sample can prove adequate and effective where researchers do not intend to generalize their findings beyond the sample in question. In purposive samples, participants are selected according to predetermined criteria relevant to a particular research objective.

Sample size

Guest et al. (2006) recommend that the size of purposive samples be established inductively and sampling continues until "theoretical saturation" occurs. Glaser and Strauss (1968) define saturation as "the point at which no additional data are being found whereby the researcher can develop properties of the category" (p. 61). Guest et al. (2006) concluded from a study involving sixty in-depth interviews with women in two West African countries that "for most research enterprises, however, in which the aim is to understand common perceptions and experiences among a group of relatively homogeneous individuals, twelve interviews should suffice" (p. 79). Guest et al. (2006) also reported that basic elements for metathemes were present as early as six interviews. The skill of the interviewer clearly has an effect on the quality of data collected and this will have a subsequent effect in achieving saturation (Guest et al., 2006). Thus the sample size becomes irrelevant as the quality of data is the measure of its value. Patton (2002) points out that "the validity, meaningfulness, and

insight generated from qualitative inquiry have to do with the information richness of the cases selected and observation/analytical capabilities of the researcher than with sample size" (p. 245).

On the limitations of this sampling technique, Cohen et al. (2007) stress that, while it may satisfy the researcher's needs to take this type of sample, it does not pretend to represent the wider population; it is deliberately and unashamedly selective and biased. Patton (2002) argues,

> there are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, the purpose of the inquiry, what is at stake, what will be useful, what will have credibility, and what can be done with available time and resources (p. 224).

The sampling technique was a snowball strategy where the early key participants were encouraged to recommend further participants to be invited to volunteer to participate in the study (Fraenkel, Wallen, & Hyun, 2012; Trochim, 2006). This technique begins by asking well-situated people "who knows a lot about.....? By asking a number of people who else to talk with, the snowball gets bigger and bigger as new information-rich cases accumulate" (Patton, 2002, p. 20). The snowball strategy was used to identify participants for the study in two colleges purposely selected for the study. A saturation point was reached when key people, already interviewed, were repeatedly recommended (Sotirios, 2013).

The sample for the study included the Learning Advisors of the Electronic Learning Media of Learning Resources, the leaders of College of Education (CoE) and College of Business and Law (CoBL) of the University, and academics in the two colleges. The snowball technique started with an informal discussion with the former leader of the Electronic Learning Media to find key participants. Informal discussions with the key participants then led to identifying some participants of the study. As I interviewed participants, other individuals were recommended who might be helpful to the study. Also,

academics who had published articles on the use of e-learning after the seismic activities were invited to be part of the study.

Key participants were essential to the study. Key participants are people who are particularly knowledgeable about the inquiry setting and articulate about their knowledge; and whose insights can prove especially useful in helping an observer understand what is happening and why (Patton, 2002). Key participants included the University's Flexible Learning Advisors and their leader who provide services as part of an integrated, college-focused academic support team and also work closely with college learning and teaching committees. They were invited to volunteer information pertaining to the research question for the study. The leaders of colleges were invited to give information on how their colleges were prepared to use e-learning before, during and after the seismic activities in 2010 and 2011.

The two colleges were purposely selected because one was a leader in New Zealand in the use of e-learning, flexible and distance learning (see Case study setting in Chapter 6). The other college was emerging as a user of flexible learning options in one of its departments in courses for first year students. Data collected from the colleges was supplemented by university documents and reports. In addition, data was collected from units in Learning Resources that supported members of the University in using e-learning. The data was then collated to make a case of use of e-learning in the university.

Patton (2002) notes that "the danger in cultivating and using key participants is that the researcher comes to rely on them too much and loses sight of the fact that their perspectives are necessarily limited, selective, and biased. Data from informants represents perceptions, not truths" (p. 321). This danger was addressed by triangulation of data from interviews, documents, reports, emails and data from the UC *Restart* and *Progressive Restart* websites.

Sources of data

In addition to interviews with the sample group, which included academics and support staff as well as College leaders, four sources of data were identified, that is, documents such as policy, reports and guidelines from the University. In addition, emails from leaders of the college and academics were used. Also, communications from senior management team posted on the university website during and after the seismic activity of 2011were identified.

Situational analysis of documents

Analysis of these documents was a primary source of data, and this was validated and enriched with the interview data from leaders in the UC colleges and the early adopters of e-learning identified during the crises. Documents were selected for their relevance to the research question. Patton (2002) stresses that "...documents prove valuable not only because of what can be learnt directly from them but also as stimulus for paths of inquiry that can be pursued only through direct observation and interviewing" (p. 294). As explained by Mutch (2005), document analysis offers an easily accessible way to gather data to answer a question. Savin-Baden and Major (2013) define documents as "written, printed, visual or electronic matter that provides information or evidence or that serves as an official record" (p. 403). The actual analysis of documents varies according to the nature of the content as well as the purpose of the study (Sotirios, 2013).

Documentary analysis of relevant publications and unpublished reports of the University was conducted. Some of the documents were public documents available on the University's website. Others were working documents that were not readily available as public documents and were made available by key participants and others who participated in the study. In addition, some of the participants of the study provided personal documents following enquiries at the end of interviews. Documents received that had no relevance to e-learning were discarded. Documents that had information regarding e-learning were also

discarded. As noted by Savin-Baden and Major (2013), "researchers must cull through documents and save only those that are relevant, although it is tempting to retain all possible information" (p. 407). In following the recommendations of Scott (as cited in Savin-Baden & Major, 2013, p. 407), steps were taken to ensure that the documents were authentic, credible and representative. The sources of the documents were authentic and the author(s) names and addresses on the documents were verifiable. Permission to use excerpts from the documents was granted by the key informants who provided them. Others were public and were available on the University website. As the documents were created independently and prior to the research, credibility was enhanced (Savin-Baden & Major, 2013).

Documents and records also have limitations. They may be incomplete or inaccurate. Documents are not necessarily representative of their kind and thus do not allow generalisations (Sotirios, 2013). In addition, comparisons between documents are not always possible. Patton (2002) asserts that document analysis, however, provides a behind-the-scenes look at the programme that may not be directly observable and about which the interviewer might not ask appropriate questions without the leads provided through documents.

Emails

Stored emails relating to e-learning from interviewees who were willing to share them were analysed. As Patton (2002) points out, "... with permission and proper safeguards to protect confidentiality, some information from private documents can be quoted directly and cited" (p. 294).

Webpages

There were communications from the Senior Management Team (SMT) and other officials of the university on the university website after the seismic activity in 2011. These were analysed on issues relating to e-learning.

Interview protocols

"An interview is defined as a specialized form of communication between people for a specific purpose associated with some agreed subject matter" (G. Anderson, 1998, p. 202). Cohen et al. (2007) point out that interviews enable participants (both interviewers and interviewees) to discuss their interpretations of the world in which they live, and to express how they regard situations from their own point of view. The interviewer can press not only for complete answers but also for responses about complex and deep issues. Also, the semi-structured interview is suitable for probing views and opinions and permits respondents to develop and expand on their own responses (Gray, 2009).

Semi-structured interviews were used for the study because this approach contains elements of both structured and unstructured types of interviews. Three sets of semi-structured interview schedules were developed for the interviews with the Senior Management Team, academics, and support services in the Learning Resources.

The first interview schedule was developed using indicators of resilience as described by Resilient Organisations (2012). The resultant interview schedule was unwieldy and was not suitable to elicit the data required for the study. It was thus discarded.

A second semi-structured interview schedule was developed with guidance from my supervisors. The resultant interview schedule was suitable to elicit data required for the study. The interview schedule was developed to elicit information from participants on their role, teaching and the tools used with respect to e-learning before and after the seismic activities in 2010 and 2011. The schedule also elicited information on whether the interviewee had or gave training to others on e-learning. Interviewees were also asked if they had documents to share or refer me to that were related to the topic. A copy of the interview schedule was sent to the participants for the study before the due date for the interview. I also followed up with email and sometimes a second interview with some participants of the study on particular

points that were raised during the interview in order to get more information. For example, I did a follow-up interview on the IT infrastructure, which was not something that had not surfaced until later. The semi-structured interview schedule developed for the study is provided in Appendix 1.

Limitations of interviews

Interview data limitations include possibly distorted responses due to personal bias, anger, anxiety, politics and simple lack of awareness since interviews can be greatly affected by the emotional state of the interviewee at the time of the interview (Patton, 2002). Interview data are also subject to recall error, reactivity of the interviewee to the interviewer and self-serving responses. For this study, the interviews were conducted four years after the seismic events which were an emotional time. Fraenkel et al. (2012) are of the opinion that the presence of the researcher may inhibit respondents from saying what they really think. In addition, important and salient topics may be inadvertently omitted. I was conscious of the body language of interviewees and the emotions expressed whilst conducting the interviews. These were a form of unconscious communication from the interviewees.

Validation of data

The interview schedules were developed using themes informed by the literature reviewed from documents. Hence, data collected could be triangulated (Sotirios, 2013). To ensure content validity the interview schedules were reviewed by the supervisors of the research. Their comments were used to revise the initial items so that respondents would understand and respond appropriately to the items and to ensure that items on the interview guide were directly related to the purpose of the research (Cohen et al., 2007; Gray, 2009). All interviews were validated using “member checking” (Sotirios, 2013, p. 446). Transcripts of the interview were sent to each interviewee to confirm that the transcription was accurate. However most of the interviewees did not reply to the email which included the interview

transcript. An assumption was therefore made that the interviewees had accepted that the transcriptions were accurate.

Data verification

Data verification involves assuring that all of the procedures used to arrive at the eventual conclusions from data collected for a study have been clearly articulated. The criteria *transparency*, *communicability*, and *coherence* (Rubin & Rubin, 2011) can be used to ensure data interpreted can be verified. *Transparency* in data analysis ensures that other researchers can follow the steps used in arriving at the analysis and involves keeping a record of what was done. The procedure employed in generating the themes and subthemes are documented in the section: Data analysis of the chapter. Another criterion for justifying data analysis is *communicability*. The themes and constructs used should be understood by other researchers and by the research participants (Auerbach & Silverstein, 2003). The themes used in the study have been explained where relevant, for example when they were based on the Technology Acceptance Model (Davis et al., 1989). Another criterion for justifying data analysis is *coherence;* thus the theoretical constructs must fit together to tell a coherent story (Auerbach and Silverstein, 2003). The use of multiples sources of data including development of timelines in Chapters 4, 5 and 6 aided coherence.

Ethical Considerations

Permission and approval were sought from the University's Educational Research Human Ethics Committee (ERHEC) to carry out the research and all protocols prescribed by the ERHEC were adhered to. Information sheets and consent forms for participants of the study were prepared and sent to ERHEC. These included detailed statements containing information about the nature of the research. Issues of confidentiality and anonymity of participants in the study were addressed. Methods of data collection, usage and storage were detailed.

The first set of documents was prepared with the aid of one of my supervisors and sent to ERHEC. The documents were returned from ERHEC for revision of some parts. Issues raised in the first set of documents were addressed with the aid of one of my supervisors. A second set of documents was then sent to ERHEC for consideration and approval. Approval to carry out the research was then granted by ERHEC (see Appendix 3).

Data collection procedures

Collection of data for the study was done in three stages:

1. A search was made on the university website for documents. These were usually policy documents, guidelines and reports from units of the University. Then a search was undertaken on the CoE and the CoBL websites for other documents specific to the Colleges. Data was also collected from publications relating to the use of e-learning from academics of the university. Documents collected were ordered chronologically to track the development of e-learning in the University from 2010 to the present.

2. A request for emails pertaining to the period of study was made after each interview. One participant gave me emails.

3. Archived webpages of UC *Restart* and *Progressive Restart* harvested by the National Library of New Zealand was searched for references made on e-learning.

4. Interviews were undertaken with participants of the study. This started with interviews of key participants then snowballed to other academics recommended by other interviewees.

Data collection began in February, 2013 and ended in November, 2014.

Collection of documents

A search was made on the University of Canterbury website for documents related to e-learning. University documents such as Teaching and Learning Plans were found. In addition key participants provided other documents such as reports generated by other units of the University in the aftermath of the seismic activities. Documents were also sought from other units in the University.

Data collection from websites

UC *Restart* and *Progressive Restart* websites were created in the aftermath of the 2010 and 2011 earthquakes respectively. Archived webpages of the websites were searched for data relating to the use of e-learning in the university. Messages from the senior management team that had information relating to the use e-learning were also analysed.

Data collection from publications

The Research Report Archive webpage of UC was searched for *Research Report*. The research report is a celebration of UC research, including research articles, summaries of research information by Colleges and a compilation of the research outputs produced by staff for a given calendar year (University of Canterbury, 2014). The reports of 2010 to 2013 were searched for publications relating to the use of e-learning for teaching in the aftermath of the seismic activities of 2010 and 2011. Publications found were saved for further analysis.

Conducting the Interviews

The process of interviewing followed the protocol recommended by Sotirios (2013). Key participants identified earlier were interviewed. I arrived at their offices at the scheduled time for the interview. At the beginning of the interview, I gave a copy of the consent form to the interviewee to sign. Consent of the interviewee was sought and when permission was granted, I switched on my audio recorder. Fraenkel et al. (2012) are of the opinion that it is essential to record as faithfully as possible what the participant has to say. I recapped the

purpose of the interview and expressed my gratitude for the opportunity to conduct the interview. I gave a hard copy of the interview schedule to the interviewee and the interview got underway.

During the interview, eye contact was maintained with the interviewee with some non-verbal expression such as nodding and smiling. I also wrote notes to indicate interest in the interviewee's responses, as recommended by Gray (2009). During the interview, probes were used to encourage the interviewee to extend or amplify a partial, irrelevant or inaccurate response as recommended by Sotirios (2013). In addition, the probes were also to stimulate and assist the interviewee to answer a question without affecting the direction of their thinking and without causing bias or distortion. Examples of the probes used were "Can you elaborate on the last statement you made" and, "what happened next?

Each interview session ended with another note of thanks to express appreciation of the interviewee's time and contribution made to the study. I did a recap of the interview and also asked if they had documents and/or emails on e-learning that they were willing to share. I promised to send a copy of the audio transcript to the interviewee for checking before I used it for my study. I made enquires as to whether there were any documents and/or correspondence the interviewees were willing to share with me. All the interviews were conducted at dates and times suitable to the respondents.

Data analysis

Data analysis in qualitative research is an iterative and continuously comparative process that involves reducing data into meaningful parts and retrieving large amounts of written information for the purpose of examining them (Fraenkel et al., 2012; Savin-Baden & Major, 2013). Analysing the data in a qualitative study essentially "involves analysing and synthesizing the information the researcher obtains from various sources (e.g., observations,

interviews, documents) into a coherent description of what he or she has observed or otherwise discovered" (Fraenkel et al., 2012, p. 435) .

The analytic method used was descriptive content analysis. Content analysis is a technique that enables researchers to study human behaviour in an indirect way, through an analysis of the frequency and patterns of use of terms or phrases (Fraenkel et al., 2012; Savin-Baden & Major, 2013). This is extremely useful as a means of analysing interview and observational data. Descriptive content analysis aims at identifying and describing the main content of data, chronologically, thematically or otherwise (Sotirios, 2013).

An advantage of content analysis is that the data are readily available and almost always can be returned to if necessary or desired. Also, content analysis permits replication of a study by other researchers. A disadvantage of content analysis is in establishing validity. Assuming that different analysts can achieve acceptable agreement in categorizing, the question remains as to the true meaning of the categories themselves (Fraenkel et al., 2012). Another disadvantage of content analysis is that some documents may not be accessible to the researcher; personal letters and diaries, for instance, may be difficult to obtain (Sotirios, 2013).

The data analysis process was three-fold. Firstly, there was analysis of a small selection of documents to find out how two educators engaged with their students using e-learning in the aftermath of the February 2011 earthquakes. This involved searches for patterns, themes and topics on resilience indicators, and assigning coding categories. This was also done for some of the emails collected and the selected archived pages of the UC *Progressive Restart* website.

Qualitative data analysis software allows a qualitative researcher to process data in a manner parallel to that used in quantitative research (Sotirios, 2013). NVivio was used for analysis of data collected. NVivo offers a complete toolkit for rapid coding, thorough

exploration, and rigorous management and analysis (Creswell, 2012). Although there are shortcomings in the use of computer software for qualitative data analysis such as displacement of weight of analysis from theory development to coding, the advantages outweigh that of manual processing. Files including university documents and interview transcripts were imported into NVivo. I did a preliminary exploratory analysis of the data and developed codes as first steps in analysis. Priori codes were created from the Indicators of Resilience (Resilient Organisations, 2012) and Technology Acceptance Model (Fred D Davis et al., 1989).

Strauss and Corbin (1998) define coding in qualitative studies "as the analytic process through which data are fractured, conceptualized and integrated to form theory" (p. 3). As Creswell (2012) explains, the object of the coding process is to make sense out of text data by cutting it into text or image segments. Cutting can occur at the level of word, phrase, sentence or full transcript (Savin-Baden & Major, 2013). The segments were then labelled with codes, which were then checked for overlap and redundancy. The codes were then collapsed into broad themes. I followed the procedure recommended by Creswell (2012) in coding the data. This involved getting a sense of the data as a whole. The codes were descriptive and captured the meaning of each data segment. As Savin-Baden and Major (2013) note, "descriptive coding is simply a process of summarising or describing the text" (p. 422). Fraenkel et al. (2012) advise that the categories should be so explicit that another researcher could use them to examine the same material and obtain substantially the same results. When coding a sentence or paragraph, I tried to capture succinctly the major idea brought out by the sentence or paragraph in a text segment (Creswell, 2012; Fraenkel et al., 2012).

The unit of analysis for the interview transcripts was the phrase/sentence that made meaning with respect to e-learning. Units of meanings were then coded into 17 initial priori codes. Two documents and two interview transcripts were initially coded. The priori codes

were too unwieldy to analyse so they were discontinued. As Fraenkel et al. (2012) acknowledge, the process of developing categories that emerge from the data is often complex.

Three new priori codes were then created. These were "positive", "negative" and "mixed" with respect to e-learning. This initial analysis of data was simpler and aided categorising of the data. Units of meaning from the documents were coded into their respective codes. Codes that come directly from the data are called inductive codes (Savin-Baden & Major, 2013). Seventeen inductive codes emerged from the data for the *positive* code, 16 for the *mixed* code and 10 for the *negative* priori code. As Fraenkel et al. (2012) uphold, "codes and sub-codes are often refined iteratively by qualitative researchers as they strive to make sense of their data through categorization, thematic analysis, and in some cases advanced theory building" (p. 436). To interpret content analysis, data frequencies were used. The numbers of units of meaning in the three priori codes and inductive codes were counted.

Braun and Clarke (2006) define thematic analysis as a method of identifying, analysing and reporting patterns in the data" (p. 4). Savin-Baden and Major (2013) add, "it is through the process of immersion in data and considering connections and interconnections between codes, concepts and themes that an 'aha' moment happens (p. 440). The Technology Acceptance Model (Fred D Davis et al., 1989) was used to analyse the units of meaning of the educators interviewed.

Themes are typically groupings of similar codes that emerge either during or after the process of developing codes, and are aggregated together to form a major idea in the database (Creswell, 2012; Fraenkel et al., 2012; Savin-Baden & Major, 2013). Layering themes was employed to answer the research question for the study. Layering themes builds on the idea of major and minor themes but organizes the themes into layers from basic elementary themes to more sophisticated ones (Creswell, 2012). Layering the analysis means

representing the data using interconnected levels of themes. Minor themes were subsumed within major themes and included major themes within broader themes.

The simple framework of readiness, response and recovery in disaster management was used to summarise the data collected for the study (see Readiness, response and recovery framework in Chapter 7). The readiness, response and recovery framework also provided a basis to compare the three case studies of UC, CoE and CoBL.

The Technology Acceptance Model and the Indicator of Resilience Model were used for additional analysis of each of the three cases. The findings for the CoE and the CoBL nested case studies were analysed before the University case was analysed. The findings for the University case is reported in the next chapter.

CHAPTER 4

THE CASE OF E-LEARNING IN THE UNIVERSITY OF CANTERBURY

This chapter presents the overarching case study of the University of Canterbury (UC). Two nested case studies are discussed in subsequent chapters. The chapter starts with an overview of the UC setting, presenting a timeline of the evolution of e-learning that was influenced by the series of earthquakes that occurred in 2010 and 2011. The case study methodology used in collecting data is then described and the findings from the data presented. The chapter concludes with an interpretation of the case study using the Indicators of Resilience model (IRM) (Resilient Organisations, 2012).

Case study setting

Established in 1873, the University of Canterbury was initially known as Canterbury College. It remained a constituent college of the University of New Zealand until 1961 when it started awarding its own degrees. The University of Canterbury, one of eight universities in New Zealand, is a research-led institution. In 2007 the Christchurch College of Education merged with the University's School of Education. The University of Canterbury in 2014 had 11,943 students and 1,886 staff (Universities New Zealand, 2015). In 2015 The University had five Colleges: Arts; Business and Law; Education, Health and Human Development; Engineering; and Science; and offered degree programmes from bachelor to doctoral level. An overview of the University of Canterbury with a timeline of e-learning activities and seismic events is shown in Table 1.

Table 1: An overview of University of Canterbury with a timeline of e-learning activities and seismic events

Year	Activity		Source
1873	Canterbury College established.		
2000	*WebCT* installed as a trial in the Commerce Faculty.		G. Ronald (personal communication, May 26, 2015).
2001	In-house development of *StudentNet* Learning Management System for use in Christchurch College of Education.		CoE9, interview transcript, September 01, 2014.
2001	University-wide adoption of *WebCT*.		G. Ronald (personal communication, May 26, 2015).
2002	Manual lecture capture began as a result of request from an Economics lecturer.		Thomas and Hollis, 2013.
2002	Manual lecture capture using *QuickTime* streaming server to deliver on-campus-only access video lectures.		Thomas and Hollis, 2013.
2003	Storing of videotaping lectures began so they could be viewed on a web browser link from *WebCT* course.		WebCT Course Designer News January, 2004.
2007	Move to Blackboard LMS.		UC Document
2007	*AdobeConnect* introduced staff in Christchurch College of Education.		CoE7, interview transcript, August 07, 2014.
2007	Christchurch College of Education officially merged with the University of Canterbury.		UC Research Report 2007
2008	University was using *StudentNet* and *Blackboard* LMS for one year		CoE7, interview transcript, August 07, 2014; CoE9, interview transcript, September 01, 2014.
2008	April	First Professor of e-learning appointed.	N. Davis (personal communication, Feb 26, 2015)
2009	Plan to move to Moodle v1.		G. Ronald (personal communication, May 26, 2015). CoE7, interview transcript, August 07, 2014
2010	February	Move to new LMS Moodle v1 (*Learn*) by University	UC Document
2010	May	Flexible Learning Options Working Group established in College of Education	College of Education Flexible Learning Committee Terms of Reference, 2010
2010	September Earthquake	Occurred when students were on vacation before the start of Term 4 in semester 2. Had less impact on use of e-learning due to timing of earthquake.	UC Restart Website
		University closed for two weeks due to earthquake.	UC Restart website

		UC *Restart* website from 5 September to 21 September Gift of extensive online library resources until end of year [2010] while others offered free access to the end of February 2011	UC website
2010	UC policy shifted emphasis from print to digital resources so that course readers and workbooks became accessible through Learn and also on CD from first semester of 2011.		Needham, Hunt, and McMurray, 2011, p. 206
	The use of social media, Facebook to inform University community and the rest of the world of the UC response to the September, 2010 earthquake		Dabner, 2012.
2011	February Earthquake	Occurred on second day of 1st semester. University closed for three weeks. Had great impact on University and College.	Thomas and Hollis, 2013.
	March	Academics recording their own audio commentaries to support PowerPoint presentations and uploaded to *Learn*.	Thomas and Hollis, 2013
		All COE ITE students moved into FLO mode based in schools to prioritise space for others on campus	N. Davis (personal communication, July 21, 2015).
	March	Manual recording of some lectures increases. *QuickTime* streaming server off-campus access implemented.	Thomas and Hollis, 2013.
	April	*Echo360* offered UC free licence for 5 lecture theatre venues and site licence for desktop capture application.	Thomas and Hollis, 2013.
	April and May	Tents erected on campus for teaching Building repaired with some closed for months/years or demolished	Vice-Chancellor's Report, 2011
	May	Temporary permission to use e-learning in UC School of Law granted by The Council for Legal Education for a semester. Extension then granted for teaching electives.	UC Learning Resource Working Group, 2011.
	June Earthquake	Occurred at end of Term 2. University closed for two days. Minimal impact as teaching was over. Prompted a university-wide move to replace exams and tests with take-home or online tests.	UC Progressive Restart Mackey et al., 2011.
	July	Start of pilot *Echo360* for automatic capture of lectures.	Thomas and Hollis, 2013.
	November	Review of pilot use of *Echo360* and decision to pay for licence to continue to use automated lecture capture.	Thomas and Hollis, 2013.
2012	May	Final approval obtained to purchase equipment and licence to increase to 20-venue	Thomas and Hollis, 2013.

		deployment and 100 desktop capture licences.	
	July	*Echo360* go live with 20-venue deployment and 100 desktop capture licences.	Thomas and Hollis, 2013
	December	e-Learning Working Group established	e-Learning WG Brief Report to SMT and Council
2013		Evolution of e-Learning Working Group to e-learning advisory group	Learning and Teaching Plan 2013-2017
		College of Arts STAR courses go online to promote recruitment	Star Arts Distance courses
	July	Move to *Moodle* v2 by University.	

The synopsis of UC e-learning activities and seismic events listed in Table 2 is explained further below.

University of Canterbury began using a learning management system in 2000 when *WebCT* was installed as a trial in the Commerce Faculty. In 2001 it was decided that IT Services would run the system and UC officially adopted an e-learning system (G. Ronald, personal communication, May 26, 2015). In the first year of *WebCT* installation only about 60 courses were hosted which grew to around 150 courses by the end of 2002. Meanwhile, before the merger with the University, Christchurch College of Education (CCE) was also developing expertise in e-learning *(CoE9,* interview transcript, September 01, 2014). In 2001 *StudentNet*, an open source Learning Management System, was developed for use in the College by Glen Davies, a staff member working in the Library of CCE, "who was very into programming" (*CoE9,* interview transcript, September 01, 2014). *StudentNet* created an online community for distance students so that they could have communication with each other and communication with lecturers (CoE9, interview transcript, March 04, 2014). However, not all lecturers were using *StudentNet* in 2007 (CoE6, interview transcript, July 29, 2014). Further discussion on the use of *StudentNet* is described in the College of Education case, Chapter 6.

In 2002 an Economics lecturer made a request for a manual lecture capture as the lecture was scheduled to be held in a room that was too small for the number of students enrolled for the course. That request was the beginning of manual lecture capture in UC. Later, a *QuickTime* streaming server was used to deliver videoed lectures that could only be accessed on campus. In 2003, stored videotaped lectures could be viewed on a web browser link from a *WebCT* course (WebCT Course Designer News January, 2004). Demand for manual recording of lectures increased to over 30 hours per week by early 2007 and averaged 75-80 hours by the end of 2010. *AdobeConnect*, a web conferencing software, was introduced to an academic member of staff of CCE in 2007. This staff member then introduced the software to other staff and demonstrated the uses of the software. In 2007 UC switched from using *WebCT* to *Blackboard*.

A participant of the study located in the College of Education remarked in an interview, "when we merged with the University the situation was we had *StudentNet* and the University was using *Blackboard*, and so for a year [2008] that was fine. Then the University decided they didn't want to support both systems" (*CoE9*, interview transcript, September 01, 2014). A large committee was formed and was charged with reviewing learning management systems, and making a recommendation to the Senior Management Team "[…about] what learning management system would serve the entire University and meet all of the needs" (CoE7, interview transcript, August 07, 2014). The committee recommended that the University select Moodle, with a condition that a Moodle developer was hired.

In 2008, UC planned to move to *Moodle v1* and ease out *BlackBoard*. In 2009 the University Centre for Teaching and Learning (UCTL) recommended that staff and students suggest an appropriate name for the LMS with the rationale that an institutionally-branded name for the LMS would be seen as an embedded function of UC. In February 2010, UC finalised the move to *Moodle v1* and the name *Learn* was adopted. (G. Ronald, personal

communication, May 26, 2015). *Learn* became the University's sole supported LMS from the start of teaching in February 2010.

The September 4 2010 earthquake occurred when students were on vacation, before the start of Term 4 in Semester 2. The University was closed for two weeks because of the earthquake, which had less impact on the use of e-learning due to its timing. On reopening, there was a gift of extensive online library resources from publishers. The University received support from national and international suppliers that offered free access for staff and students to tens of thousands of e-books, online journals and global databases in the aftermath of the September 2010 earthquake (PVC Learning Resources, Professor Sue McKnight, 2010). Data from interviews from participants of the study revealed that academics were mostly unaffected by the effects of the earthquake and teaching resumed when UC reopened for Term 4 in 2010.

In October 2010 UC College of Education produced Flexible Learning Guidelines that outlined expectations for academics who offered courses enhanced with e-learning. To enhance course quality and reduce workload, the guidelines recommended that each CoE course have only one UC *Learn* course site. Flexible Learning Guidelines also recommended "a greater use of *Learn Gradebook* to reduce administration of grades, particularly transcription errors" (UC College of Education, 2010, p. 3). The UC College of Education Flexible Learning Guidelines further recommended the "inclusion of short video or audio instructions, graphic representations of content, and/or illustrations to enhance a student's ability to understand or complete aspects of the course content in UC *Learn"* (UC College of Education, 2010, p. 3). To ensure this was appropriate for University level studies it is useful to note that these were the first guidelines within the University and had been under development before the September earthquake, although the *Gradebook* recommendation was

added after the earthquake. (Further discussion on *Gradebook* is covered in College of Education case, Chapter 6).

In 2010, UC policy shifted emphasis from print to digital resources so that course readers and workbooks became accessible through *Learn* and also on CD from the first semester of 2011. This change helped to "further embed *Learn* as an essential learning and teaching tool in all courses" (Needham, Hunt, & McMurray, 2011, p. 206).

The February 22, 2011 earthquake occurred on the second day of the1st semester and had a great impact on the University. All initial teacher education students on FLO were on campus for "on-site intensives" when the earthquake occurred. The University was closed for three weeks due to the earthquake. The effect of the earthquake on the Colleges of Business and Law and of Education will be discussed further in the next two chapters 5 and 6 as nested case studies.

In March 2011 academics recorded their own audio commentaries to support PowerPoint presentations and uploaded them to *Learn*. Manual recording of some lectures increased and *QuickTime* streaming server off-campus access was implemented in 2011(Thomas & Hollis, 2013). In April 2011 *Echo360* offered UC licence for 5 lecture theatre venues and site license for desktop capture application of *EchoSystem*. The gift of the license provided UC with a tool to aid academics in creating teaching materials. The gift also enabled UC "to test whether an automated lecture capture system would serve as a viable replacement for the existing manual recording service" (Thomas & Hollis, 2013, p. 192).

In May 2011, The Council for Legal Education granted temporary permission to use e-learning in UC School of Law. An extension was then granted for teaching electives. The Council for Legal Education is a statutory body that ensures the quality of legal education in New Zealand. A report from The Learning Resources Working Group (2011) indicated that "directly after the earthquake, application was made to the Council to present electives online

– as an emergency measure. The Council agreed to such presentation but only for the duration of the first term" (p. 28) stipulating that a full application would have to be made to the Council if further online presentation was to continue.

The 13 June 2011 earthquake, as indicated earlier in the study, occurred at the end of Term 2 and resulted in the University being closed for two days. The earthquake had minimal impact as the term's teaching was over (UC *Progressive Re-start*). The earthquake however had an impact on assessment and some academics moved to online assessment of students. The earthquake occurred when lecture theatres had been newly opened after the February 22 earthquake and in winter when students were studying in tents as a result of loss of teaching spaces due to the February 22 earthquake.

Pilot use of *Echo360* for automatic capture of lectures began in July 2011 as a result of a gift from Echo360 Education Technology Company and ended in November 2011. A review of pilot use of *Echo360* in November 2011 indicated that the automated lecture capture system would be a viable replacement for the existing manual recording system. A decision was made to pay and continue to use the automated lecture capture system (Thomas & Hollis, 2013). A decision was also made to expand the use of Echo360. In May 2012, a final approval was obtained to purchase equipment and the license for a 20-venue deployment, as well as licences for 100 desktop capture. On July 9, 2012 the expansion of Echo360's *EchoSystem* lecture capture system with 20-venue deployment went live in UC (University of Canterbury, 2012). University of Canterbury started using Moodle v2 in July 2013.

An e-Learning Working Group was established in December 2012 in UC and reported to the University Learning and Teaching Committee. The e-Learning Working Group had the goal of reviewing the current status of e-learning, identifying potential e-technologies for the support of learning and teaching at UC, and, where appropriate, supporting implementation of e-technologies. The e-Learning Working Group also had a goal to develop an e-learning

strategy for UC and present it to the University Learning and Teaching Committee. In the Learning and Teaching Plan 2013-2017, the e-Learning Working Group became the e-Learning Advisory Group. In 2013, the College of Arts STAR courses went online to promote recruitment of students.

The number of courses in *Learn* increased between September 2010 and August 2013 across all the Colleges in the University. Similarly, total staff and student users of *AdobeConnect* also increased from 430 in 2011 to 39738 in 2013. ASKLIVE, a service from the Library where one can request assistance from a librarian, has been integrated into *Learn*. Library Resources such as *MultiSearch* and *Catalogue Search* can also be searched through *Learn.*

Methodology

The case study method requires the use of multiple sources of evidence which might include the use of structured, semi-structured or open interviews, field observations and document analysis. Chapter 3 has provided a detailed description of the methodology used for the case study. An overview of the University of Canterbury with a timeline of e-learning activities and seismic events is shown in Table 1:

Data sources

Archived webpages of UC from 2002 – 2012 were searched for e-learning adoption and use in the University. University of Canterbury reports such as UC *Research Reports* and Learning Resources Working Group reports and memoranda were searched for evidences of e-learning. These reports and memoranda were then selected for further study. In addition, web postings on the *UC Restart* (after September 2010 earthquake) and UC *Progressive Restart* (after February 2011 earthquake) websites by the Senior Management Team about the use of e-learning were also used. Publications from academics from Colleges in UC that had a university-wide overview were selected to describe e-learning in UC. This was to aid triangulation and validation of the data collected by other means, including interviews (refer to Table 2.

Table 2: Information about sources of e-learning development in University of Canterbury

Title	Source	Date
Teaching and learning plan 2011-2013 (document).	University-wide Plans	2010
The University of Canterbury response to the 22nd February 2011 earthquake: The student/academic staff perspective (report).	Learning Resources Working Group	2011
The use of electronic resources in blended learning environments.	Learning Resources Working Group	2011
Engagement at the epicentre (journal publication).	Monti, Tull, and Hoskin	2011
"A new sort of normal" (presentation).	www.canterbury.ac.nz	2011
Message to students from PVC Student Services and International.	UC *Progressive Restart* website	2011
Learning Resources update.	UC *Progressive Restart* website	2011
Update – 1 March Message from the Vice-Chancellor.	UC *Progressive Restart* website	2011
Update – 10 March Message from the Vice-Chancellor.	UC *Progressive Restart* website	2011
Update – 14 March Message from the Vice-Chancellor.	UC *Progressive Restart* website	2011
University of Canterbury's progressive restart begins Monday 14 March.	UC *Progressive Restart* website	2011
'Breaking Ground' in the use of social media: A case study of a university earthquake response to inform educational design with Facebook (journal publication).	Dabner, N.	2012
Resilience tested: A year and a half of ten thousand aftershocks.	Seville, Hawker, & Lyttle	2012
Increased demand for automatic and manual lecture video capture (report).	Hanlon, A.	2013
Learning and teaching plan 2013-2017.	www.canterbury.ac.nz	2013
Project management, complexity and creativity (book chapter).	Thomas and Hollis	2013
Interviews.	One SMT and two staff of Learning Resources	Jul. 2014 – Aug. 2014
Emails (3 correspondences, May).	*LR4*	2015

Four members of the Senior Management Team (SMT) were identified as key informants for the study. One key informant was identified for the study by Niki Davis, Professor of e-Learning. The responses of two support staff in Learning Resources were purposively selected as they had information that was of help to the study. The responses of three staff in Learning Resources were used for the College of Business and Law, and College of Education nested cases in Chapters 5 and 6 respectively. These participants also identified relevant documents for the study. Table 3 shows a list of participants for the study in the UC case.

Table 3: List of participants for the University of Canterbury case study.

Pseudonym	Type of position
SMT1	Senior Management Team
SMT2	Senior Management Team
SMT3	Senior Management Team
SMT4	Senior Management Team
LR1	Support
LR2	Support
LR3	Support
LR4	Support
LR5	Support

Three deductive themes, that is, positive to e-learning, negative to e-learning and mixed to e-learning were used to initially sort the units of meaning (UoM) from interviews with the participants of the study provided in Table 3. Further analysis of the responses in the three main categories led to the generation of inductive themes for each main category (see Data analysis in Chapter 3). Units of meaning from the documents that served as sources of e-learning development in University of Canterbury were also coded into the deductive themes and further coded into 13 inductive themes.

Thematic findings

This section presents the findings from analyses of documents, reports and UC websites as presented in Table 2 and interviews presented in Table 3. The findings are then interpreted with Indicators of Resilience Model (IRM) (Resilient Organisations, 2012).

The use of e-learning in the aftermath of the seismic events of 2010 and 2011 to for teaching and learning was part of the information that was propagated using the various communication channels UC engaged, which included e-learning tools such as the learning management system. In UC, the crises were triggered by three major seismic events in two years. Other crises resulting from the seismic events included student enrolment, student and staff attrition among others. In all instances of the seismic events communication about the event to the UC community was essential. Electronic forms of communication were important, particularly as members of the university community could not get access to the campus; in September 2010 the University was closed for two weeks and in February 2011 it was closed for three weeks (see Case study setting in chapter 4).Therefore, the University set up websites to serve as the main source of communication. The style of communication following seismic events in September, 2010, February 2011 and June 2011 evolved over time.

UC set up websites UC *Restart* and UC *Progressive Restart* websites dedicated to giving information about the crises on campus. The University's decision to use e-learning to engage with students was propagated using the websites and *Facebook*. In addition, Cloud computing was utilised for the first time by the University when it set up a UC Earthquake Recovery *Facebook* site to communicate with members of the University community on the UC response to the first seismic event in 2010. The use of cloud computing by the UC to communicate with members of the university and the wider community was innovative. E-learning uses electronic forms of communication and so many students who use the LMS

probably received the information about the UC response to the earthquakes through the LMS which then directed them to check on UC *Facebook* and UC *Restart* and UC *Progressive Restart* websites. For students who were not using the LMS they received the information about the UC use of e-learning from UC *Facebook* and UC *Restart* and UC *Progressive Restart* websites. Students have embedded *Facebook* into their daily habits and their attitudes towards the site increased positively (Lampe, Ellison, & Steinfield, 2008).

Published papers

Published papers on e-learning from staff in UC were analysed to find evidence on how staff evolved with e-learning as a result of the seismic events of 2010 and 2011. The publications selected from a list developed during the literature review outlined in Chapter 2 had a focus on University-wide use of e-learning. The publications show that UC employed e-learning for communication and engaging with staff and students in the aftermath of the seismic events of 2010 and 2011. (Note: some of these publications were also cited earlier in the chapter to establish e-learning activities in UC over time.)

Monti, Tull, and Hoskin (2011) in a publication *Engagement at the epicentre* made observations from a case study sample of lecturers whom they supported in their position as Flexible Learning Advisors, drawing on their courses in UC following the February 22nd, 2011 earthquake in Christchurch. Tents were temporarily mounted in car parks on UC Ilam campus for lectures. Two lecturers in the sample saw the tents as a flexible space opportunity. The usual lecture time was used instead for discussion and problem solving sessions using content already delivered online. The interviews conducted by the authors also highlighted interventions that some lecturers had put into place in order to restart their courses. Monti et al. (2011) reported that "some lecturers, who already had course sites developed for on-campus and distance students, felt prepared" (p. 875). The participants of their study reported that communication with their students via two-way discussion forum posts or one-way news

forum posts was common on *Learn*. In addition, lecturers engaged students using the online communication tool and expressed concern for their welfare. The authors reported that through the use of *Learn,* lecturers who had already begun to engage pedagogically with their students as part of their teaching developed their use of the online environment. Monti et al. (2011) observed that "some lecturers incorporated the content of students' discussion forum posts into their assessment"(p. 876). They added, "lecturers found many of the interventions they implemented had appeared to enhance student engagement and they would choose to use these in future iterations of their courses" (p. 877).

Dabner (2012) in a publication, "Breaking Ground" in the use of social media: A case study of a university earthquake response to inform educational design with *Facebook*, described how a new *Facebook* community was immediately established in the aftermath of the 2010 earthquake. The *Facebook* community enabled "on- going dialogue and information sharing between staff at the institution and the wider educational community" (p. 69). She noted in her publication that, following the 2010 earthquake, official information for the UC community would be through the university website. Dabner (2012) confirmed that the UC Quake Recovery Site on *Facebook* and a web-space situated within the larger university website, *UC Re-start*, were established that housed all of the earthquake-related information and links. She added that a review of the UC Quake Recovery Site on *Facebook* had led to "some innovative developments by the university communications team, who are now utilising social media to connect with students using the platforms they are most familiar with" (p. 73). The UC Earthquake Recovery has been closed but the University continues to use *Facebook* to communicate with students and there are several Facebook pages linked to UC.

IT infrastructure

This consists of the network architecture, which includes the network's physical components, configuration and organization. These are the back-end systems that are not visible to end-users of the IT infrastructure, such as the servers for applications that end-users interact with at the front-end (Canaday, Harrison, Ivie, Ryder, & Wehr, 1974) and servers for student login directories and files. There are different servers in the UC IT infrastructure, such as servers for staff Windows login directories, print servers for printers located all over campus. Other servers in the IT infrastructure include the Management Information System servers that run the software packages used for the administration of the University, including the Student System, PeopleSoft HR system, the Active Directory server and other servers that end-users interact with on the IT infrastructure. The University implementation of Active Directory framework (R. Allen & Lowe-Norris, 2003) enables authenticated users access to the University's IT resources on UC campus.

Marshall (2009b), in his e-Learning Maturity Model Capability Assessment of UC, reported that UC IT infrastructure was robust and sufficient in 2009 and that the IT infrastructure could therefore support the adoption and use of e-learning technologies. The report stated that the "IT infrastructure needed to support wide adoption and use of e-learning technologies and pedagogies is in place and being actively maintained" (Marshall, 2009b, p. 10). The IT infrastructure including the servers remained operational in 2010 and 2011. The UC IT system had to be reconfigured to enable UC community to access the gift of e-books and journal access from publishers in the aftermath of the September 2010 earthquake.

Active Directory used in the University was of great benefit as it enabled enrolled students and staff to get several services such as access to publisher portals and library databases when on UC campus. The Active Directory domain controller validated and granted permission to all the users and computers in the network. "Campus users are

generally served by registering the campus network addresses with the vendors who, in turn, allow access from any computer with a valid address within the registered IP range" (Lawrence, 2009, p. 41). Off-campus access to electronic resources from the library is through the ezproxy server which validates users from the ICTS server. A proxy server is software located between a user's computer and a server on campus which requires users to authenticate with a username and password assigned by the University. When a user is validated, the ezproxy server directs the request to the appropriate vendor database (Lawrence, 2009).

Following the September 2010 seismic event, the IT infrastructure was not affected. Thomas and Hollis (2013) confirmed the finding of Marshall (2009b) that the UC IT architecture had been designed and implemented in such a way that it could be built on and expanded without undue disruption. Cloud computing was utilised for the first time, as noted earlier, when the University set up a UC Earthquake Recovery *Facebook* site to communicate with members of the University community on the UC response to the seismic event. Cloud computing eased the stress on the UC IT infrastructure as the IT services were hosted in the cloud. The University IT hardware was not compromised. UC had invested significantly in a brand new data centre and as a result of the investment the core IT infrastructure was undamaged by the earthquakes.

Although, there was a loss of power at the Dovedale campus, a back-up generator kept working when power to the primary data centre at Dovedale was lost as a result of the February 2011 earthquake. The secondary data centre at Ilam was lost because of power failure and it did not have a backup power supply. There was no loss of internet access and the Fibre cables performed very well. There were key data and applications on individual PCs rather than on centralised servers since some departments had persisted with running their own networks and servers. The loss of electricity on campus meant that access card systems

were not working and there was the need to revert to physical locks and keys to lock buildings. Loss of electricity also affected Voice Over IP telephony systems which required a large percentage of the network to be running. Webmail services worked well and were not affected by the earthquakes. In comparison, there was considerable damage to the ICT infrastructure at the Christchurch Polytechnic Institute of Technology and there was little or no access to databases or any of the usual communication systems (Seaton et al., 2012).

However, the IT infrastructure was stressed by the increase in the number of requests for manual lecture capture. There were two key issues of the need for increased labour, and resources such as equipment in doing a manual lecture capture. Manual lecture capture video recordings are manually copied off the recording device and put into a processing workflow that produces a video file and an audio file. The file outputs are subsequently, copied onto a server where students access them. The manual lecture capture system involves high cost of labour. There was also the potential that there may not be sufficient Learning Resources staff with devices to record the lectures.

Another stress on the IT infrastructure was the increase in the number of users of the technologies that run on the IT infrastructure, including e-learning applications that will be discussed in the next section. In the aftermath of the February 2011 earthquake, the number of active courses in the LMS showed an increase from 1225 on 21 February 2011 to 1332 in 14 April 2011. Also, active students on *Learn* increased from 16071 to 17005. In addition, between 22 February and the middle of April 2011, 474 new video recordings were added to the *QuickTime* streaming server (Learning Resources Working Group, 2011).

There was also some less than optimal practice of using the LMS server for streaming audio and video files. The LMS was not designed to stream multimedia files, and as a result, the system slowed down. Bandwidth constraints became an issue as very large files that were created by academics during audio and video recordings using software such as *Camtasia* and

Audacity could not be downloaded by students (see Documents, Findings in Chapter 5). Students also used up their UC Internet allowance in downloading large files uploaded by academics on the LMS thus students had to top-up their Canterbury card leading to more stress on the IT infrastructure.

Access to library resources also depends on IT infrastructure. There was a dramatic increase in access to online resources generously provided by publishers. This required adjustment to the IT infrastructure such as the configuration of an ezprozy server to permit out of campus access to users (see IT infrastructure, Thematic findings in Chapter 4). Accessing library resources increased the flow of traffic over the system including download of many hundred more document files. The library had returned the donated online resources the UC received in the aftermath of the September 2010 seismic event just one week before the February 2011 earthquake. A request had to be made for the online resources from the publishers and the ezproxy server reconfigured again in order to allow off-campus access to the resources from the publishers (P. Kennedy, personal communication, August 27, 2015).

Another stress on the IT infrastructure was wireless connectivity in the aftermath of the February 2011 seismic event. Wireless access points on UC campus were increased to enable a good quality service to users and reduce dead zones where no reception is available. A further need identified as a result of the seismic events was for the UC network to be able to accommodate large numbers of concurrent users accessing the UC system from multiple devices. Staff and students have multiple wireless devices such as cell phones, tablets and laptops with varying transmit and receive sensitivities all accessing the UC wireless network.

Furthermore, in June 2011, the seismic event occurred when lectures had ended for semester one and students were preparing for mid-year final examinations. Academics therefore resorted to online assessment and submission of assignments, especially for large

classes. This increased the use of *Turnitin* which was integrated into the IT infrastructure. In some instances UC was exceeding its license in its use of *Turnitin*.

The study revealed that the IT infrastructure, although, not affected by the seismic events in 2010 and 2011 was under some stress in the aftermath of the earthquakes for the many reasons noted above. The SMT therefore requested a review of e-learning activity after the earthquake of 22 February 2011 by a Learning Resources Working Group. Their report recommended that the UC Learning and Teaching Plan might consider the inclusion of a shared, communally-defined understanding of the role that technology would play in future in learning and teaching innovation and more effective use of digital resources. In addition, academic staff filing and storage protocols with regard to electronic documents and electronic learning materials may be agreed upon and communicated.

The University took several actions to reduce the stress on the IT infrastructure. As reported by Todorova and Bjorn-Andersen (2011) in CoBL, the University commissioned three additional front-end servers to increase capacity in in the aftermath of the February 2011 earthquake. This confirmed SchWeber (2008) findings of characteristics commonly associated with resilient organisations that "organisations faced with crises expand upon existing resources or obtain access to resources beyond those normally available" (p. 40). Cutting up large multimedia files into smaller files solved the problem of downloading one large file. There was additional capacity to the *QuickTime* streaming server and off-campus access to the server was implemented (Thomas & Hollis, 2013). In addition, *Echo 360* was installed in July 2011. The installation of *Echo 360* was relatively unproblematic because UC had a large virtual server in the IT infrastructure. *Echo 360* is supported in a virtual environment and designed to work with Active Directory among others. The *Echo* server infrastructure was built on six virtual servers and there were no extra requirements to make *Echo 360* work within the UC IT environment. Later, *Echo 360* was purchased in July 2012

(see Case study setting in Chapter 4). *Echo 360* reduced the stress on the manual lecture capture that had increased following the February and June 2011 earthquakes. Student Internet allowances were increased and further increases have occurred. For example, postgraduate students had an internet allowance of 10Gb in 2012 and this was increased to 20Gb and now, in September 2015, the internet allowance is 40Gb. The increase in Internet allowance of students was partly as a result of complaints from students that they used up their Internet allowance in downloading podcasts, vodcasts and other multimedia files online.

At the time of writing in September 2015, the IT infrastructure has been reorganised and a Secondary Data Centre has been established at UC. In addition, there has been an increase in wireless developments occurring at UC. Also, new buildings include careful consideration of e-learning for teaching and learning.

The overall finding was that IT infrastructure is essential to e-learning and must not be ignored during disasters. The IT infrastructure may be made more resilient by decentralisation of services and hosting some applications utilising Cloud computing. In addition, having alternate Internet Service Provider and having key data and applications on centralised servers rather than on individual PCs will enable the running of services from one of the Data Centres, thus eliminating the need to switch on individual servers in compromised buildings. In addition, it is useful strategically to have off-campus backup, security and relationships with established preferential service agreements with organisations that can provide IT services in times of crises. The resilience of the IT infrastructure enabled UC's library to deploy electronic resources received from publishers. Despite these sustained stress from repeated seismic activities the UC IT infrastructure served well as the backbone for the deployment of e-learning for academics and students. Therefore, IT infrastructure was also subjected to shocks from the increase in traffic due to the sudden surges with uptake of

e-learning. The sudden increase in traffic on the network has become permanent as more academics and students continue to use e-learning.

Websites

The University set up websites to serve as the main source of communication for all information relating to UC response to the seismic events on 2010 and 2011. The first website was the UC *Restart* set up after the September 2010. UC *Progressive Restart* website was set up in response to the February 2011 earthquake. A website was not set up for the June 13 2011 earthquake but information on UC with regards to the earthquake was posted on UC *Progressive Restart* website. The themes of communication on the UC *Restart* website were on reopening for Semester 2 and gift and utilization of online resources. Communications on the UC *Progressive Restart* were on the restart of the academic year, a focus on utilization of e-learning resources for teaching and learning and other earthquake related information. The theme of communications on the June 2011 earthquake were on the use of e-learning for assessment.

September 2010 Earthquake

The University of Canterbury set up a website, *UC Restart* that kept staff and students up to date with all the latest announcements and information relating to the 4 September earthquake and UC's re-opening (as described in earlier chapters, see Chapter 1). The University of Canterbury (including the College of Education at Dovedale) was closed for Term 4 until 6.00 am Monday 13th September 2010, while the Ilam and Dovedale campuses were assessed for health and safety issues. The University used postings on its website to keep everyone advised of events on campus. The main UC telephone line and data line connectivity to the campus remained operational. The Chancellor, Rex Williams, in a message posted on the UC *Restart* website, reported that since the initial response at the

weekend, Council had been fully informed both directly and through the impressive communications by email and on the UC website, *Facebook* and *Twitter*.

The main library was inaccessible for use after the earthquake. On 9 September, 2010, the PVC Learning Resources Professor Sue McKnight posted on the *UC Restart* website that the University had secured unprecedented access to global learning resources. "The University was delighted by the support it had received from national and international suppliers who had offered free access for staff and students to tens of thousands of e-books, online journals and global databases potentially worth millions of dollars" (PVC Learning Resources Professor McKnight, UC *Restart* website). This was in response to the University's approach to the vendors, to try and address student concerns about the central library's prolonged closure. Professor McKnight added that students and staff would be provided with online and in-person support to help them utilise the new online services which they could access through their university IT accounts. In a message on 13 September 2010, the UC Vice Chancellor announced that the PVC Learning Resources Professor Sue McKnight would outline to staff attending forums some of the wide range of online resources being made available to the University community. On Day 12, an update from the VC thanked all staff who were continuing to work "long and hard" to ensure that the University was ready for reopening on 13 September 2010. He reported that the University was accelerating into a more online and e-resourced environment that complemented the existing quality lecturing programme. The last posting on the UC *Restart* website was on September 20, 2010. The website no longer exists on the UC website.

February 2011 Earthquake

The UC *Progressive Restart* website was set up after the 22 February 2011 earthquake to give information on how UC was re-organising to continue with the 2011 academic year.

An update from the Vice Chancellor on UC *Progressive Restart* outlined a wide range of initiatives for programme delivery which included restarting on-line and blended learning programmes for College of Education students at UC's Nelson, New Plymouth, Tauranga and Rotorua campuses and extending flexible learning options to students enrolled in on-campus programmes in the College of Education (VC UC, *Progressive Re-start*, 2011). The Vice Chancellor also added that students who were part way through the enrolment process before the earthquake would have their enrolments completed automatically. These students would then receive their ID and password so they could access the online student portal – *Learn*.

A Public Relations Consultant posted a message on 11 March 2011 that UC's progressive restart would begin on Monday 14 March. In addition, UC would begin delivering lectures on-site, off-site and online for more than 250 individual courses from March 14 as it commenced its progressive restart of academic delivery for the 2011 year, following the 22 February earthquake in Christchurch. A message from the VC on UC *Progressive Restart* stated that "From Monday 14 March approximately 250 courses will be being delivered either on campus, off campus, online, on field trips or through our distance learning programmes" (VC, UC *Progressive Re-start*, 2011). Students were advised to check the website for any changes before 14 March 2011 and throughout the weeks ahead.

In Update – 14 a message from the VC UC announced that there would be a separate message for students, providing information about *Learn*, wireless, computer labs, library services and the bus shuttle service between Dovedale and the Clyde Precinct. A message to students from the PVC Student Services and International on 16 March, 2011 offered an explanation on the meaning of "distance learning" on the Restart timetable. The PVC explained that "distance learning" meant flexible learning and did not necessarily mean that a student was studying by distance. The PVC added that the timetable was being updated to effect the change. Further explanation was given that what one would normally expect from a

course that is indicated as "Flexible Learning" is a blend of teaching delivery styles such as online discussion, lecture videos and online group tasks or activities. In many cases this would change towards on-campus classes as more teaching space became available.

On 24 March, the PVC Learning Resources posted a Learning Resources update on UC *Progressive Restart* that staff who wished to record their lectures to post on *Learn* could do so by filling in an audio equipment request form. The PVC also informed staff who were recording their lectures to let their students know how to access the recording.

These websites were used for sending information that originated from the SMT. This seems to suggest that a “top-down” approach was adopted in managing UC response to the seismic events using e-learning.

Interviews and other sources of data

The responses from five semi-structured interviews were coded into three deductive themes and further into 13 subthemes as described earlier in the Methodology section. Analyses done on data in the CoE and CoBL nested case studies served as a guide in deriving the subthemes of this case study. The 13 inductive themes were ordered from the highest number of UoM to the lowest and across three deductive categories of *Positive, Mixed and Negative*. The units of meaning were coded from three interviews conducted from July 17, 2014 to August 21, 2014. The distribution of responses and other sources of data collected for the study are shown across themes in Table 4.

Table 4: The distribution of units of meaning from all sources of data in the University of Canterbury shown in three themes of positive, mixed and negative statements about e-learning across 13 themes identified with inductive coding**.**

Theme	Positive		Mixed		Negative		Total
Sub-theme	S	UoM	S	UoM	S	UoM	UoM
Organisation direction	10	45	0	0	5	8	53
Perceived usefulness	10	32	0	0	2	2	34
Pedagogy	6	26	0	0	2	4	30
Earthquake motivating factor	5	21	0	0	0	0	21
Multimedia	7	20	0	0	0	0	20
Resource availability	6	9	0	0	5	11	20
Access to support	8	16	0	0	2	3	19
External support	4	11	2	2	0	0	13
Engagement	5	11	0	0	1	1	12
Accessibility of material	5	8	0	0	0	0	8
Assessment	3	5	0	0	0	0	05
Attitude of students	0	0	1	2	1	1	03
Skills	0	0	0	0	1	1	01

Key

S – Sources

UoM – Unit of meaning

Organisational direction

The *Organisational direction* theme UoM relates to how organisational direction was perceived in the use of e-learning in the aftermath of the earthquakes in 2010 – 2011. The *Organisational direction* theme had the highest number of UoMs in the study indicating widespread relevance from the data collected. In the positive category, a UoM coded from the data was "The University of Canterbury will begin delivering lectures on-site, off-site and online for more than 250 individual courses from next Monday as it commences its progressive Restart of academic delivery for the 2011 year following the 22 February earthquake in Christchurch" – UC *Progressive Re-start*, March, 2011. This UoM gave an indication that the University had an inclination to use e-learning for teaching and learning in

the aftermath of the earthquake. In the negative category, a UoM from a document was "…from a quality control and accreditation perspective, the Tertiary Education Commission required significant documentation on all changes to course content and method of delivery" (Seville et al., 2012). This UoM gave an indication that there were hindrances to overcome in the use of e-learning for certain courses.

Perceived usefulness

The *Perceived usefulness* theme UoMs related to how e-learning was perceived to be useful (or not) for teaching and learning in the aftermath of the earthquakes that occurred in 2010 and 2011. In the positive category, a UoM was coded from the data collected was: "In February 2011 e-Learning very quickly emerged as a panacea that was going to save us, and that we were going to be able to deliver lectures to students in their homes" (SMT 1, interview transcript, August 4, 2014). In the negative category, a UoM from a document was "…the online environment [was] 'more challenging and more time-consuming [to use]'" (Learning Resources Working Group, 2011).

E-learning was useful when there were no teaching spaces because of damage to lecture theatres in the February 2011 earthquake. E-learning was also used for other activities such as engaging with students (see engagement theme) and for assessment (see assessment theme) in the aftermath of the earthquakes.

Pedagogy

The *pedagogy* theme had a UoM that related to how the seismic events of 2010 and 2011 influenced the method and practice of teaching using e-learning in UC. In the positive category, a UoM from an article written by members of Learning Resources who were likely to have a good overview of the University was "Lecturers who had already begun to develop their use of the online environment as a part of their teaching strategy, were in a better position to engage their students in a pedagogically sound way through the use of Moodle"

(Monti et al., 2011). In the negative category, a UoM from a document by Learning Resources Working Group was "the major stumbling block amongst academic staff in supporting students online was that lecturers were generally not prepared well enough to design online student learning" (Learning Resources Working Group, 2011).

Earthquake motivating factor

The *Earthquake motivating factor* theme had only positive UoMs and they related to how the earthquakes of 2010 and 2011 were perceived as a motivating factor in the use of e-learning. An interviewee noted,

> …when the quakes happened there was a big - particularly the February quakes - there was a big push to you know, how do we actually keep teaching. So those who weren't doing it, they were you know, basically came running to us saying how do I get my stuff online? (LR5, interview transcript, August 21, 2014.)

Multimedia

The *multimedia* theme had a UoM that related to how multimedia such as audio and video was used as an e-learning tool in the aftermath of the earthquakes of 2010 and 2011. An interviewee remarked, "…lots of staff did little videos using a webcam on a laptop, that sort of thing, and we did a lot of helping staff to put video clips into PowerPoints, and then putting those on *Learn* for the students (LR4, interview transcript, July 17, 2014).

Resource availability

The *resource availability* theme had a UoM that relates to how e-learning resources were available in UC in the aftermath of the earthquakes of 2010 and 2011. A UoM from a document was "Processes were also in place to recommend the purchase of suitable electronic information resources, to recommend electronic information resources as alternatives to trapped print resources, and to provide links for embedding in Learn courses" (Seville et al., 2012). A UoM in the negative category was "…the earthquake similarly

highlighted the need to avoid a situation where departmentally-installed servers operated specialized software, far from the primary and secondary data centres" (Learning Resource Working Group, 2011).

Access to support

Access to support referred to support in the use of e-learning in UC. The support could be from support staff such as FLA in using *Learn,* or academics offering support in using e-learning. In the positive category, a UoM was "…the FLAs assisted academic staff members in the redesign of their courses, with a view to incorporating online learning elements, generally, and particular learning technologies, more specifically"(Learning Resources Working Group, 2011). In the negative category, an interviewee noted "...we do have quite limited resource around our learning resources staff, um, there's an opportunity cost of going to support a particular part of the University" (SMT 1, interview transcript, August 4, 2014).

External support

The *external support* theme had a UoM that related to how UC had external support in using e-learning tools in the aftermath of the earthquakes of 2010 and 2011. In the positive category, an interviewee remarked, "Adobe were very good, … we have a hundred licences that we pay for, but they gave us another five hundred for a few years, free licences, so we could have unlimited use" (LR4 1, interview transcript, July 17, 2014). In the mixed category, an interviewee commented, "The other thing we identified though was the need for putting in place relationships prior to major events like this" (SMT 1, interview transcript, August 4, 2014). Relationships with other organisations may be established earlier so those organisations can be relied on for support in times of crises.

Engagement

The *engagement* theme had a UoM that showed how UC engaged with students using e-learning in the aftermath of the earthquakes of 2010 and 2011. In the positive category, a

UoM from a document was “Lecturers who view student engagement as paramount, set about redesigning their courses for the blended environment after the earthquake” (Learning Resource Working Group, 2011). In the negative category a UoM from a document was “A first-year student expressed disappointment at the fact that she had expected more individualized support from academic staff, particularly in view of the fact that the earthquake took place on the second day of the academic year” (Learning Resources Working Group, 2011).

Accessibility of material

The *Accessibility of material* theme had only positive UoMs that gave indications of accessibility of e-learning material to students and/or staff in the aftermath of the seismic events of 2010 and 2011. A UoM from a document was “The vast majority of undergraduate students found course materials made available on their *Learn* course sites to be the most valuable learning resources in the weeks following the earthquake” (Learning Resource Working Group, 2011).

Assessment

The *Assessment* theme had a UoM that related to how e-learning was used for assessment in the aftermath of the earthquakes of 2010 and 2011. From a document, a UoM was “There was a marked increase in lecturer interest in *Learn*, not only for making content available but also for the purposes of communication and formative assessment” (Learning Resource Working Group, 2011).

Attitude of students

The *attitude of students* theme had UoMs that related to the attitude of students, from the data collected for the study, on the use of e-learning in the aftermath of the earthquakes of 2010 and 2011. In the mixed category, a UoM was “…some felt that third and fourth-year students were better able to cope with online teaching” (Seville et al., 2012). In the negative

category, a UoM was "students made a number of negative comments surrounding *Learn* courses. The biggest problem seems to have been the fact that these 'online courses' were never really designed as online courses" (Learning Resources Working Group, 2011). This UoM could be due to some students' unfamiliarity with teaching using e-learning.

Skills

The *skills* theme UoM related to the skills of academics in the use of e-learning in the aftermath of the earthquakes of 2010 and 2011. An interviewee commented, "...the need to support them [academic colleagues] by providing technical support or templates or something like that became quite apparent and it's still an issue we face now in terms of effective use" (SMT 1, interview transcript, August 4, 2014).

Findings from several documents and reports from various sections of the University documented UC response to the seismic events and the lessons learnt. E-learning has been integrated in the 2013-2017 Learning and Teaching Plan which has a provision for the establishment of an e-learning advisory group by mid-2013. The Learning and Teaching Plan also had an increased provision of blended learning by the end of 2014.

Summary of thematic findings

Findings from the data collected for the study showed that UC was resilient with e-learning in the aftermath of the seismic events that occurred in 2010 and 2011. The findings from the data indicated that UC had progressively increased its e-learning capacity since the introduction of *WebCT*, *StudentNet* and manual lecture capture in the University.

The first response to the severe earthquakes in September, February and June was communication with students and staff about the safety of the University campus, closure of campuses and then the way forward regarding the continuation of activities in the University. The restart of Semester 2 was the main focus in September 2010 whereas in February 2011 the focus was on delivering a quality full academic year programme in the 2011 calendar

year. In June the focus was on assessment. There was also maturing use (Marshall, 2012b) of e-learning taking place in UC as there were standard university-wide course templates and integration of UC Library resources in *Learn.*

The seismic events of 2010 and 2011 resulted in an interest in online resources and the use of e-learning for teaching, learning and assessment. The use of e-learning prior to the seismic events by some academics in some Colleges increased the capacity of UC to use e-learning in the aftermath of the seismic events of 2010 and 2011. In addition, the capacity of the IT infrastructure to support numerous connections and from multiple devices was initially stressed to its full capacity. Organisational direction from SMT and College Executive gave impetus to staff to use e-learning especially in the aftermath of the seismic event of February 2011. This was because there was the need to retain students enrolled in the University/College in the aftermath of the seismic events because there was a reduction in student enrolments immediately after the February 2011 earthquake.

The introduction of a web conferencing software, *AdobeConnect* in 2007 increased the use of e-learning in the University. Some academics adopted the use of *AdobeConnect* in order to be able to engage with their students visually due to limited teaching spaces. Manual lecture capture increased in the aftermath of the February earthquake, which led to an increase in requests for downloads from the *QuickTime* Streaming video server. The links to manually captured lectures were hosted on the *Learn* site of courses. The academics also posted snippets of video recordings onto the *Learn* course sites. The *Learn* server was therefore streaming multimedia and hosting links to the QuickTime Streaming video server, which led to capacity issues.

The UC *Restart* and UC *Progressive Restart* websites were set up to serve as the main source of communication for all information relating to UC response to the seismic events on 2010 and 2011. A *Facebook* page set up by the University also served as a source of

information on UC earthquake recovery activities. The Senior Management Team relayed information about UC response to the seismic events on the websites and Facebook.

Furthermore, data from the findings of the study showed that academics resorted to the use of e-learning in order to engage with students because of the limited availability of teaching spaces. There was support from staff in Learning Resources for academics to use the e-learning resources available in UC. Academics with more expertise in e-learning also helped their colleagues who needed assistance to use e-learning in the aftermath of the seismic events. On-campus students became distance students temporarily in 2011 because there were few teaching spaces and they therefore engaged with materials that were meant for distance students. Some academics also used *Learn* to assure students of their wellbeing.

In addition, the data from documents and interviews indicated that the earthquakes of 2010 and 2011 were motivating factors for some academics to increase their use of e-learning as e-learning was the only option for engaging with students. Some academics began using other technologies such as *Echo360 EchoSystem*, *AdobeConnet* while others increased their usage of *Learn*. However, there were some students who were unsure about using e-learning technologies. Some students did not enjoy the experience and reverted to face-to-face interactions with teachers when there were teaching spaces.

In the following section the findings of the study will be interpreted using the Indicators of Resilience Model to determine how the University was resilient with e-learning in the aftermath of the seismic activities.

Interpretation of the case study

The Indicators of Resilience Model was adopted to interpret UC resilience to the seismic activities of 2010 and 2011 through the use of e-learning (see Chapter 2).

Indicators of Resilience Model

Resilience is defined as an ability to recover from or adjust easily to misfortune or change (Jacso, 1997). Chang-Richards et al. (2013) define organisational resilience as "the ability of an organisation to survive a crisis and thrive in a world of uncertainty" (p. 117). It also refers to how organisations improve their ability to respond to and quickly recover from catastrophic events such as natural disasters and terrorist attacks. The results of the study were used to find out how resilient UC was in carrying out its activities using e-learning in the aftermath of the seismic events of 2010 and 2011.

The IRM posits there are 13 indicators that can be used in assessing the resilience of an organisation (Resilient Organisations, 2012). These 13 indicators are grouped into three categories: Leadership and Culture; Networks; and Change Ready. The distribution of the indicators across the categories is shown in Table 5.

Table 5: Resilience Indicators.

Category	Indicators
Leadership and Culture	Leadership
	Staff Engagement
	Situation Awareness
	Decision Making
	Innovation and Creativity
Networks	Effective Partnerships
	Leveraging Knowledge
	Breaking Silos
	Internal Resources
Change Ready	Unity of Purpose
	Proactive Posture
	Planning Strategies
	Stress Testing Plans

Data collected for the study from various sources as listed in Table 5 and coded into UoMs were further analysed and interpreted using the Indicators of Resilience Model (Resilient Organisations, 2012).

Leadership and Culture

Evidence of the indicators of Leadership and Culture were found in the data collected for the study. The indicators of leadership and culture and an example of selected data from the study illustrating each of the indicators, where applicable, are shown in Table 6.

Leadership was demonstrated when the VC made postings on the UC *Progressive Restart* website with regards to the use of e-learning in the College. Academics had *situation awareness* when lecturers who had identified the loss of physical space as the most pressing problem resulting from the seismic event of February 2011 sought to replicate the face-to-face experience in the online environment.

In addition, some academics showed *Innovation and Creativity* as evident in the statement, "lots of staff did little videos using a webcam on a laptop and posting them on *Learn*" so students could hear and see them as they would in a face-to-face class. The indicator, *Staff Engagement*, was evident as academics had a desire to make use of technology such as video to replicate lecture delivery, despite a lack of confidence with technology. *Decision Making* was evident when lecturers indicated they were open to rethinking aspects of their course delivery.

Table 6: A table of quotes selected to illustrate IRM indicators of Leadership and Culture

Category	Indicators	Event	Selected quote
Leadership and Culture	*Leadership*	Feb. 2011	"…the management team decided the university website would become the central port for official information for the UC community" (Dabner, 2012, p. 73).
	Staff Engagement	Feb. 2011	"There was also huge relief from College of Education lecturers who already had Flexible Learning Option (FLO) courses running and just needed to add study guides online and direct on-campus students to their Learn sites" (Learning Resources Working Group, p 12).
	Situation Awareness	Feb. 2011	"…lecturers who had identified the loss of physical space as the most pressing problem, sought to replicate the face-to-face experience in the online environment" (Learning Resources Working Group, p 22).
	Decision Making	Feb. 2011	The University was accelerating into a more online and e-resourced environment that complemented the existing quality lecturing programme (VC, *UC Restart*, 15 September, 2010).
	Innovation and Creativity	Feb. 2011	"lots of staff did little videos using a webcam on a laptop." (LR 4, Interview, July 17, 2014).

Networks

The indicators of Networks in the IRM found in the collected data are represented with selected quotes and shown in Table 7. There existed *Effective Partnerships* between UC and other organisations such as Adobe Corporation and UC, which resulted in a gift of licences in using *AdobeConnect*. Evidence of *Leveraging Knowledge* in the collected data is represented by the quote, "FLAs assist academic staff members in the redesign of their courses, with a view to incorporating online learning elements, generally, and particular learning technologies, more specifically" (Learning Resources Working Group, 2011, p. 22). In addition, evidence of *Internal Resources* in the collected data is represented with the quote, "Staff who wish to record their lectures to post on *Learn* can do so by filling in the audio equipment request form. If you are recording your lectures, please let your students know

how to access it" (UC *Progressive Re-start*). The Learning Resources of the University provided extra capacity to accommodate the needs of academics.

Table 7: A table showing the indicators of networks with selected quotes

Category	Indicators	Event	Selected quote
Networks	*Effective Partnerships*	Feb. 2011	Adobe were very good, they gave us, we have a hundred licences that we pay for, but they gave us another five hundred for a few years, free licences, so we could have unlimited use" (LR4, interview transcript, July 17, 2015).
	Leveraging Knowledge	Feb. 2011	FLAs assist academic staff members in the redesign of their courses, with a view to incorporating online learning elements, generally, and particular learning technologies, more specifically" (Learning Resources Working Group, 2011, p. 22).
	Breaking Silos	Feb. 2011	"…all updated information from the university was first posted to the UC website, including links to video material housed on the UC YouTube channel and information on external websites. Links to this material were then created on the Facebook earthquake recovery site (Dabner, 2012, p. 74).
	Internal Resources	Feb. 2011	"Staff who wished to record their lectures to post on *Learn* can do so by filling in the audio equipment request form. If you are recording your lectures, please let your students know how to access it" UC *Progressive Re-start*, PVC (Learning Resources).

Breaking Silos occurred when "all updated information from the University was first posted to the UC website, including links to video material housed on the *UC YouTube* channel and information on external websites. Links to this material were then created on both the Facebook earthquake recovery sites" (Dabner, 2012, p. 74). The silos in the University were groups of members of the University such as academic staff in a department, within Colleges. Using the UC websites and other media for communication broke silos as the same message was accessible to all groups of members of the University community.

Change Ready

Indicators on being *Change Ready,* including selected quotes from data collected from the study, are shown in Table 8 below. *Unity of Purpose* was demonstrated when, in a staff briefing presentation on March 2011, the VC indicated that UC was in a "A new sort of normal" and that more material will be delivered through other platforms such as the University's Learning Management System, *Learn*.

Table 8: A table showing the indicators of Change Ready with selected quotes

Category	Indicators	Selected quote
Change Ready	*Unity of Purpose*	"'A new sort of normal' and that more material will be delivered through other platforms such as the University's Learning Management System, Learn" (VC UC, Staff briefing presentation, March 2011).
	Proactive Posture	A strategic business review of blended learning developments within and across Colleges (Learning and Teaching Plan 2013-2017).
	Planning Strategies	High risk innovations are best piloted and monitored in a low risk supportive setting where expertise is at hand (Learning and Teaching Plan 2013-2017).
	Stress Testing Plans	No evidence

Evidence of *Proactive Posture* in the data collected was demonstrated in the aim of completing a strategic business review of blended learning developments within and across Colleges as envisaged in the Learning and Teaching Plan 2013-2017. UC would then be in a position to respond to early warning signals of change in the UC's internal and external environment. Also, *Planning Strategy* was evident in the data collected for the study. An example was found in the Learning and Teaching Plan 2013-2017 where a recommendation was made that high risk innovations were best piloted and monitored in a low risk supportive setting where expertise was at hand. *Evidence for Stress Testing Plans* was not found in the data collected for the study.

Twelve out of the 13 indicators of the IRM were found in the data collected for the study and could be explained using the model. The IRM was therefore an appropriate model for use in interpreting the data for the study.

Conclusion

This chapter has described the case of UC resilience with e-learning in the aftermath of seismic events of 2010 and 2011. Sources of data for the case study were from archived webpages of UC from 2002 – 2012, University of Canterbury reports and documents. In addition, publications from staff, interviews and web postings on UC *Restart* and UC *Progressive Restart* served as sources of data. Findings from the data were categorised into sub-themes and the Indicators of Resilience Model was used to interpret the data to determine UC resilience to the seismic activities of 2010 and 2011 using e-learning. Data from the study revealed that UC has become more resilient with e-learning in the aftermath of the seismic activities in 2010 and 2011.

The next two chapters of the thesis describe the nested case studies of the CoBL and CoE resilience with e-learning in the aftermath of seismic events of 2010 and 2011.

CHAPTER 5

THE CASE OF E-LEARNING IN THE COLLEGE OF BUSINESS AND LAW

This chapter presents the embedded case study, specifically the case of the College of Business and Economics, which merged with UC School of Law to become the College of Business and Law in 2013. Data collection spanned 2000-2014 and therefore includes material from when the College was known by its old name and its current name. This is one of two nested case studies within the larger case study of the University of Canterbury. The other nested case study of the College of Education will be presented in the following chapter. Case study methodology was used to gather and analyse evidence, using interviews, documents and web-based information. The chapter starts with an overview of the College of Business and Economics, including its merger with UC School of Law to become the College of Business and Law, and presents a timeline of how e-learning evolved through the series of earthquakes that occurred in 2010 and 2011. The methodology used in collecting data is then described. The chapter continues with a description of the findings analysed from the data collected. The chapter concludes with an interpretation of the case study using the Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000) and Indicators of Resilience model (IRM) (Resilient Organisations, 2012).

Case study setting

UC School of Law and UC College of Business and Economics merged to form the College of Business and Law (CoBL) in 2013, which today comprises the School of Business and Economics, and the School of Law (Research & Innovation & Student Services and Communications, 2013). In 2015, the College had 3873 students including 542 postgraduates and 298 international students, 114 staff with 87 academics, including 21 law academics (College of Business and Law, 2015). The College of Business and Law offers bachelor, masters and doctorate programmes with more than 300 courses.

The School of Business and Economics was one of the first business schools in higher education in New Zealand. In 2014, the School earned initial accreditation by AACSB International – The Association to Advance Collegiate Schools of Business. AACSB Accreditation is the hallmark of excellence in business education, placing the School in the top five percent of the world's business programmes (College of Business and Law, 2015). The School has other affiliations such as Association of MBAs and was ranked within the world top 100 for Accounting and top 200 for Economics in QS World University Rankings (2012/13 QS World University Rankings). The School of Business and Economics ranks second in the Tertiary Education Commission Performance Based Research Fund assessments. The School of Business and Economics in the College of Business and Law is custodian of New Zealand's oldest Bachelor of Commerce degree, which was established in 1906 (College of Business and Law, 2015).

The UC School of Law, founded in 1873 in Christchurch, in the South Island of New Zealand, is well established as one of the leading research and teaching Law Schools in New Zealand. In 2015, there were about 1000 students at all levels studying law at the University of Canterbury. Some were taking introductory law courses as part of a Bachelor of Laws (LLB) degree. Others chose to take law as part of a Commerce, Arts, Science or Social Work degree (Hickson & Agnew, 2013). At the time of the February 2011 earthquake, UC School of Law was not part of the College structure but had a close relationship with the College of Business and Economics.

UC documents, reports and publications from academics in the College of Business and Economics and School of Law were used to chronicle e-learning activities in the College. The data collected included material from the College of Business and Law (CoBL), which was formed after the merger of the College of Business and Economics and the School of Law in 2013. In addition, archived webpages of UC from 2001 to 2015 were searched for

evidence of e-learning in the College. An overview of CoBL and a timeline of e-learning activities gleaned from UC documents, webpages, reports and publications from academics in CoBL, as well as personal communication with staff in UC, are shown in An overview of the University of Canterbury with a timeline of e-learning activities and seismic events is shown in Table 9

Table 9: An overview of College of Business and Law with a timeline of e-learning activities

Year	Activity	Source
1906	The Faculty of Commerce was established. 1st B.Com in New Zealand began in College.	UC School of Business and Economics, 2015. http://www.bsec.canterbury.ac.nz/about.shtml
2000	*WebCT* installed as a trial in the Commerce Faculty.	G. Ronald (personal communication, May 26, 2015).
2001	University-wide adoption of *WebCT.*	G. Ronald (personal communication, May 26, 2015).
2002	Manual lecture capture began as a result of request from an Economics lecturer. Manual lecture capture using *QuickTime* streaming server to deliver on-campus-only access video lectures.	Thomas and Hollis, 2013.
2003	Videotaping lectures, then stored so they can be viewed on a web browser link from *WebCT* course	WebCT Course Designer News January, 2004.
2007	Move to *Blackboard* LMS	UC Document
2009	Plan to move to *Moodle* v1	G. Ronald (personal communication, May 26, 2015).
2010	February: Move to *Moodle* v1 (*Learn*) by University	UC Document
	Standardised template for *Learn* sites in College	*CoB1,* interview transcript, August 08, 2014.
	Discontinuation of "K: drive" use to encourage use of uploading files in *Learn.*	*CoB1,* interview transcript, August 08, 2014.
	Minimal use of e-learning	*CoB1,* interview transcript, August 08, 2014.
	September: Earthquake — Occurred when students were on vacation before the start of Term 4	UC *Restart* website

		Had less impact on use of e-learning due to timing of earthquake	
		University closed for two weeks	UC *Restart* website
		Gift of online library resources	UC *Restart* website
2011	February: Earthquake	Occurred on second day of 1st semester	Thomas and Hollis, 2013.
		University closed for 3 weeks	
		Had great impact on University and College	
	March	Use of *Learn, Facebook, Camtasia, Audacity* to engage with students	*CoB7*, interview transcript, October 31, 2014.
		Academics recording their own audio commentaries to support PowerPoint presentations and uploaded to *Learn*	Thomas and Hollis, 2013.
		Video recording of courses prepared in 2010 made available to students	*CoB5*, interview transcript, August 08, 2014;
			Thomas and Hollis, 2013.
		Manual recording of some lectures increases	Thomas and Hollis, 2013.
		QuickTime streaming server off-campus access implemented.	
	April	*Echo360* offers UC licence for 5 lecture theatre venues and site licence for desktop capture application.	Thomas and Hollis, 2013.
	May	Temporary permission to use e-learning law society for a semester. Extension then granted for teaching electives.	UC Learning Resource Working Group.
	June Earthquake	Occurred at end of Term 2	UC *Progressive Re-star*t
		University closed for two days	
		Minimal impact as teaching was over	
		Move to online assessment	Hickson and Agnew, 2013.
	July	Start of pilot use *Echo360* for automatic capture of lectures	Thomas and Hollis, 2013.
	Nov	Review of pilot use of *Echo360* and decision to continue and pay to continue to use automated lecture capture.	Thomas and Hollis, 2013.

2012	May:	Final approval obtained to purchase equipment and licence for a 20-venue deployment as well as 100 desktop capture licences.	Thomas and Hollis, 2013.
	July	*Echo360* go live	Thomas and Hollis, 2013.
2013	Merger of UC School of Law with College of Business and Economics		UC Research Report, 2012.
	Move to *Moodle* v2 by University.		
2014	Development of STAR courses in CoBL to use e-learning.		*CoB2*, interview transcript, August 08, 2014.
2015	Plans for development of programmes in CoBL to use e-learning.		*CoB2*, interview transcript, August 08, 2014.

The Faculty of Commerce had been established in 1906 and the UC Bachelor of Commerce degree was first offered in that year by Sir James Hight (College of Business and Law, 2015; School of Business and Economics, 2015). *WebCT* was installed as a trial in the Commerce Faculty in 2001 when UC officially adopted an e-learning system (G. Ronald, personal communication, May 26, 2015). The first manual lecture capture began in 2002 as a result of a request from an Economics lecturer "who had been timetabled into a room that was too small to cope with the number of enrolled students"(Thomas & Hollis, 2013, p. 191) Staff of the Audio Visual Services and ICT services then worked together using a *QuickTime* streaming server to implement a solution to deliver videoed lectures that could be accessed only on campus (Thomas & Hollis, 2013). In 2003, stored videotaped lectures could be viewed on a web browser link from a *WebCT* course (WebCT Course Designer News January, 2004). In 2007 UC switched from using *WebCT* to *Blackboard* LMS. In 2007 UC planned to move to *Moodle v1* and in February 2010 UC finalised the move to *Moodle v1* and named it *Learn* (G. Ronald, personal communication, May 26, 2015).

Prior to the introduction of *Learn* in the University in the first semester of 2010, the University had been using *Blackboard* and its use was voluntary. The University had a network drive, the "K:" drive which was designated for students to access. Academics dropped files pertaining to courses taught for students to access in the "K: drive", but this was discontinued to encourage the use of *Learn* (*CoB1*, interview transcript). Since the introduction of *Blackboard* in the College, the level of engagement in e-learning within the College of Business and Economics was varied. There was a small group of lecturers who used e-learning quite extensively in their courses prior to the earthquakes in 2010 and 2011 (*CoB2*, interview transcript). Large classes in Level 100 courses in the College had some lectures recorded manually preceding the earthquakes in 2010 and 2011. These lectures were recorded using *Echo360*, an automatic lecture capture system, since July 2011.

The September earthquake occurred during the term break, and, although impact on students was minimal, the University was closed for two weeks. In the aftermath of the September 2010 earthquake, the University received support from national and international suppliers who offered free access for staff and students to tens of thousands of e-books, online journals and global databases (PVC Learning Resources Professor Sue McKnight). Data from interviews with participants in the study revealed that academics were mostly unaffected by this earthquake and teaching resumed when UC reopened for Term 4 in 2010. (UC *Restart* website).

The School of Law's use of e-learning was restricted because of the challenges to professions such as Law to go online. The Council for Legal Education is a statutory body that ensures the quality of legal education in New Zealand. The Learning Resources Working Group (2011) document reported that "directly after the earthquake, application was made to the Council to present electives online – as an emergency measure. The Council agreed to

such presentation but only for the duration of the first term" (p. 28). A full application would have to be made to the Council if further online presentation was to continue.

The February earthquake occurred on the 2nd day of the first semester, closing the University for three weeks and having a significant negative effect on students and staff. In the aftermath of the earthquake in February 2011, the number of active courses registered on *Learn* in the College of Business and Economics directly before the earthquake, compared to the number of active courses registered on *Learn*, three months after the earthquake, showed an increase from 119 to 137 (Learning Resources Working Group, 2011). In 2011, the College directed that all courses immediately design assessments to be "earthquake-proof" – in the sense that the courses would be focused more on continuous formative assessment, rather than summative assessment (Learning Resources Working Group, 2011). Pockets of expertise in e-learning already existed with some academics having their lectures manually recorded and some using *Facebook* for interacting with students (Learning Resources Working Group, 2011; Nesbit & Martin, 2012).

In April 2011 Echo360 offered UC licence for five lecture theatre venues and site license for the desktop capture application of *EchoSystem*. The gift of the license provided UC with a tool to aid academics in creating teaching materials. The gift also enabled UC "to test whether an automated lecture capture system would serve as a viable replacement for the existing manual recording service" (Thomas & Hollis, 2013, p. 192).

The 13 June 2011 earthquake occurred at the end of Term 2 and resulted in the University being closed for two days. The earthquake had minimal impact as teaching was already over for the term (UC *Progressive Re-start*). However assessments were affected and some academics moved to online assessment of students. As noted by CoBL academics, Hickson and Agnew (2013), "in the event of an unanticipated disruption to normal life, universities tend to shift to an online environment in both delivery and assessment" (p. 297).

The start of pilot use of *Echo360* for automatic capture of lectures began in July 2011 and ended in November 2011. A review of the pilot use of *Echo360* indicated that the automated lecture capture system was a viable replacement for the existing manual recording system. A decision was made to pay and continue to use the automated lecture capture system (Thomas & Hollis, 2013).

In May 2012, final approval was obtained to purchase equipment and license for a 20-venue deployment as well as 100 desktop capture licenses. On July 9, 2012 *Echo360 Echo System* went live in UC.

Interviews in 2014 with a member of the College Executive in CoBL indicated that e-learning had been incorporated into activities in the College. The number of courses that used e-learning had increased. For example, Level 100 courses with large student numbers were recorded. The use of e-learning however had decreased in higher level courses (*CoB1*, interview transcript). In 2014, the College developed new courses and programmes for implementation in 2015, that involve significant use of e-learning. The College has also developed more STAR courses, which use e-learning (interview transcript, *CoB1*).

Methodology

Sources of data

The methodology used in the CoBL case study is presented in the following order: a description of e-learning from archived UC webpages, UC documents, reports and publications from academics in CoBL; and the sampling approaches adopted for selecting CoBL staff who were interviewed. In addition, inductive categories and deductive themes identified from interviews are described. Chapter 3 provided a detailed description of the methodology for the larger case study of the University of Canterbury.

Archived webpages of UC from 2002 – 2012 were searched for e-learning adoption and use in the University and College. University of Canterbury reports such as UC Research Reports, Learning Resources Working Group reports, College of Business and Economics Strategic Plan, College of Business and Law Strategic Plan were searched for evidences of e-learning in CoBL. In addition, web postings on the UC *Restart* (after September 2010 earthquake) and UC *Progressive Restart* (after February 2011 earthquake) websites by the PVC College of Business and Economics were also used. Publications from academics from the College were accessed to describe e-learning in the College. This was to aid triangulation and validation of the data collected.

Table 10: Sources of e-learning development in the College of Business and Law

Source	Author(s)	Date
Archived website of University of Canterbury	University of Canterbury	2002 – 2013
College of Business and Economics Strategic Plan 2010 - 2012	College of Business and Economics	November 2009
UC Progressive Re-start Website PVC Business and Economics	University of Canterbury	7 March 2011
eLearning: A Solution in a Crisis: Don't forget the pedagogy	Nesbit and Martin	5-8 July 2011
University learning in times of crisis: The role of IT	Todorova and Bjorn-Andersen	2011
Assigning grades during an earthquake – shaken or stirred?	Hickson and Agnew	17 Aug 2012
College of Business and Law Strategic Plan 2013 – 2017	College of Business and Law	26 September 2012
Using online assessment to replace invigilated assessment in times of natural disaster: Are some online assessment conditions better than others?	Agnew and Hickson	2012
Enhancing engagement in large courses: The Facebook experiment	Nesbit and Martin	8-10 October, 2012
Interviews of a member of CoBL Executive, Flexible Learning Advisors and purposive sample of academics in CoBL		Aug. 2014 – Oct. 2014

Seven academics who used e-learning services were purposively selected and interviewed. Selected responses from two Flexible Learning Advisors (FLA) were also added because they were members of the College Learning and Teaching Committee. The FLAs advised on the use of e-learning and offered support to academics with e-learning issues such as setting up *Learn* sites, design and use of links to other resources. The FLAs also provided advice on downloading content, setting up assessments, and running forum interactions.

Key informants for the University case identified the first key informant in the CoBL, who then identified other academics in the College who were using e-learning, both before and after the earthquake of February 2011. These participants also identified relevant documents. As part of the interview, the key informants then identified other academics in the College who used e-learning, especially before and after the earthquake of 2011. Using this snowball strategy, other academics were then identified and interviewed (See Chapter 3: Population and Sampling). The sampling continued until I was referred to participants whom I had already interviewed. Glaser and Strauss (1968) define saturation as "the point at which "no additional data are being found whereby the (researcher) can develop properties of the category" (p. 61). Table 11 shows a list of participants for the study in CoBL.

Table 11: List of participants for the study in the College of Business and Law

S. No.	Pseudonym	Type of position
1	CoB1	Academic
2	CoB2	College Executive
3	CoB3	Academic
4	CoB4	Academic
5	CoB5	Academic
6	CoB6	Academic
7	CoB7	Academic
8	LR1	FLA
9	LR2	FLA

The responses from nine interviewees were first coded into three deductive categories: positive to e-learning, negative to e-learning, and mixed to e-learning. Further analysis of the responses in the three main categories led to the generation of inductive themes for each main category (See Chapter 3, Data analysis).

Findings

This section presents the findings from analyses of documents, reports and UC websites as presented in Table 10. Findings from interview analyses are also discussed. Finally, the findings are interpreted using two models, Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2000) and Indicators of Resilience Model (IRM) (Resilient Organisations, 2012).

Documents

The College of Business and Economics Strategic Plan 2010-2012 showed the College's planned activities for the period 2010-2012. This document gave an overview of 2009, especially the global financial crisis and its effect on education in New Zealand. The document described how the Government sought to reduce public expenditure on higher education for 2010 and beyond, and how the University of Canterbury responded to the changed policy environment. The document also elaborated on how the College of Business and Economics responded to these challenges. This included significantly increasing its national market share of domestic students and diversification of its international enrolments. The document concluded with how "the College's 'core business' must be aligned with the fundamental challenges posed by the need to attract academic staff and students in a way which is financially viable in the long term" (College of Business and Economics, 2009, p. 6). In the College of Business and Economics Strategic Plan 2010 – 2012, there was no reference to the use of e-learning.

Nesbit and Martin (2011), in a publication, “eLearning: A solution in a crisis: Don’t forget the pedagogy” indicated that a number of the first year courses in the Bachelor of Commerce adopted aspects of e-learning to ensure the courses could continue to be delivered (p 197). They described how the lecturers in four papers in the first year of the UC Bachelor of Commerce degree adopted e-learning approaches in the wake of the earthquake in February 2011, as the earthquake left many teaching spaces and staff office spaces unusable for much or all of the semester. A decision was made that the courses comprising the core of the first year of the Bachelor of Commerce would commence online delivery as soon as possible. This confirms the Pro Vice Chancellor of the College’s message on the UC *Progressive Restart* website that the College was assessing its capacity to deliver its programmes, utilising diverse learning platforms. Evidence from interviews indicates that Level 100 courses in the College have the greatest use of e-learning.

Nesbit and Martin (2011) acknowledged the "challenges involved in enabling delivery to commence with many of these challenges involving the lack of experience of some of the staff in delivering papers online" (p. 198). Nesbit and Martin (2011) discovered that “the ‘voice over PowerPoint’ approach available in PowerPoint was utilised. This created files that were too large for some students to download" (p. 202). When video/audio is streamed from *Learn* rather than downloaded, there may be a problem because *Learn* is not a streaming server and is thus not suited for that purpose. A high level of email traffic, as reported by Nesbit and Martin (2011), could have resulted from inexperience in the use of *Learn.* They also reported that some important details were being missed by some students when *Learn* was being used.

Learn was perceived as useful because it was used as a “document repository”, replacing the use of manual course readers, which were prepared four months before the start of a course and which could not be changed or completed once printed. *Learn* became much

more important in how the paper was being delivered, such as posting of lecture notes and PowerPoint slides. *Learn* was also used for assessment, as tutorial questions were made available online with students submitting their responses online. There was also the use of software such as *Audacity* and *Camtasia* to create audio and video files. These files tended to be large so they were divided into 10-15min segments to enable easy download.

Students were engaged with e-learning as they used online quizzes, downloaded and uploaded tutorials and used online forums in *Learn*. Chapters of textbooks, in portable document format, that had been made available by publishers due to the circumstances of the February 2011 earthquake, were also downloaded by students. Students worked on their tutorials in groups and their work was submitted as groups, thus creating social interaction. Nesbit and Martin (2011) reported students' difficulty in using *Learn*, such as determining the frequency of accessing *Learn* sites. Some tutorials were only going to be made available online until face-face tutorials became possible, however the online versions continued well into the second half of the semester as many students were still geographically dispersed.

In a publication, "University learning in times of crisis: The role of IT", Todorova and Bjorn-Andersen (2011) reported that all staff in the Department of Accounting and Information Systems had some familiarity with the online learning platform, *Learn*. Academic staff primarily used *Learn* to upload content for students and to make important class announcements. Todorova and Bjorn-Andersen (2011) discovered that "although we are working with 'fifth-generation IT' and 'third-generation application software', we still have 'first generation' academic staff working with the technology, whose familiarity with *Learn* was relatively basic" (p. 4).

Hickson and Agnew (2013) concluded from their research that online assessments proved to be invaluable in an earthquake disrupted semester. Online assessments could be completed by students without physically being present on campus. There was innovation in

one course where the assignment was replaced by online tutorial quizzes and an online progress test was introduced. Agnew and Hickson (2012), in their research on assessment in four courses in the UC College of Business and Economics, reported that "online assessments are more substitutable for invigilated assessments in the event of invigilated assessments having to be cancelled at short notice, if certain restrictions are placed on them such as period of availability and number of attempts" (p. 9).

In their research on the UC College of Business and Economics following the February 2011 earthquakes, Nesbit and Martin (2012) showed how *Facebook* was used as a complement to the emails and postings from *Learn*. They noted many students were without electricity for periods of time but were able to access a text-only version of *Facebook* on their mobile phones at no cost. They discovered that "as many of the students were already regular users of *Facebook* for social communication there was a degree of ease of use and familiarity that enhanced the level of engagement that students had with the respective courses" (p. 76).

The College of Business and Law Strategic Plan 2013-2017 outlined the College's planned activities for the period 2010-2012. The document is divided into seven Key Strategic Areas: Research and Creative Work, Teaching and Learning, Students and Staff, Community Engagement, Internationalisation, Governance and Leadership, and Financial Viability. Each Key Strategic Area had Strategic goal(s), Measures for achieving the goal(s), and Actions for 2013 (College of Business and Law, 2012).

Two instances of the use of e-learning were identified in the Strategic Plan. These were in the Key Strategic Area 2: Teaching and Learning, which states:

1) Flexible and innovative learning methods are in place to suit changing student needs (p. 4)
2) Establish a working group to develop College-wide vision and approach to e-learning (p. 4).

The second statement was also included in *Actions for 2013*.

The use of e-learning in the College of Business and Law 2013 -2017 was in line with the University Teaching and Learning Plan 2011-2013, which aimed to "support and promote the development of flexible learning and distance education options" (University of Canterbury, 2010, p. 6).

Website

September 2010 Earthquake

The University of Canterbury set up a website, UC *Re-start*, that kept staff and students up to date with all the latest announcements and information relating to the 4th September earthquake and UC's re-opening. This contained all the information posted on the University website following the earthquake. The University of Canterbury campuses were closed (including the College of Education at Dovedale) until 6.00 am Monday 13th September while they were assessed for health and safety issues. The University used postings on its website to keep everyone advised. The main UC telephone line and data line connectivity to the campus remained operational. The Chancellor, Rex Williams, in a message posted on the UC *Restart* website, reported that since the initial response at the weekend, the University's Council had been fully informed both directly and through the impressive communications by email and on the UC website, *Facebook* and *Twitter*.

On 9 September, 2010, the PVC Learning Resources Professor, Sue McKnight, posted on the UC *Restart* website that the University had secured unprecedented access to global learning resources. "The University was delighted by the support it had received from national and international suppliers that had offered free access for staff and students to tens of thousands of e-books, online journals and global databases potentially worth millions of dollars" (PVC Learning Resources Professor McKnight, UC *Restart* website). The University had approached the vendors to try and address student concerns about the central library's

prolonged closure. Professor McKnight added that "students and staff will be provided with online and in-person support to help them utilise the new online services which they will be able to access through their university IT accounts". In a message on 13 September 2010, the Vice-Chancellor announced that PVC Learning Resources Professor Sue McKnight had outlined to staff attending forums some of the wide range of online resources being made available to the University community. On Day 12, an update from the Vice-Chancellor thanked all staff who were continuing to work long and hard to ensure that the University was ready for reopening on 13 September 2010. He reported, "the University was accelerating into a more online and e-resource environment that complemented the existing quality lecturing programme".

February 2011 Earthquake

The UC *Progressive Restart* website, set up after the 22nd February 2011 earthquake to give information on how the University was re-organising to continue with the 2011 academic year, had a posting from the College of Business and Economics on the processes the College had put in place to restart on March 14, 2011. The PVC Business and Economics also made postings on the UC *Progressive Restart* website including a message that "we have been actively engaged in assessing our capacity to deliver our programmes, utilising diverse learning platforms, changed facilities and drawing on the capabilities of our experienced and knowledgeable staff" (PVC Business and Economics message on *Restart* website on 7 March 2011). The PVC Business and Economics continued,

> It seems that we will be restarting on March 14 with very limited lecture theatre capacity, which is why I have asked staff teaching the critical 100-level courses to try and ensure that they could begin online, using their UC *Learn* sites to get students started.

The PVC Business and Economics on 17 March 2011 added, "Our level 100 courses all began on Monday, each with a face-to-face lecture in "Tent City" supplemented by flexible learning support through UC *Learn*. Our MBA and MBM resumed teaching in

facilities generously provided to us by Lincoln University" (PVC Business and Economics message on *Restart* website).

The Learning Resources Working Group's report on the University of Canterbury response to the 22nd February 2011 earthquake discovered that many students had not yet been enrolled and could thus not access their courses on *Learn.* Student self-learning was to be supported and academics were urged to restructure learning environments with a view to providing that support. The Teaching and Learning Committee in the College expressed "the need for a far greater emphasis on the use of many continuous assessment opportunities as opposed to one high-stakes assessment opportunity at the end of the course" (Learning Resources Working Group, 2011).

Interviews

The responses from nine semi-structured interviews were coded into three categories and then into 17 themes, as described earlier in the section on Methodology. The 17 deductive themes were ordered from the highest number of Units of Meaning (UoM) to the lowest and across three inductive categories of *Positive, Mixed and Negative*. The distribution of responses across themes is shown in Table 12.

Perceived usefulness

The *Perceived usefulness* theme UoM related to how participants perceived e-learning as being useful for teaching and learning in the aftermath of the earthquakes that occurred in 2010 and 2011. Some of the participants of the study were using e-learning in their course prior to the earthquakes. Eight participants of the study had 40 positive UoMs. Six participants had eight mixed UoMs on perceived usefulness of e-learning. In addition, six participants of the study had 14 negative UoMs on perceived usefulness of e-learning. The *Perceived usefulness* theme had the highest number of UoMs in the study indicating widespread relevance to the participants.

Table 12: The distribution of units of meaning from the College of Business and Law interviews arranged in three categories of positive, mixed and negative statements about e-learning across the 17 themes identified with inductive coding.

Category	Positive		Mixed		Negative		Total
Themes	P	UoM	P	UoM	P	UoM	UoM
Perceived usefulness	8	40	6	8	6	14	62
Access to support	9	29	7	10	2	6	45
Organisation direction	6	25	3	2	6	11	38
Earthquake motivating factor	5	19	5	9	4	9	37
Engagement	7	18	0	0	3	9	27
Accessibility of material	8	25	1	1	0	0	26
Communication and interaction	6	21	2	4	0	0	25
Attitude of students	5	10	4	6	3	4	20
Assessment	7	17	2	2	0	0	19
Resource availability	0	0	0	0	8	18	18
Multimedia	5	13	3	4	0	0	17
Perceived ease of use	6	8	0	0	3	4	12
Skills	5	8	1	1	1	2	11
External support	4	7	2	3	0	0	10
Recruitment	2	6	0	0	1	2	8
Community	3	3	3	3	0	0	6
Quality of work	3	3	2	2	0	0	5

Key

P – Number of participants of the study

UoM – Unit of meaning

In the theme *Perceived usefulness*, a UoM from the positive category that was coded from an interview transcript was: “I mean, it’s certainly very useful when a campus is closed, physically it’s certainly very useful to have those tools that you can then use … in the short term it was very useful when there was no physical campus” – *CoB 6.*

In the mixed category, the same interviewee remarked, "all the other things that I do on *Learn* like quizzes and you know, tutorial things and posting files and links to other places and stuff, I've done that for a long time and so nothing really changed long term" – *CoB 6*.

In the negative category, a UoM coded from an interview was, "Well, you have to remember a lot of people weren't using *Learn*, that is, before the February 2011 earthquake then. A lot of people were not using *Learn* at all" – *CoB 4*.

Academics may have realised the usefulness of having a *Learn* site for features such as hosting files and communicating with students, among others.

The units of meaning from the participants of the study in the *Perceived usefulness* sub-theme indicate that most viewed e-learning as useful. E-learning was useful when there were no teaching spaces because of damage to lecture theatres. Academics had to find other ways to continue teaching students and e-learning was used to engage with students. One academic described e-learning as "a silver lining" in the aftermath of the earthquake as the earthquakes made people think of e-learning and led to academics "putting stuff up online which they might not have put up before such as Head and Shoulders Video lectures". Academics knew of the existence of *Learn* on campus and some courses were using it, especially in the undergraduate programme.

Some academics said *Learn* sites helped facilitate classroom activities. One academic said that lecturers had had virtual meetings with students because there were limited facilities following the February 2011 earthquake. Two academics were having their lectures manually recorded and hosted on the *Learn* site before the September earthquake. However, due to the small number of students, academics teaching postgraduate courses were reluctant to use *Learn* in spite of its advantages. An academic confirmed that "the higher up you went, the less it [e-learning] was used".

Access to support

The participants related *Access to support* to their use of e-learning. The support could be from the University in providing staff such as Flexible Learning Advisors (FLAs) to assist in using *Learn,* and other e-learning tools such as audio and video tools. The theme also had UoMs that related to support from colleagues in the College or elsewhere. Nine participants of the study had 29 positive UoMs on *A*ccess *to support*. Seven participants had 10 mixed UoMs and two participants had six negative UoMs on *Access to support* in the use of e-learning.

In the positive category, an interviewee noted, "…I don't know what their title is, e-Learning advisors or something ... if you've got a question, you can contact them, and they'll answer it for you" – *CoB 5.*

In the *Access to support* theme in the mixed category, one interviewee remarked, "... at the time [in the aftermath of the February 2011 earthquake] we really were kind of left to sink or swim and find your own way, and Audacity [software] was free so, we just had to find something for ourselves" – *CoB 1. CoB 1* continued, "everybody just tried different things by themselves and then we would sort of say what we've tried, so it was a lot more, peer to peer help as opposed to actually somebody from the University helping us".

> A participant of the study understood that "some of them [staff] work very closely with two colleagues to design courses, and now are trying to move the boundaries, but they feel quite unsupported by the Institution and then they say well where does this fit because the University of Canterbury can't compete with Massey [University] in that space – *CoB 2.*

Another interviewee remarked, "We [another colleague and I] were asked if we could build a resource for any other first year courses in the College because the learning advisors were swamped as well" – *CoB 7.*

In the *Access to support* theme in the negative category, the same interviewee remarked, "I mean one of the things I discovered when we had the earthquake and they said well try to do it online and there was nobody to help out" – *CoB 7.*

From the UoMs on *Access to support*, it can be deduced that some of the participants had support either from colleagues or Flexible Learning Advisors in using e-learning. Others were of the opinion that the support was inadequate or non-existent.

Organisation direction

The *Organisation direction* theme UoMs related to how participants of the study perceived organisational direction in the use of e-learning in the aftermath of the earthquakes in 2010 – 2011. Six participants of the study had 25 positive UoMs on *Organisation direction.* Three participants had two mixed UoMs and six participants had 11 negative UoMs on *Organisation direction* in the use of e-learning.

In the positive category, an interviewee noted, "After the earthquake I think there had been a shift on the part of Senior Management team. A recognition that we'd better keep this thing that we call e-Learning and in fact we'd better perhaps make more use of it" – *LR 1.*

In the *Organisation direction* theme in the mixed category, an interviewee remarked,

"I mean the problem is I think that very often it's all about return in investment so people think that if I put all this extra work what do I get and there's not that much difference"– *CoB1.*

In the *Organisation direction* theme in the negative category, a participant in the study commented, "…no I think we just went ahead and did it. You know, you just go ahead and do it" – *CoB 6.*

The responses from participants of the study indicated that some got information that they could use e-learning while others were of the opinion that the information to use e-learning was received late. Some academics too were of the opinion that the University had been advertising itself as an on-campus University. Nevertheless it is evident that the Pro Vice Chancellor of Business and Economics posted a message on UC *Progressive Restart* website on 7 March 2011 asking "staff teaching the critical 100-level courses to try and ensure that they could begin online, using their UC *Learn* sites to get students started".

Earthquake motivating factor

The *Earthquake motivating factor* theme had UoMs that related to how participants of the study perceived the earthquakes of 2010 and 2011 as a motivating factor in the use of e-learning. Five participants of the study had 19 positive UoMs on earthquakes as a motivating factor. Five participants had nine mixed UoMs and four participants had nine negative UoMs on earthquakes as a motivating factor in the use of e-learning.

In the positive category, an interviewee noted,

> Between February, March and April following that February earthquake, that's where I saw the maximum innovation, because the idea of a tent, a canvas tent, obviously it was a very, very poor substitute for a lecture theatre or a lecture room. I mean you couldn't use whiteboards, because these were really big tents, you couldn't see them, so people kept very, very innovative, finding online alternatives at that point – *LR 2*.

In the mixed category, one interviewee remarked, "I guess what I was doing, and I still do it, I was doing it before, but probably, but I'm doing it more now. But I don't think it's because of the earthquake" – *CoB 4.*

In the negative category, an interviewee remarked, "I got the impression that e-Learning was not considered to be important at all, before the earthquake" – *LR 2.* Another interviewee added,

> … basically, one of the ways of muddling through was to um, use the Internet and *Learn*. So to describe that as e-Learning was stretching it a bit really. It was forced on us and a few people adopted things like online assessment – *CoB 4.*

The participants of the study were of the opinion that the earthquakes of 2010 and 2011 were motivating factors in encouraging them to use e-learning. Nevertheless, some participants were of the opinion that e-learning was imposed on them.

Engagement

The *Engagement* theme had UoMs that showed how the participants of the study engaged with students using e-learning in the aftermath of the earthquakes of 2010 and 2011. Seven participants of the study had 18 positive UoMs for *Engagement* and three participants had nine negative UoMs for *Engagement*.

In the positive category, one interviewee's comment on the use of *Engagement* was, "in the short term around the time of the February earthquake I did deliver part of one of my courses as sort of an online distance type of thing"– *CoB 6.*

In the negative category, another interviewee's comment on the use of e-learning for *Engagement* was:

> one of the things which obviously, the initial feedback from the students was, we wanted to get together, we've lost the feel of the course. We've lost the interaction with other students and the like, so as soon as there was space available on campus, I actually set up a one hour tutorial session where we could actually go over the material and stuff like that and the students seemed to appreciate just being physically able to get together and actually being asked questions face to face using the forums – *CoB 3.*

Academics saw that students were engaged with materials posted on *Learn,* using *LearnTrack* to find out how students were accessing the materials. Although a course was not set up for distance, a student who preferred to stay out of Christchurch was able to use posting on *Learn* to complete the course. Some academics however were of the view that students missed out when they did not turn up in class and relied only on lecture recordings.

Accessibility of material

The *Accessibility of material* theme had UoMs relating to how accessible the e-learning material was to students, from the perspective of the study's participants. Eight participants had 25 positive UoMs and only one participant had one mixed UoM on *Accessibility of material* on e-learning by students.

In the theme *Accessibility of material,* a UoM from the positive category was that "the tents were far inferior to a lecture theatre, so the majority of students didn't go to the lectures in tents. They just watched the videos online because the videos, the lecture videos were probably a better product than the lecture in the tent" – *CoB 5.*

In the mixed category, there was only one UoM. The interviewee remarked, "So now the situation is that everybody wants *Echo360* capture of their lectures and information from Learning Resources is that we cannot do this so there is need to know which courses are priority courses for *Echo360* capture"– *CoB 3*.

E-learning was accessible to students and those who could not get access to Internet had materials burned onto DVD. Most academics now want their lectures recorded using *Echo360* but the priority is given only to some lectures.

Communication and interaction

The *Communication and interaction* theme had UoMs that related to how the participants of the study used e-learning for communication and interaction in the aftermath of the earthquakes of 2010 and 2011. Six participants of the study had 21 positive UoMs for communication and interaction and two participants had four mixed UoMs for communication and interaction.

In the positive category, a participant of the study confirmed, "so *Learn* is now much better used by all staff, and not just for basic but there are discussion forums ... there's just

much more engagement between staff and students on an ongoing basis through *Learn*"– *CoB 3*.

In the mixed category, a participant of the study remarked, "I think they [academics] basically may have seen *Learn* as a vehicle for resources and providing audio and video, but not necessarily communicating"– *LR 2*.

E-learning was used by some academics for communication with students, especially discussion forums and using *Learn* for delivering audio and video. Students had to be given guidance on using e-learning. Time frames were usually given to complete a task. Due to the disruption caused by the earthquakes some flexibility was expected from academics when giving timeframes to students to complete tasks online. Learning activities were scaffolded, therefore tasks given online had to be completed on schedule for other learning activities to be added.

Attitude of students

The *attitude of students* theme had UoMs that related to the attitude of students to the use of e-learning in the aftermath of the earthquakes of 2010 and 2011. Five participants of the study had 10 positive UoMs on attitude of students. Four participants had six mixed UoMs and three participants had four negative UoMs on attitude of students to the use of e-learning.

In the positive category, an interviewee, *CoB 4* noted, "what I was doing was kind of gradually moving with what was possible and what the students would accept and [with] *LearnTrack*, you can see who's viewed what".

In the mixed category, the same interviewee remarked, "…what I find is with e-resources here, that the level of take-up by students, you can see it on *LearnTrack*, varies a great deal" – *CoB 4*.

For the negative category, this interviewee remarked, "Basically they sort of said, right, everything can go online and you know, students, the students they were meant for just couldn't cope technically and just I guess psychologically, socially with that" – *CoB 4*.

Participants of the study were of the opinion that students were accessing materials which helped them study at their own pace and kept them from worrying about the earthquakes although the participants of the study felt some students could not cope technically, psychologically and socially.

Assessment

The *Assessment* theme had UoMs that related to how the participants of the study used e-learning assessment in the aftermath of the earthquakes of 2010 and 2011. Seven participants of the study had 17 positive UoMs for assessment and two participants had two mixed UoMs for assessment.

In the positive category, an interviewee, *CoB 5* confirmed, "I used the *Learn* site for online quizzes and for online assessment". In the mixed category, a participant of the study remarked, "the students had to, were given it [exams], received it online but they had to submit it physically and they had to handwrite it"– *CoB 4*.

Participants of the study were using e-learning for online assessment and submission of assignments especially for large classes. Some academics however wanted students to handwrite and submit exams.

Resource availability

The *Resource availability* theme had UoMs that related to how e-learning resources were available to study participants and their students in the aftermath of the earthquakes of 2010 and 2011. Eight participants of the study had 18 negative UoMs for availability of e-learning resources.

One interviewee's comment on resource availability was, "I actually did request the manual [video recording] one but they said that it's very hard because there are no resources. Because the student's commented that they do prefer to have video as well as audio"– *CoB 1*. Another interviewee remarked, "a significant proportion of your class, especially your first year class, on the first two weeks of the semester, haven't got access to *Learn*, …well you can't even get onto a *Learn* site until you've paid your fees"– *CoB 4*.

Most of the participants of the study had issues with resource availability. Some made requests for video recordings but there were no resources. Some students preferred both audio and video and not just audio. The *Learn* server was delivering the audio and video files although it was not a streaming server. This put the system under stress.

There was a small group of lecturers who used e-learning quite extensively in their courses. Most of the level 100 courses had high use of *Learn* (CoB 2, interview). The use of e-learning however tends to decrease as classes become smaller and students move to higher level courses (CoB 2, interview). Some academics in Accounting & Information Systems, Economics & Finance used *Learn* extensively and had their lectures videoed. Some lawyers in the School of Law also used *Learn* at the time of the study.

Multimedia

The *multimedia* theme had UoMs that related to how the participants of the study used multimedia such as audio and video as an e-learning tool in the aftermath of the earthquakes of 2010 and 2011. Five participants of the study had 13 positive UoMs for multimedia and three participants had four mixed UoMs for multimedia.

In the positive category, an interviewee remarked, "so we did one week's worth of content using Camtasia, [record on-screen activity software] where we had PowerPoint slides and for some of the lecture we had the recording of my face there talking so they could actually see that" – *CoB 7*.

In the mixed category, a participant of the study remarked, "… but at the time of the earthquakes, yeah, you'd be right ECHO wasn't available, so it would have been very difficult for lecturers to make their own videos. So that's why Audio was used"– *LR 2.*

Audio was encouraged by some staff so that students could hear their voices because they realised that students clicked the audio links frequently to take verbatim notes. The low number of UoMs on the use of video was surprising considering that some first year courses were captured using manual recording. Some academics who had their lectures recorded the previous year requested that the links to those videos be provided on *Learn*. Some academics did video recordings using software but had difficulties. Others were apprehensive about their recording being public and there were concerns about the use of some YouTube links which were licenced for use only within the University.

Perceived ease of use

The *Perceived ease of use* theme had UoMs that related to how the participants of the study perceived the ease of use of e-learning in the aftermath of the earthquakes of 2010 and 2011. Five participants of the study had eight positive UoMs on perceived ease of use of e-learning. Three participants had four negative UoMs and there were no mixed UoMs for perceived ease of use.

In the positive category, an interviewee, *CoB 6* noted,

> for most of these things, for new tools and things, either I'll learn about them myself, so somebody told me about Socrative [a student response system], and I just went, oh and looked it up, and I just figured out how to use it myself.

In the negative category, an interviewee noted, "…well, that might have been what the students kind of were expecting in some ways. A replacement for the lecture, but that is not the way e-Learning works"– *CoB 4.*

Some of the participants were able to manage the use of some tools of e-learning with ease and find new ways of doing things. Others relied on previous recordings of lectures while some probably reverted back to familiar ways of teaching.

The inductive themes *Accessibility of material, Communication and interaction, Assessment, Multimedia, External support, Community, and Quality of work* had UoMs in positive and mixed categories only.

Skills

The *Skills* theme had UoMs that related to the study participants' skills in the use of e-learning in the aftermath of the earthquakes of 2010 and 2011. Five participants had eight positive UoMs about their skills. One participant had one mixed UoM and one participant had two negative UoMs about their skills in the use of e-learning.

In the positive category, an interviewee, *CoB 4* noted, "So of course when I got my site, first of all I'd find out how to get rid of those sections. How to get rid of the other bits of the template, replace what I wanted and arrange things in topics". *CoB 4* added, "I get quite a few queries, on like, how to use this, or what I'd do in that … I had occasion last semester or last year [2014] this time to go into a few *Learn* sites".

Another participant remarked, "there is certain flexibility how you use it. So there is certain core elements that everybody does and then some people experiment and do different things" – *CoB 1*. *LR 1* commented, "I've been involved in um, quite a bit with some lecturers in the College of Business and Law who are flipping their classroom and doing all sorts of interesting things".

In the mixed category, one interviewee remarked, "I think there are other people that say, well, when the University's got the resources to do it properly, and when they've got the staff who will, there must be a recognition that designing a course for students to be done electronically is different to what they've been doing" – *CoB 2*.

For this theme in the negative category, an interviewee remarked,

> I mean one thing that when I used to teach a large level 100 class which is a core for everybody, we did have additional features that we were using in Blackboard, that um, I thought were very useful. I understand now they have been scrapped because the teaching staff considered it to be a lot of work – *CoB 2*.

Some of the participants had the skills to use e-learning and were flipping their classrooms. Others were of the opinion that there must be recognition by the University that there is a difference in designing a course for students to do electronically.

External support

The *External support* theme had UoMs that related to how much external support the participants of the study in using e-learning tools in the aftermath of the earthquakes of 2010 and 2011. Four participants of the study had seven positive UoMs for external support and two participants had three mixed UoM for external support.

In the positive category, an interviewee remarked,

> a lot of international agencies gave free access to their databases, to the Library, and for six months to a year we had an enormous number of e-Journals, e-Books … even software companies such as Adobe. Adobe gave us probably at least a hundred or two hundred free licenses to use *Adobe Connect* – *LR 2*.

In the mixed category, a participant of the study remarked, "Auckland University saying we can give you all of our resources, which would have meant that we'd probably have to realign our course content a bit from what we need, but that was an offer sitting there" – *CoB 7*.

There was substantial external support in using e-learning as a number of organisations gave the College of Business and Economics access to their electronic resources. Other companies gave free licences to their software.

Recruitment

The *Recruitment* theme had UoMs that related to how the participants of the study perceived e-learning as useful for recruitment of students in the aftermath of the earthquakes of 2010 and 2011. Two participants had six UoMs for the use of e-learning for recruitment. One participant had two negative UoMs for the use of e-learning for recruitment.

In the negative category, one interviewee commented that the use of e-learning was not a positive recruitment tool because "…one of our selling points, when we go overseas or when we go, is to say we are a campus University, where you will get interaction face to face"– *CoB 2*.

One of participants of the study was of the outlook that the University could recruit students at a distance by encouraging the use of e-learning as there were potential students who, because of their schedule, could not be on-campus students.

Community

The *Community* theme had UoMs that related to how the participants of the study were able to build a community using e-learning tools in the aftermath of the earthquakes of 2010 and 2011. Three participants had three positive UoMs and three participants had three mixed UoMs for e-learning's community-building capacity.

In the positive category, an interviewee remarked, "I certainly got feedback from lecturers saying that they really enjoyed the experience post-earthquake because they got to know the students better. There was an amazing irony that deprived of seeing them physically, they reached out to them more online" – *LR 2*.

In the mixed category, a participant remarked, "he found out much more personal responses that might have included hardships, family problems" – *LR 2.*

Some academics are of the opinion that they got to know their students better when using e-learning as students and lecturers reached out more to each other.

Quality of work

The *Quality of work* theme had UoMs that related to how the participants of the study viewed the quality of their use of e-learning in the aftermath of the earthquakes of 2010 and 2011. Three participants had three positive UoMs and two participants had two mixed UoMs for quality of work with regard to e-learning.

In the positive category, an interviewee remarked, "Initially I think it was fairly crude. I think it was, you know, I don't think it was anything very elaborate or special because, so it was a steep learning curve, it just went like that" – *CoB 2*.

In the mixed category, a participant of the study commented, "lecture videos were probably a better product than lectures in the tent" – *CoB 2.* Some of the participants of the study were of the view that the quality of their e-learning was rather crude.

Interpretation of the case study

Two models, Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2000) and Indicators of Resilience model (IRM) (Resilient Organisations, 2012) were selected to interpret the results of the case study. Technology Acceptance Model 2 was used to interpret the data from the participants of the study, and the Indicators of Resilience Model was used to interpret the resilience of the College of Business and Economics/CoBL to the seismic activities of 2010 and 2011 using e-learning.

Technology Acceptance Model

Factors that lead to user acceptance or adoption of a particular information technology are commonly presented in terms of depicting models of technology acceptance. Technology Acceptance Model (TAM) as originally proposed by Fred D Davis et al. (1989) has proved useful in explaining 40% of users' acceptance of technology (Venkatesh & Davis, 2000). TAM classifies two major influences that determine technology acceptance as *perceived usefulness* and *perceived ease of use*. Venkatesh and Davis (2000) extended the original

TAM model to describe *perceived usefulness* and usage intents in terms of social influence. TAM2 incorporates "additional theoretical constructs spanning social influence processes (*subjective norm*, *voluntariness*, and *image*) and cognitive instrumental processes (*job relevance*, *output quality*, *result demonstrability*, and *perceived ease of use*)" (Venkatesh & Davis, 2000, p. 187). Table 13 below shows the constructs of TAM2 and evidence found in the data collected for the study.

Table 13: The constructs of TAM2 and corresponding selected quotes from data of study

Category	Indicator	Selected quote
Perceived usefulness	*Voluntariness*	I have asked staff teaching the critical 100-level courses to try and ensure that they could begin online, using their UC *Learn* sites to get students started" – PVC College of Business and Economics.
	Experience	"I use *Learn* for students to submit their assignments. I find it really easy because there is a record that they have done it, and so they can see that they have done it. Usually when they email, I have to reply and say, I have received your email and it's all good. When it's on *Learn* they get that reassurance" – *CoB1*.
	Subjective norm	"...to future disaster proof courses so that each course would have at least one or more assignments that could be done totally off site, online, but all the materials that the students would require to do it were on *Learn*, they would be able to do it, and upload it, and submit it from anywhere"– *CoB2*.
	Image	"We created the Facebook page and emailed the students because we were an hour off having our first lecture for the year [2011] with the students saying that this is another way that you want to interact with us, then sign up to the Facebook page and it's another way of making contact" – *CoB7*.
	Job relevance	"What I see is the use of electronic media to um, facilitate the classroom activities" – *CoB4*.
	Output quality	"I had the live chats [in *Learn*] ... I would set them up for a particular time and we'll be discussing this and you'll have to prepare something in advance and everyone has to say something and will have five sentences on this and then we will all have some comments. And for the small groups that worked out well" – *CoB2*.

	Result demonstrability	I have checked the reports on *Learn* as well to see who has logged in, how often they log in, what they use and I have noticed that even though the class is quite full they [students] still go to the recording so obviously they need some of the repetition – *CoB2*.
Perceived ease of use		" …for most of these things, for new tools and things, either I'll learn about them myself or seek help from the FLAs– *CoB6.*

Perceived Ease of Use refers to situations where the less effortful a system is to use, the more the use of it can increase job performance. *Perceived ease of use*, as defined by Fred. D. Davis (1989), refers to "the degree to which a person believes that using a particular system would be free of effort" (p. 320) The *Perceived Ease of Use* theme in the data from the interview transcripts sought to find out how the participants perceived the ease of use of e-learning.

Analysis of interview data showed that the theme *Perceived usefulness* had the highest number of units of meaning (62 in total) amongst the participants of the study. The figure is composed of 40 positive, 8 mixed and 14 negative units of meaning. The data seem to indicate that the participants of the study regarded e-learning as useful in the aftermath of the seismic events. Other themes that fall in the category of *subjective norm* in the TAM2 model feed into the *perceived usefulness* category. These themes gave credence to the participants displaying a preference for technology to aid in overcoming barriers in engaging with students in the aftermath of the earthquakes. Eight out of nine participants had positive units of meaning in their interview transcripts.

The *Access to support* theme had all participants of the study contributing 45 units of meaning. Nine participants of the study had 29 positive units of meaning, seven participants had 10 mixed units of meaning, where as, two participants had six negative units of meaning. *Access to support* can be incorporated in the Output category of TAM2. When there is access to support then the use of e-learning will be more satisfying for both academics and students.

This will then lead to a perceived usefulness of e-learning in overcoming barriers in times of crisis.

Interview data shows that while some academics discontinued active use of e-learning when teaching spaces became available again for face-to-face teaching, others continued to use e-learning on the basis of other benefits they perceived they would derive from using e-learning such as enhanced effective collaboration, engagement and communication.

Perceived usefulness of e-learning by management may have influenced the Executive of the College to direct academics to use e-learning to overcome barriers in teaching in the aftermath of the earthquakes. This is indicated by the *organisation direction* theme having the third highest number of units of meaning of 38 from six of the study's participants.

Subjective norm in the TAM2 refers to the "intention that people may choose to perform a behaviour, even if they are not themselves favourable towards the behaviour or its consequences, if they believe one or more referents think they should and they are sufficiently motivated to comply with the referents" (Venkatesh & Davis, 2000, p. 187). There was a direction from the management of the University and of the College to use e-learning, especially in Level 100 courses. Some participants of the study remembered communication of this directive while others did not remember. The message from the PVC Business and Economics on the *Restart* website read "I have asked staff teaching the critical 100-level courses to try and ensure that they could begin online, using their UC *Learn* sites to get students started" (March 2011). The statement served as a social influence on academics in the College of Business and Economics. The PVC Business and Economics on 17 March 2011 added, "Our level 100 courses all began on Monday, each with a face-to-face lecture in "Tent City" supplemented by flexible learning support through UC *Learn"*. The *Subjective norm* in TAM2 indicates there is a positive causal relationship between *subjective norm* and *perceived usefulness*.

The increase in UoMs in the *Accessibility of material* and *Engagement* themes in the interview transcripts gave an indication that the use of e-learning in the aftermath of the

earthquakes was relevant to the academics' "job" of engaging, communicating and interacting with students.

Some academics had experience in using e-learning. A participant of the study reported using *Learn* and lecture videos prior to the September 2010 earthquake and offered informal support to colleagues who requested help. TAM2 indicates that experience has a causal positive effect on *Subjective norm*.

The interpretation of the results using TAM2 demonstrates that the adoption of technologies during crises aids in overcoming barriers to learning in times of crisis. The components of the TAM2 were found in data collected for the study. The use of TAM2 was therefore useful in the interpretation of the study's data.

Indicators of Resilience Model

Resilience is defined as an ability to recover from or adjust easily to misfortune or change (Jacso, 1997). Chang-Richards et al. (2013) define organisational resilience as "the ability of an organisation to survive a crisis and thrive in a world of uncertainty" (p. 117). It also refers to how organisations improve their ability to respond to and quickly recover from catastrophic events such as natural disasters and terrorist attacks. The results from the participants of the study were used to find out how Business and Economics/CoBL demonstrated resilience in carrying out its activities using e-learning.

The IRM posits there are 13 indicators that can be used in assessing the resilience of an organisation (Resilient Organisations, 2012). These 13 indicators are grouped into three categories: Leadership and Culture; Networks; and Change Ready. Table 14 shows the distribution of the indicators across the categories.

Table 14: Resilience Indicators (Resilient Organisations, 2012).

Category	Indicators
Leadership and Culture	Leadership
	Staff Engagement
	Situation Awareness
	Decision Making
	Innovation and Creativity
Networks	Effective Partnerships
	Leveraging Knowledge
	Breaking Silos
	Internal Resources
Change Ready	Unity of Purpose
	Proactive Posture
	Planning Strategies
	Stress Testing Plans

Metadata from the deductive themes from interview transcripts and documents were interpreted using the Indicators of Resilience Model (Resilient Organisations, 2012). Table 15 shows the indicators of resilience with metadata from interviews and documents.

Table 15: Indicators of resilience with metadata from interviews and documents

Category	Indicators	Metadata
Leadership and Culture	*Leadership*	Organisation direction
	Staff Engagement	Earthquake motivating factor
	Situation Awareness	Perceived usefulness
	Decision Making	
	Innovation and Creativity	Engagement
Networks	*Effective Partnerships*	Access to support
	Leveraging Knowledge	Accessibility of material
	Breaking Silos	Communication and interaction
	Internal Resources	Resource availability
Change Ready	*Unity of Purpose*	UC Website
	Proactive Posture	CoBL strategic plan 2013-2017
	Planning Strategies	LR Working Group
	Stress Testing Plans	

Leadership and Culture

The management of the College of Business and Economics exhibited leadership in advising academics to use e-learning to engage with students after the February 2011 earthquake. The indicators of *Leadership and culture* and an example of selected quotes from the study illustrating each of the indicators, where applicable, are shown in Table 17.

Table 16: Indicators of Change Ready with selected quotes

Category	Indicators	Event	Selected quote
Leadership and Culture	*Leadership*	Feb. 2011	"Our level 100 courses all began on Monday, each with a face-to-face lecture in "Tent City" supplemented by flexible learning support through UC Learn (PVC College of Business and Economics).
	Staff Engagement	Feb. 2011	"We also found that we created a social platform where the students could interact, when there was a lot of uncertainty, so it created just a different way of connecting with students" (Interview, CoB7).
	Situation Awareness	Feb. 2011	I remember I sent an email saying, well, the recordings, if you recorded last year's lectures the recordings are online, and you could actually activate that... (Interview, CoB2).
	Decision Making	Feb. 2011	I got the guys from AV to burn lecture recording onto CD's for those who did not have access the Internet (Interview, CoB5).
	Innovation and Creativity	Feb. 2011	We [academics] did Audio recording of lectures using Audacity and we did one week's worth of content using Camtasia where we had PowerPoint slides and for some of the lecture we had the recording of my face... (Interview, CoB7).

Leadership was demonstrated when the PVC made postings on the UC *Progressive Restart* website with regards to the use of e-learning in the College. Some academics showed *situation awareness*, sharing information with colleagues on how to make previous recordings of lectures available on *Learn* for students.

In addition, some academics showed *Innovation and Creativity* by using other software such as *Audacity* to make audio clips and *Camtasia* to make videos, making these files

available on *Learn*. Other academics also used audio when making PowerPoint presentations that were then posted on the *Learn* site of their courses. The indicator *Staff engagement* was evident as the academics saw the need to engage with students using forums in *Learn*, as teaching spaces were not immediately available in the aftermath of the February earthquake to engage in face to face meetings.

Networks

Table 17 shows indicators of *Networks* with representative quotes from data collected during the study. *Effective Partnerships* existed between the College and other organisations as some of the academics in the College contacted publishers of books used for courses taught in the College for "pdf" versions of the first three chapters of the books. Some of the publishers responded by giving the whole textbook in pdf format. Other publishers gave out the books that had been used for exhibitions. When publishers were unwilling to give pdf versions of their books, the academics were able to source them from other competing publishers.

Table 17: Indicators of networks with selected quotes

Category	Indicators	Event	Selected quote
Networks	Effective Partnerships	Feb. 2011	"We got in touch with the publishers of our textbook and said can you give us the first three chapters in PDF format so we can put them onto the learning management system and our publishers were good at that" (Interview, *CoB7)*.
	Leveraging Knowledge	Feb. 2011	"…if you've got a question you can contact them [FLAs], and they'll answer it for you" (Interview, *CoB1)*.
	Breaking Silos	Feb. 2011	Information on Facebook relating to the earthquake was first posted on *UC Restart* website which was the main source of information about UC response to the earthquakes.
	Internal Resources	Feb. 2011	The *Learn* system was given priority over other systems. It was set up using virtual servers, which helped to scale it up very quickly (Todorova & Bjorn-Andersen, 2011, p. 598).

Leveraging Knowledge was demonstrated as academics had access to varied expertise from FLAs in using e-learning. Other colleagues who were expert users of e-learning also provided help such as how to do assessments using online quizzes in *Learn*. *Breaking Silos* occurred when academics used forums in *Learn* to communicate with students rather than sending individual emails to them. This ensured that all the students had the same message. An academic used *Facebook* as well to send the same message that was sent through *Learn.* Some students may not have been able to connect to the *Learn* site but could access *Facebook* on their mobile phones for free. *Internal Resources* became an issue for a while when the *Learn* server could not handle the increased demand. Academics reported inability to download long video clips. They therefore resorted to using audio and making video clips of shorter lengths.

Change Ready

Table 18 shows indicators of *Change ready* with representative quotes from data collected during the study. *Unity of Purpose* was demonstrated when Senior Management Team declared that the university was in a "new normal" and alternate forms of teaching would be employed to successfully complete the semester. The PVC College of Business and Economics followed up with a message on UC Progressive website on how the college would continue running its programmes. Academics teaching level 100 courses were encouraged to use e-learning in teaching.

Table 18: Indicators of Change Ready with selected quotes

Category	Indicators	Event	Selected quote
Change Ready	*Unity of Purpose*	Feb. 2011	I have asked staff teaching the critical 100-level courses to try and ensure that they could begin online, using their UC *Learn* sites to get students started" – PVC College of Business and Economics.
	Proactive Posture		Flexible and innovative learning methods in place to suit changing student needs (CoBL strategic plan 2013-2017, p. 4).
	Planning Strategies	Feb. 2011	The Teaching and Learning Committee of the College directed in 2011 that all courses with immediate effect design assessments to be "earthquake-proof" – in the sense that the courses would be focused more on continuous formative assessment, rather than summative assessment (Learning Resources Working Group, 2011).
	Stress Testing Plans		No evidence The IT servers of the Faculty of Commerce, which contained all the teaching and research files of academic staff, became inaccessible.

Data from the participants of the study revealed there were pockets of expertise in using e-learning in the College. Some lectures were manually recorded. This was not as a result of the College having a *Proactive Posture* but rather some academics that were using e-learning on their own. The College of Business and Law Strategic Plan 2013-2017 had flexible and innovative learning methods in place to suit changing student needs.

To conclude, the *Planning Strategies* that are in place in the CoBL now were not existent before the February 2011 earthquakes. Because the College servers had not been centrally located on the University network (which was unaffected by the earthquake) when the Commerce building became inaccessible, the servers for the College went down. This has subsequently been remedied. The indicator *Stress Testing Plans* was not present in the data collected for the study. Whilst academics were minimally affected by the earthquake in

September 2010, they were not prepared for the disruption caused by the February 2011 earthquakes.

The interpretation of the results using IRM showed that the model was useful. 11 out of the 13 indicators showed that the College has become more resilient with e-learning in the aftermath of the seismic activities in 2010 and 2011.

CHAPTER 6

THE CASE OF E-LEARNING IN THE COLLEGE OF EDUCATION

This chapter presents the second embedded case study, specifically the case of the College of Education (CoE). This is one of two nested case studies within the larger case study of the University of Canterbury. Case study methodology was used to gather and analyse evidence using interviews, documents and web-based information. The chapter starts with an overview of CoE, presenting a timeline of the evolution of e-learning and the influence on e-learning of the series of earthquakes that occurred in 2010 and 2011. The methodology used in collecting data is then described, followed by the presentation of the findings. The chapter concludes with an interpretation of the case study using the and Indicators of Resilience model (IRM) (Resilient Organisations, 2012). The case study begins with a description of the context of CoE.

Case study setting

UC documents, reports and publications from academics were used to chronicle e-learning activities in CoE, as well as archived webpages of UC from 2001 to 2015 and personal communication and interviews with CoE staff. An overview of CoE and a timeline of e-learning activities gleaned from the abovementioned data are shown in Table 19.

Founded in 1873, the Christchurch College of Education (CCE) delivered teacher training education which encompassed Early Childhood, Primary and Secondary pre-service education and included Professional Development and Support Services for teachers. In 1996, the College offered the first teacher education programme by distance in New Zealand, known as Primary Open Learning Option (POLO) (*CoE12*, interview transcript, September 09, 2014). POLO was print-based with supplementary audio-visual resources. POLO developed because of "some Principals in the North Island who wanted to train teachers who needed to live in the area [Rotorua]. So they approached us because none of the colleges in

the North Island were keen and said, would you develop distance delivery for Primary Teacher Ed, and we said yes" (*CoE9*, interview transcript, September 01, 2014). By 1999 the College was delivering the distance teacher education programme to students throughout New Zealand.

The Distance Material and Assignment Centre (DMAC) was established alongside POLO to receive and return marked assignments from distance students, and to send materials to distance students, including library books. There was a POLO Dean, a role which included the provision of academic, administrative and pastoral advice to distance students. The position later evolved to POLO Co-ordinator, with responsibility for ensuring that distance students had access to the same academic, operational and administrative opportunities as campus students.

Table 19: An overview of College of Education with a timeline of e-learning activities

Year	Activity	Source
1873	Christchurch College of Education founded	Teacher Training Education in New Zealand.
1996	Primary Open Learning Option (POLO) distance education. Print-based with supplementary audio-visual resources	Delany and Wenmoth (2003, p. 5); Hunt (2007, p. 1)
2001	In-house development of *StudentNet* Learning Management System for use in Christchurch College of Education.	*CoE9*, interview transcript, September 01, 2014.
2007	*AdobeConnect* introduced staff in CCE	*CoE7*, interview transcript, August 07, 2014.
2007	Christchurch College of Education officially merged with the University of Canterbury	UC Research Report 2007
2008	University running *StudentNet* and *Blackboard* LMS	*CoE7*, interview transcript, August 07, 2014; *CoE9*, interview transcript, September 01, 2014.
	April: First Professor of e-learning appointed	N. Davis, (personal communication, Feb 26, 2014).
2009	Plan to move to *Moodle v1*	G. Ronald (personal communication, May 26,

			2015). *CoE7,* interview transcript, August 07, 2014
2009	Revitalisation of College's Flexible Learning Options results in only one *Moodle* course site for each course, regardless of the range of offerings.		*CoE4*, interview transcript, April 03, 2014; N. Davis (personal communication, June 17, 2014). Needham, Hunt, and McMurray, 2011, p. 206
2010	Shift in FLO course delivery from print-based or telephone communication to online learning and *Learn* became the central location to orient most students		Needham et al. (2011, p. 205)
2010	February: Move to *Moodle v1* (*Learn*) by University		UC Document
2010	May: Flexible Learning Options Working Group established in College.		College of Education Flexible Learning Committee Terms of Reference, 2010
2010	September: Earthquake	Occurred when students were on vacation before the start of Term 4 in semester 2	*UC Restart* website
		Had less impact on use of e-learning due to timing of earthquake	
		University closed for two weeks due to earthquake	*UC Restart* website
		Gift of online library resources	*UC Restart* website
2010	October: UC College of Education Flexible Learning Guidelines draft approved by College Executive		UC College of Education Flexible Learning, 2010
2010	UC policy shifted emphasis from print to digital resources so that course readers and workbooks became accessible through *Learn* and also on CD from first semester of 2011.		Needham, Hunt, and McMurray, 2011, p. 206
2011	February: Earthquake	Occurred on second day of 1st semester	Thomas and Hollis, 2013.
		University closed for three weeks	
		Had great impact on University and College	
		Tents erected on campus for teaching	
		Buildings needing repair with some closed for months/years and later demolished	
	June Earthquake	Occurred at end of Term 2	*UC Progressive Re-start*
		University closed for two days	Mackey et al. (2011, p. 836)
		Minimal impact as teaching was over	
		Prompted a university-wide move to replace exams and tests with take-home or online	

		tests.	
	July:	Start of pilot use *Echo360* for automatic capture of lectures. Updated computer/internet statement for all students (particularly FLO and new students) on CoE website.	Thomas and Hollis, 2013. Draft FLO Notes for Meeting on 28/7/11.
	Nov:	Review of pilot use of *Echo360* and decision to pay to continue to use automated lecture capture. DMAC was closed and re-established under the umbrella of the Academic Services Team in the College Office.	Thomas and Hollis, 2013. A. Willington (personal communication, June 09, 2015).
	Dec:	All FLO materials, still in the format of Course Info books, Study Guides and Readers were uploaded to CD's. Printing was stopped.	*CoE4*, interview transcript, April 03, 2014.
2012	March:	All FLO course assignments to be submitted via *Learn*. Lecturers encouraged to use *Learn* for on-campus course assignments.	FLO Guidance on Online Assessment, 2012.
	May:	Final approval obtained to purchase equipment and licence for a 20-venue deployment as well as 100 desktop capture licences.	Thomas and Hollis, 2013.
	July:	*Echo360* goes live.	Thomas and Hollis, 2013
	July:	FLO Committee recommends to the College Executive that all courses in CoE have a *Learn Gradebook*	FLO Committee Guidance on Online Assessment, 2012.
2014	FLO Committee became Blended Education Advisory Committee covering all modes and courses in the College.		N. Davis (personal communication, 2015)

In 2001 *StudentNet,* an open source Learning Management System, was developed for the Christchurch College of Education by a staff member who worked in the Library, "who was very into programming" (*CoE9*). *StudentNet* created an online community for distance students so that they could have communication with each other and with lecturers (*CoE9,*

interview transcript, March 04, 2014). However, not all lecturers were using *StudentNet* in 2007 (*CoE6*, interview transcript, July 29, 2014).

Christchurch College of Education officially merged with the University of Canterbury School of Education and Health Sciences Centre to become the University's fifth College in 2007 (Research and Consultancy, 2007). In the same year, one of the participants of the study was introduced to *AdobeConnect,* a web conferencing software, and introduced this software to other staff, by demonstrating its use. *CoE7* reported "we had a project running in the University that was evaluating future technologies at the time, so I networked with a colleague and we set up a couple of demos to show people how it [*AdobeConnect*] went and what it did" (interview transcript, August 07, 2014).

CoE7 added "with the advent of the merger then part of the undertaking of the merger was that the learning management systems would be evaluated by the University (interview transcript, August 07, 2014). In another interview *CoE9* reported, "when we merged with the University we then had the situation where we had *StudentNet* and the University was using *Blackboard*, and so for a whole year that was fine. Then the University decided they didn't want to support both systems" (interview transcript, September 01, 2014). A large committee was formed and was charged with finding a learning management system, or making a recommendation to the Senior Management Team, the top hierarchy of the University, as to what learning management system would serve the entire University and meet all of the needs (*CoE7*, interview transcript, August 07, 2014). The group recommended to the Senior Management Team to go with Moodle on the proviso that a Moodle developer was hired.

In 2008, UC planned to move to *Moodle v1* and ease out *BlackBoard*. In 2009, the University Centre for Teaching and Learning (UCTL) made a recommendation that staff and students suggest an appropriate name for the LMS with the rationale that an institutionally-branded name would be seen as an embedded function of UC. The name *Learn* was adopted.

In February 2010, UC finalised the move to *Moodle v1* and renamed it *Learn* (G. Ronald, personal communication, May 26, 2015).

Flexible Learning Options (FLO) had been developed to increase flexibility to make University study possible for students who did not have the ability to get to a local campus and allowed students to study, part-time or full-time, in selected programmes whilst they continued work, met family responsibilities and pursued other interests. However, as a result of the merger of UC and CCE in 2007, the e-learning aspect had faded and had become more print-based (*CoE10*, interview transcript, March 19, 2014). In 2009, a project was led by *CoE10* with support of a teaching development grant from the University and the College Manager to revitalize FLO.

The vision for FLO Working Group in 2009 was to move away from print materials and to go online. Thus any course material would be uploaded to *Learn* (*CoE4*, interview transcript, March 04, 2014). *CoE4* added, "this would obviously have benefits for us, because it would reduce our print budget quite significantly, for the planning, because of less paper" (interview transcript, March 04, 2014). In addition, FLO Working Group recognized that "[some of] the students wanted to use their hand held devices, thus, to send them a big printed textbook or course book or reader did not quite match what our students were maybe moving into" (*CoE4*, interview transcript, March 04, 2014). *CoE4* concluded "so by uploading our resources online, having them online, it would allow them to use their handheld devices for reading and make them more flexible". With the revitalisation of flexible learning options, the FLO Working Group also decided that each course would have one coordinator and one online course site to cater for multiple occurrences including campus, distance, and regional blended offerings (Mackey et al., 2011). This fulfilled the aim of the FLO Working Group to oversee the migration of all *CoE* courses to the new *Learn1* (*CoE4*, interview transcript, March 04, 2014).

The September 4, 2010 earthquake had little effect on distance students in CoE and they were able to continue to study without interruption. Printed course materials had been sent to them by post and they were also interacting with *Learn* sites through which they could communicate with academics "so we had that great advantage that our distance students could carry on practically seamlessly after the 2010" (*CoE4*, interview transcript, March 04, 2014). *CoE9* stated that the first earthquake in 2010, "didn't have a huge effect on us in our operations, because our on-campus [ITE] students were actually on practicum" (interview transcript, September 01, 2014). However, it was recognised that on-campus students were going to be hugely disadvantaged in the aftermath of the September earthquake because University examinations were in October. The lack of space led to a situation whereby on-campus students could not have face to face interaction with lecturers and thus "it was really imperative that we got them online into *Learn* to teach them so that they could carry on with their learning and preparing for the exams" (*CoE4*, interview transcript, March 04, 2014). *CoE4* was of the opinion that the CoE response to the earthquake was "so good" because the College already had the shells for *Learn* sites for courses in the College set up and some College lecturers were already using *Learn* quite extensively. Lecturers were "quite forward thinking" with *Learn*. The 2010 earthquake propelled lecturers "who had been a bit reticent to use *Learn*, to use it earnestly because that was the only way they could communicate with their students" *CoE4*, interview transcript, March 04, 2014).

In October 2010 UC College of Education produced Flexible Learning Guidelines that outlined expectations of academics who offered courses enhanced with e-learning. To enhance course quality and reduce workload, the guidelines recommended that each CoE course have only one UC *Learn* course site. The Flexible Learning Guidelines also recommended "a greater use of *Learn Gradebook* to reduce administration of grades, particularly transcription errors" (UC College of Education, 2010, p. 3). The UC College of

Education Flexible Learning Guidelines further recommended the "inclusion of short video or audio instructions, graphic representations of content, and/or illustrations to enhance a student's ability to understand or complete aspects of the course content in UC *Learn"* (UC College of Education, 2010, p. 3).

In 2010, UC policy shifted emphasis from print to digital resources so that course readers and workbooks became accessible through *Learn* and also on CD from the first semester of 2011. This change helped to "further embed *Learn* as an essential learning and teaching tool in all courses" (Needham et al., 2011, p. 206). Furthermore, at the end of 2010, *CoE4*, who was in a support role in the College, said, "CoE decided to move a lot faster with getting rid of the paper based materials but we didn't move straight to online. We moved to burning a lot of our previous course information books, study guides, and course readers onto CDs" (*CoE4*, interview transcript, March 04, 2014). The documents were later uploaded onto *Learn* and gave the opportunity for students who wanted to download materials onto their handheld devices to do that. Students "had the option of putting a CD into the computer, reading online, they could print if they wanted to" (*CoE4*, interview transcript, March 04, 2014).

The February 22, 2011 earthquake occurred on the second day of the 1st semester and had great impact on the University and the College. The FLO students were on campus for "on-site intensives". Furthermore, ITE students had already started their courses before semester 1 had begun. The effect on CoE will be discussed in more detail later in the chapter. The June 13, 2011 earthquake occurred when teaching in the University was almost over for semester 1, so it was not surprising that most academics in CoE reported the earthquake had minimal impact on their teaching. A participant of the study recounted "when it came to the midwinter June earthquake it, it didn't impact me again, particularly on the undergraduate side, because that guest lecture had been cancelled anyway, and we were almost in the exam

season, so it was really a case of closing off the courses and making sure enough was covered for the students to undertake good assessment" (*CoE10*, interview transcript, February 19, 2014). As reported by Mackey et al. (2011) "the possibility of further earthquakes prompted a university-wide move to replace exams and tests with take-home or online tests or assignments to avoid having large numbers of students sitting in lecture theatres" (p. 386). This was when lecture theatres had been newly opened after the February earthquake and students were studying in tents in the winter. The above authors, academics in CoE, indicated they used a variety of assessment strategies already used for their distance students and adapted for their campus students. In July 2011, a decision was made by the FLO Working Group on updating Computer/Internet Access and Course Material on the *Frequently Asked Questions about Programme Entry* to reflect that, in order to study at the UC College of Education, a student must have continual access to a computer with broadband internet access, and access to a printer. A student would also need to have the facility to play CD's and DVD's and a telephone to join in conference calls.

In March 2012, the Pro Vice Chancellor Education (PVC) informed the College about a change in assessment practice for 2012. FLO course assignments were to be submitted via *Learn* and lecturers were encouraged to use *Learn* for on-campus course assignments. A participant of the study recollected that "I've been having my students upload their assignments to dropboxes for the last couple of years because there's been an edict that we need to be more economic, that we can't print off" (*CoE6*, interview transcript, July 29, 2014).

In July 2012, FLO WG recommended to the College Executive that all courses in CoE have a *Learn* Gradebook. In addition, all assessment results would be communicated to students via the *Learn* Gradebook.

FLO Committee became Blended Education Advisory Committee covering all modes and courses in the College. This was a result of the increasing use of blended teaching approaches in CoE. As *CoE11* recollected in an interview for the study:

> I think it [earthquakes] showed us the importance of having different models of delivery. I think the blended model, where they had some on campus experience to do the socialisation, to meet the lecturers face to face combined with some online learning - independent work online, was the best model. So a mixture of, a little bit of face to face and online, so the blended model was I think most effective (*CoE11*, interview transcript, September 01, 2014).

In 2015 e-learning has become integrated into most programmes in CoE. One study participant remarked, "I think part of the College's learning journey is about encouraging more staff to really be lifting their practice in e-learning in terms of looking at what's the most effective types of teaching strategies online" (*CoE11*, interview transcript, September 01, 2014). Gradually though, as *CoE12* commented, "what the distance students have done is become much more integrated with what our on campus students do as well. It really has become blended now and hard to differentiate a lot of the things that on campus [students] do from the things that distance students do".

Methodology

A case study method was used for the study. Case studies afford researchers opportunities to explore or describe a phenomenon in context using a variety of data sources. Chapter 3 provided a detailed description of the methodology for the larger case study of the University of Canterbury.

Data sources

Archived webpages of UC from 2001 – 2012 were searched for e-learning adoption and use in the University and College. University of Canterbury reports such as UC Research Reports and Learning Resources Working Group reports were searched for evidences of e-learning in CoE. In addition, web postings on the UC *Restart* (after September 2010 earthquake) and UC *Progressive Restart* (after February 2011 earthquake) websites by the PVC College of Education were also used. Publications from academics from the College

were also accessed to describe e-learning in the College. This was to aid triangulation and validation of the data collected by other means, including interviews (refer to Table 20).

Sixteen academics who used e-learning services were purposively selected and interviewed. Selected responses of a Flexible Learning Advisor (FLA) were also added because the FLA was a member of the College Learning and Teaching Committee. The FLA advised on the use of e-learning and offered support to academics with e-learning issues such as setting up *Learn* sites, design and use of links to other resources. The FLA also provided advice on downloading content, setting up assessments, and running forum interactions.

Table 20: Sources of e-learning development in the College of Education

Title	Source	Date
Bridging education: Foundation studies, CUP, cert ETS students	UC *Re-start* Website	6 October, 2010
PVC Education for College of Education students	UC *Progressive Re-start* Website	25 February 2011
Message from PVC Education to students in teacher education programmes	UC *Progressive Re-start* Website	1 March 2011
Messages from the PVCs to students – College of Education	UC *Progressive Re-start* Website	7 March 2011
College of Education re-start information: Message from the PVC	UC *Progressive Re-start* Website	14 March 2011
Riding the seismic waves: Re-blending teacher education in response to changing demands.	Mackey, Breeze, Buckley, Dabner, and Gilmore.	2011
Blended learning for academic resilience in times of disaster or crisis.	Mackey, Gilmore, Dabner, Breeze, and Buckley	2012
Emails (21 correspondences).	*CoE10*	2011
Interviews.	Two members of CoE Executive, a Flexible Learning Advisor, Support staff and a purposive sample of academics in CoE	Feb. 2014 – Nov. 2014

Key informants for the University case identified the first key informant in the CoE who then identified other academics in the College who used e-learning, both before and after the earthquake of February 2011. These participants also identified relevant documents. As part of the interview, the key informants then identified other academics in the College who used e-learning, especially before and after the earthquake of 2011. Using this snowball strategy, other academics were then identified and interviewed (See Chapter 3: Population and Sampling). The sampling continued until I was referred to participants whom I had already interviewed and no new data were being found, thus the data saturation referred to by Glaser and Strauss (1968), (p. 61) was achieved. Table 21 shows a list of participants for the study in CoE.

Table 21: List of participants for the study in the College of Education

Pseudonym	Type of position
CoE1	Academic/ Support
CoE2	Academic
CoE3	Academic
CoE4	Support
CoE5	Academic
CoE6	Academic
CoE7	Academic
CoE8	Academic
CoE9	Academic
CoE10	Academic/College Executive
CoE11	College Executive
CoE12	Support
CoE13	Academic
CoE14	Academic
CoE15	Academic
LR3	Support

Three deductive categories, that is, positive to e-learning, negative to e-learning, and mixed to e-learning were used to initially sort the units of meaning from interviews with the participants of the study provided in Table 20. The responses in the three categories were then further coded into themes initially generated when interviews were being analysed in Chapter 4. I however kept an open mind for additional themes that could be deduced from the interviews.

Thematic findings

This section presents the findings from analyses of documents, reports and UC websites as presented in Table 20 and from interviews shown in Table 21. The findings are then interpreted using the Indicators of Resilience Model (IRM) (Resilient Organisations, 2012).

Website

The University set up websites to serve as the main source of communication for all information relating to UC response to the seismic events on 2010 and 2011. The first website was UC *Restart* and was set up after the September 2010. UC *Progressive Restart* website was set up in response to the February 2011 earthquake. Information on UC with regards to the June 13 2011 was also posted on UC *Progressive Restart* website.

September 2010 Earthquake

The website UC *Restart* kept staff and students up to date with all the latest announcements and information relating to the 4 September earthquake and UC's re-opening. It contained all the information posted on the University website following the earthquake. The University of Canterbury, including its campuses outside Christchurch, were closed for health and safety assessment issues. The University was re-opened at 6:00am Monday 13th September for Term 4. The University used postings on its website to keep everyone advised.

There was only one posting related to the use of e-learning on UC *Restart* website. On 6 October, 2010 PVC Education posted a message: Bridging Education: Foundation Studies, CUP, Cert ETS students informing them that examinations would take place as planned beginning 20th September. The PVC added that students would be examined only on work that had already been covered. Students were informed to check individual courses on *Learn* for more details.

February 2011 Earthquake

The UC *Progressive Restart* website was set up after the 22 February 2011 earthquake to give information on how UC was re-organising to continue with the 2011 academic year. There were four postings from the College of Education on the processes the College had put in place to restart on March 14, 2011. On the UC *Progressive Restart* website PVC Education posted a message:

> I would like to thank our students studying with us out of Christchurch, via flexible learning options, for your kind messages and best wishes. I know a number of FLO students were on campus at the time of the earthquake for teaching intensives and I hope you have managed to return safely to your homes (PVC Education message on UC *Restart* website on February 25, 2011).

On March 1, 2011, PVC Education posted a message on UC *Progressive Restart* to students in Teacher Education programmes stating that "Professional Studies courses have information on *Learn* for you to work through and your lecturers will contact you online as soon as they are able to do so for further details and learning support" (PVC Education message on *Restart* website on March 1, 2011).

On March 7, 2011, PVC Education posted a further message on the UC *Progressive Restart that* "all students enrolled in Flexible Learning Options (FLO) Primary or Early Childhood programmes will continue with their usual programmes from March 14. Any adjustments to assessments will be notified through the *Learn* site for each course". The posting continued, "Year 1 students who are not familiar with *Learn*, will need support to

access and utilize this medium. This process is beginning this week and programme coordinators will notify you of details" (PVC Education message on *Restart* website on March 7, 2011). The PVC Education informed students of all other Certificate and Diploma courses offered through the College of Education to check the *Learn* sites for their courses to receive instructions.

On 14 March 2011, PVC Education posted a message that all students enrolled in on-campus primary and early childhood programmes would continue their learning via a FLO model for semester 1. In addition, on-line learning would be supplemented with lectures and workshops as more teaching space became available from early April.

I found that communication using the UC *Restart* and UC *Progressive Restart* websites were from the Senior Management Team (SMT). This suggests that a "top-down" approach was adopted in managing UC's response to the seismic events using e-learning. There was no evidence of communication on the websites from other categories of staff in UC.

Published papers

Published papers on e-learning from staff in CoE were analysed to find evidence of how staff evolved with e-learning as a result of the seismic events of 2010 and 2011. Some of the publications were used earlier in the chapter to establish e-learning activities in the College over time.

Mackey et al. (2011) reported that the College of Education was able to respond to the disaster of the 22nd February earthquake because of its existing infrastructure, pedagogy and capability to support blended learning. In addition, the authors reported that faced with the sudden closure of the campus and the unavailability of physical spaces and resources, College of Education staff were generally well placed to respond to the emergency situation they found themselves in at the beginning of the academic year. Mackey et al. (2011) identified

three phases or waves of activity to conceptualise the phases and activities which characterised their response to meet student needs via blended learning strategies.

The first wave was React/recover/re-design which focussed on making contact and maintaining communication with colleagues and with students. They added, "we were immediately required to re-think our teaching strategies and evaluate our ability to offer courses beginning from 14 March and meeting student needs was a high priority" (Mackey et al., 2011, p. 833). The second wave, Restart, began when some courses in CoE were launched in fully online mode while others included some on-campus sessions as safe teaching spaces, including tents and single-level buildings, became available. The authors reported that "teaching spaces were scarce and consequently online learning became the cornerstone of 'restart' teaching" (Mackey et al., 2011, p. 834).

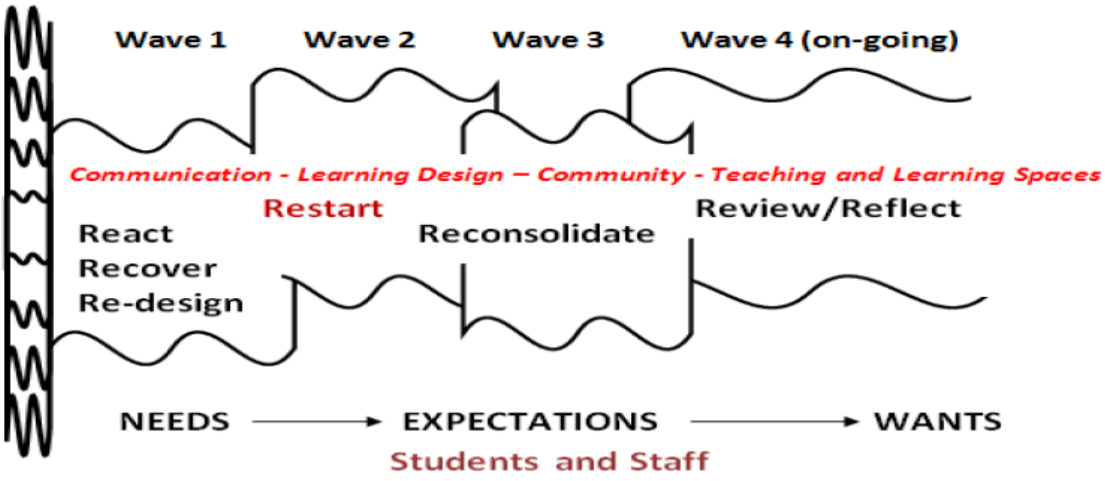

Figure 1: Waves of responses (Mackey et al., 2011, p. 126). Reproduced with permission from the authors.

The phases: Re-consolidate, Review and Reflect were commonly centred on teaching and managing the blend between online and on-campus learning, and iterative processes of reviewing and reflecting. Mackey et al. (2011) reported that a relaxed approach to attendance was adopted to encourage students to manage their own blend of learning experiences by

opting into campus or online classes depending on their circumstances and irrespective of their official course enrolment status. This flexible approach was feasible "because the online course sites had been designed around the needs of our distance students and then broadened to provide resources and complementary elements for campus-based students" (Mackey et al., 2011). Campus classes were recorded and the videos and podcasts were used to enrich the online classes. The authors did not report on the experiences of on-campus students using blended learning as per their enrolment they were expecting face-to-face teaching.

In a publication, "Blended learning for academic resilience in times of disaster or crisis" (2012), (Mackey, Gilmore, et al.) described how blended learning could provide academic resilience in times of natural disaster, civil emergency, and crisis. The authors described the immediate post-earthquake challenges of redesigning courses using different blends of face-to-face and online activities to meet the needs of on-campus, regional campus, and distance pre-service teacher education students. Mackey, Gilmore, et al. (2012) explained that "there was a very real difference between planned design for blended delivery and the rapid adaptations and innovations required to meet changing circumstances in disaster conditions" (p, 123). The authors indicated staff had a very condensed timeframe (approximately one week) within which to plan, create, prepare, and launch a flexible online programme. Staff maintained strong communication within their course sites, and they encouraged and monitored student participation. Mackey, Gilmore, et al. (2012) reported that the traumatic events of 2011 prompted many changes in the ways that teacher educators at UC used blended learning strategies, and academics who were previously ambivalent about online learning began to explore how *Learn* features could support authentic and meaningful experiences for students. The authors observed these changes as teaching staff members of the College, through observations and interactions with colleagues in the College. It is difficult to determine if teaching staff would have adopted the use of e-learning for teaching and engaging with students anyway, or if the seismic events served as an agent of change to adopt e-learning.

Emails

While conducting interviews for the study, participants were asked to supply any documents that they felt comfortable to share, including stored emails that related to the use of e-learning within the period of study. Twenty-one emails relating to the period of the study were received from *CoE10*. Sixteen emails were selected for study as they related to the use/disruption of e-learning during 2010-2012. Some of the emails had documents attached such as minutes of meetings and reports.

In an email to the FLO working group there was a proposal to the University Quake Recovery Project for temporary support for the Centre (DMAC) that handled FLO students' materials. *CoE10* wrote in an email: "As a result of the quake disruption and lack of access to facilities and resources Course leaders are likely to be behind in course production and it is essential that new courses will be ready in time" (email to: FLO WG from *CoE10* on 18 May 2011 Subject: Draft request for funding for DMAC/FLO). Changes in the College that influenced the use of e-learning as a result of the seismic events were initiated by emails. It was unfortunate that these emails were not archived.

Interviews

The responses from nine semi-structured interviews were coded into three categories and further into 16 themes as described earlier in the Methodology chapter. The 16 deductive themes were ordered from the highest number of UoM to the lowest and across three inductive categories of *Positive, Mixed and Negative*. The units of meaning were coded from 16 interviews conducted from February 2014 to November 2014. The distribution of responses across themes is shown in Table 22

Table 22: The distribution of units of meaning from interviews in the College of Education arranged in three categories of positive, mixed and negative statements about e-learning across 16 themes identified with inductive coding

Category	Positive		Mixed		Negative		Total
Theme	P	UoM	P	UoM	P	UoM	UoM
Perceived usefulness	14	98	8	24	11	26	148
Engagement	14	74	5	5	7	9	88
Access to support	15	64	3	8	6	13	85
Earthquake motivating factor	14	58	5	5	3	3	66
Organisation direction	13	38	2	3	5	7	48
Attitude of students	9	23	4	4	8	14	41
Perceived ease of use	6	15	3	4	4	5	24
Multimedia	8	17	0	0	0	0	17
Skills	4	5	4	5	5	7	17
Assessment	8	15	0	0	0	0	15
Accessibility of material	5	8	2	2	0	0	10
External support	4	10	0	0	0	0	10
Pedagogy	4	7	2	2	0	0	9
Community	1	3	1	1	0	0	4
Resource availability	0	0	0	0	3	6	3
Recruitment	0	0	0	0	0	0	0

Key

P – Number of participants of the study

UoM – Unit of meaning

Perceived usefulness

The *Perceived usefulness* theme UoMs related to how participants perceived e-learning as being useful (or not) for teaching and learning in the aftermath of the earthquakes that occurred in 2010 and 2011. Most of the participants of the study were using e-learning in their courses prior to the earthquakes. The *Perceived usefulness* theme had the highest number of UoMs in the study indicating widespread relevance to the participants.

The units of meaning from the participants of the study in the *Perceived usefulness* sub-theme indicate that most of the participants viewed e-learning as useful. E-learning was useful when there were no teaching spaces because of damage to lecture theatres in the February 2011 earthquake. E-learning was also used for other activities such as engaging

with students (see *Engagement* theme) and for assessment (see *Assessment* theme) in the aftermath of the earthquakes. A directive from PVC Education prior to the February 2011 earthquake resulted in all course offerings in CoE having one *Learn* site no matter the mode of delivery. This directive turned out to be of great benefit to the College in the aftermath of the earthquakes as academics were able to inform their on-campus students to engage with materials that had already been prepared for the distance students taking the same course. Two participants interviewed together about the loss of teaching space remarked, "…how are we going to manage, that we can't reach our on campus students, but we still pretty much just got the modules that we would have used with our distance students, and got them to work through that" (*CoE2; CoE3,* interview transcript, February 2, 2014).

The lack of face-to-face interaction with on-campus students and the truncated onsite intensives for distance students resulted in academics not having the same face to face opportunities to interact with and get to know their students. Some academics reported that they needed face-to-face interaction with students in order to get to know if a student had the disposition to be a good teacher. Some academics therefore adopted the use of *AdobeConnect* in order to engage with their students visually. *CoE2 and CoE3* added, "…we had to really think about, you know what's happening for everyone, and how we can use some different technologies to get to know the students. Then we actually had another colleague who started talking about *AdobeConnect*". *CoE9* concluded*, "*I do think people are more open now because they also can see the fact that there is a good reason to invest time in here [e-learning] because if something did happen, it's always there".

Engagement

The *Engagement* theme had UoMs that showed how the participants of the study engaged with students using e-learning, in the aftermath of the earthquakes of 2010 and 2011.

In the positive category, one interviewee's comment on the use of e-learning to engage students was, "I was trying to think about how I can stimulate that engagement, but on there, using *Learn* as a tool" – *CoE5*. Another interviewee remarked, "…most of those people [academics] at least had a *Learn* site, and had forums and things they could communicate with the students" – *CoE8*. In the mixed category, one interviewee, an academic, observed that "not only do the lecturers need to upskill on *Learn* use, but the students have to have a certain level of competence as well" – *CoE3*. In the negative category, an interviewee's comment on the use of e-learning for engagement was: "…we had to be very understanding, that even though we had this environment [e-learning], there would be some of our students that just could not do it [e-learning]" – *CoE9*.

The immediate engagement for most academics in the aftermath of the February 2011 earthquake was to communicate with students and to assure the students that the academics were well and had survived the earthquake. *CoE9* remarked, "…obviously we had a lot of anxious students, in Christchurch who didn't know what was going on, and even our distance students were really, what's happened, is the course going to continue?" Academics had to find ways other than face-to-face to continue teaching students, and e-learning was used to engage with students. Some academics used other tools in *Learn* such as forums to engage with students, while others used other software such as *Echo360* for that purpose.

Access to support

The participants related *Access to support* to their use of e-learning. The support could be from UC providing staff such as Flexible Learning Advisors (FLA) to help with the use of *Learn,* or from colleagues offering support in using e-learning. In the positive category, an interviewee noted, "…myself and an e-Learning advisor, we're all going around each of the schools within our College over the remainder of this year [2014] to talk to staff, let them know the support that's available for them" – *CoE12.* In the mixed category, one interviewee

remarked, "the problem is that Flexible Learning Advisors are quite a scarce resource [only one per college], so we need to invest in more resource in terms of really helping our staff gain professional development in learning" – *CoE12*. In the negative category, an interviewee remarked, "I sought [access to support] in different ways, and access to our advisors like *LR3* was limited because *LR3* was so busy" – *CoE5*. Some academics who had more skills in the use of e-learning offered support to their other colleagues who needed help to use the online environment.

> We made a hit list of staff that we then could say, right we need to go and support this person. We need to help them to get material online. I ran a little session in the office which was still open, and staff were able to just come in with their computers and we literally helped them to upload files and say, look this is how you do this. Just so that everybody could keep it all going [in 2011] – *CoE9*.

Earthquake motivating factor

The *Earthquake motivating factor* theme had UoMs that related to how participants perceived the earthquakes of 2010 and 2011 as a motivating factor in the use of e-learning.

In the positive category, an interviewee noted, "…In the past we'd been trying to sell it [e-learning], but the earthquakes quickly sold it for us. That this is an important way of studying …as part of normal study, but also has so many benefits in times of disaster" – *CoE12*. In the mixed category, one interviewee remarked, "My use of e-learning changed since the earthquake but I wouldn't say that it's changed necessarily as a result of the earthquake." – *CoE6.* In the negative category, an interviewee remarked, "…but the earthquake has made it harder, because of the lack of funding for everything. So we've gained and lost" – *CoE9.* The adoption of e-learning as a result of seismic events was varied as some of the respondents were of the opinion that they were already using e-learning whilst others were of the opinion that lack of funding made the use of e-learning a viable option since there was infrastructure in place to use e-learning.

As *CoE9* remarked,

> …probably the earthquake did shake people into this [e-learning] environment, I think it probably did contribute, but I truly believe [it is] the student expectation now [2014]. Because now they've got great courses with lots of things, and if they go into a course and it's not there, they go, where is it?

Organisation direction

The *Organisation direction* theme UoMs related to how participants perceived the influence of organisational direction on the use of e-learning in the aftermath of the earthquakes in 2010 – 2011. In the positive category, an interviewee in CoE support noted, "I think that's an important thing, is that that decision in 2009 to have a *Learn* site for every course made, made all the difference to us then [in 2011]" – *CoE4.* The interviewee added, "Heads of Departments, as I said, and lecturers just came and were very, very open to negotiation about what they could do. So we found we had a fantastic opportunity to push e-Learning and I think we did". Another participant of the study who was in College support remarked, "…what happened with the earthquake I recall was that the academic managers, the deans and whatnot, said right, we've got to try and get [recruit and] to keep the students" – *CoE4.* In the mixed category, an interviewee remarked, "So at that point [the issue] was [that], it wasn't a direction from Management, it was support from Management, for whatever they [academics] needed in order to use e-Learning"– *LR3.* However, there were ITE programmes that resisted e-learning, such as the following: "…we haven't yet got Secondary Teacher Education online [2014], but it's certainly something we are considering" – *CoE11* (a member of College Executive). It is interesting to note that academic staff that had resisted e-learning are now positive about e-learning. As an interview remarked, "one of my colleagues who was possibly one of the staunchest opponents [of e-learning] said to me, you know, if we hadn't had this event [February earthquake] I would never have done this [e-learning]. But now I can see the possibilities" – *CoE15*.

Attitude of students

The *Attitude of students* theme had UoMs that related to the attitude of students to the use of e-learning in the aftermath of the earthquakes of 2010 and 2011, from the participants' point of view. In the positive category, an interviewee, *Co11* noted, "some students who'd never studied online before fed back to say they really liked that experience and they'd like to have more access and independence in their learning". In the mixed category, one interviewee remarked, "…so we had a lot of students who were unsure about using technologies and were having to use the online space to find out how to do that" – *CoE8*. In the negative category, an interviewee remarked, "…but for other students it [e-learning] didn't work. They wanted to be on campus, in lecture theatres, the way they were used to doing it before [the earthquakes of 2011]" – *CoE11*.

The attitude of students towards the use of e-learning in the aftermath of the earthquakes was varied. While some enjoyed the experience, others wanted to revert to face-to-face interactions. Academics have become conscious of information overload for students. *CoE9* recalled, "…one week on one night [2012] they [students] had three *ECHO's* from three different courses, all scheduled". Every course has a certain number of hours to be used. Giving too many weblinks and *Echo360* recordings to students could result in students spending more than the required amount of hours for a particular course. To reduce stress on students, a coordinator of a programme made a recommendation, "if you do an ECHO, you can only do it on a particular day. You have to give the students a week's notice" - *CoE9*.

Perceived ease of use

The *Perceived ease of use* theme had UoMs that related to how the participants perceived the ease of use of e-learning in the aftermath of the earthquakes of 2010 and 2011. In the positive category, an interviewee, *CoE7* noted, "when we had the earthquake [2011] we were able to get up and running very quickly because I was conversant with

AdobeConnect and we ran a class for our secondary [ITE] students". In the mixed category, an interviewee remarked, "I don't think effective online teaching is easy. It actually requires a lot of work, it's not just about putting the information up there" – *CoE5*. In the negative category, an interviewee noted, "So for some staff it [e-learning] was quite a steep learning curve [in 2011]" – *CoE11*. Some academic staff had been using e-learning so it did not take much effort for them to use e-learning as a result of the seismic events. For others using e-learning was a steep learning curve thus changing their belief about the ease of using e-learning.

Multimedia

The *Multimedia* theme had UoMs that related to how the participants used multimedia such as audio and video as an e-learning tool in the aftermath of the earthquakes of 2010 and 2011. In the positive category, an interviewee remarked, "we've videoed ourselves explaining the assignment, or, we did interviews with each other – *CoE2*. Another participant of the study reported, "at the beginning of each new course I would do, use *ECHO* 360 to do a ten or fifteen minute introduction to the course to give students an overview of the *Learn* site for the course, and outline my expectations" – *CoE6*. Students' ability to understand graphic representations of content may have been enhanced with the inclusion of short video or audio instructions as recommended in the UC CoE Flexible Learning Guidelines in 2010. An effect of the seismic events has been that "our distance students expect to get access to not just books anymore. They want lectures to be recorded so they can feel part of the experience of a lecture or a workshop" – *CoE9*. A potentially negative effect has been that "the students now are getting almost too much" – *CoE9*.

Skills

The *Skills* theme UoMs related to skills in the use of e-learning in the aftermath of the earthquakes of 2010 and 2011. Four participants of the study had five positive UoMs relating

to their skills. Four participants had five mixed UoMs and five participants had seven negative UoM on skills in the use of e-learning.

In the positive category, an interviewee noted, "We [the College] had a certain level [higher than other Colleges] in using the *Learn* site [pre-earthquakes]" – *CoE6.* In the mixed category, one interviewee remarked, "…we had these reluctant lecturers who were kind of like propelled into using it, because that was the only way, but their skill level was very low in using *Learn* – *CoE4*. In the negative category, an interviewee remarked, "…[some] staff were scared about forums. They really were. They didn't know what to do in them" – *CoE9*. Academics who already taught using FLO were considerably more skilled in using e-learning than their colleagues in other programmes in CoE. These academics served as a resource for their other colleagues who had to adopt the use of e-learning in order to engage with their students in the aftermath of the seismic events of 2011.

Assessment

The *Assessment* theme had UoMs that related to how the participants of the study used e-learning as an assessment tool in the aftermath of the earthquakes of 2010 and 2011. Eight participants of the study had 15 positive UoMs for assessment. There were no UoMs for the mixed and negative categories. In the positive category, an interviewee commented, "I enjoy marking online. You don't have to carry scripts around with you". *CoE9* remarked, "…in terms of being able to quickly return feedback, and enter grades into *Gradebook*, it certainly has improved things". This UoM confirms the FLO WG recommendation to the College Executive that all courses in CoE have a *Learn Gradebook*.

Accessibility of material

The *Accessibility of material* theme had UoMs about accessibility of e-learning materials to students and staff, from the perspective of the participants of the study. A UoM from the positive category was "…We also learnt the importance of staff having access from

off-site to their e-Learning materials and thinking about the technologies we needed and processes we needed to enhance our e-Learning if we couldn't access computers on campus" – *CoE11*. This has implications for users off campus accessing the University network.

External support

The *External support* theme had UoMs that related to how much external support the participants of the study had in using e-learning in the aftermath of the earthquakes of 2010 and 2011. Four participants of the study had 10 positive UoMs for external support. There were no UoMs for the mixed and negative categories. In the positive category, an interviewee remarked, "Lincoln [University] offered that they could use their library [after the February 22 earthquake]"– *CoE14.* Another interviewee commented, "…because we were going from print to CD, we decided to outsource [CD copies] to Wellington" – *CoE4*. External support in using e-learning especially in times of disasters/crises is of great benefit.

Pedagogy

The *Pedagogy* theme had UoMs that related to how the participants viewed the influence of their use of e-learning on their methods and practice of teaching, in the aftermath of the earthquakes of 2010 and 2011. In the positive category, a participant of the study who had the opportunity of viewing *Learn* sites in the aftermath of the earthquake remarked, " I know of some lecturers [in CoE] who even though all their students are face-to-face, their e-Learning, their *Learn* spaces are just as comprehensive as an online course would be in some areas" – *LR3*. *LR3* continued, "I don't think they [SMT] ever actually thought through the amount of effort it takes to use e-Learning properly.

In order for academics to improve their pedagogy, *CoE9* was of the opinion, "I'd like every staff member to work online for a bit so that they can understand how frustrating it is". *CoE9* added, "our staff have not been taught in online pedagogy". *CoE9* believes, "the ideal would be workshops to do with *How to*, and then a whole day where we looked at, *Why*

[would] be most useful".

Community

The *Community* theme had UoMs that related to how the participants of the study were able to build a community using e-learning in the aftermath of the earthquakes of 2010 and 2011. In the positive category, an interviewee remarked, "I had to straight away think about building a community, an online community for those students to get them going, to make them feel supported" – *CoE5*. In the mixed category, a participant of the study remarked, "people were sharing different ways on how to engage these students online and get them going and get them underway and making them feel part of a community, which is what those first lectures on campus would have done, but we weren't able to do that" – *CoE3*.

Resource availability

The *Resource availability* theme had UoMs that related to how available e-learning resources were to the participants of the study and their students in the aftermath of the earthquakes of 2010 and 2011. Three participants of the study had six negative UoMs for the availability of e-learning resources.

One interviewee remarked, "We've got an increased interest by students and staff in recording of lectures but really the IT support has not kept up with that [in 2011]" – *CoE12*. Data from Electronic Learning Media (ELM) and Digital Media Group (DMG) in 2011 indicated student requests for video-captured lectures and the number of gigabytes of content downloaded from the *QuickTime* streaming server had increased. In addition, the report from ELM and DMG stated *Learn* use prior to the earthquake and after the earthquake had increased. *CoE9* was of the opinion that there were probably some at the University at the higher levels that were not so convinced of the use of e-learning "…if you're going to have this [e-learning], it's got to be supported and funded properly" – *CoE9*.

Summary of thematic findings

Findings from the data collected for the study showed that the College of Education was resilient with e-learning in the aftermath of the seismic events that occurred in 2010 and 2011. The findings from the data indicated that the College had progressively increased its e-learning capacity since the introduction of POLO in the Christchurch College of Education in 1996. The use of e-learning prior to the seismic events and the revamping of the FLO in the College increased the capacity of the College to use e-learning in the aftermath of the seismic events of 2010 and 2011. The evolution of Flexible Learning Option Working Group to Flexible Learning Option Committee to Blended Advisory Committee (BLAC) covering all modes and courses in the College indicated that e-learning has been embedded in the activities of the College. Organisational direction from SMT and College Executive gave impetus to staff to use e-learning, especially in the aftermath of the seismic event of February 2011. This was because there was the need to retain students enrolled in the University/College in the aftermath of the seismic events.

In-house development of *SudentNet* in 2001 and subsequent adoption of *Moodle (Learn)* by UC in 2010 enhanced the use of e-learning in the College. The introduction of the web conferencing software, *AdobeConnect* in 2007, increased the use of e-learning in the College. Some academics adopted the use of *AdobeConnect* in order to engage with their students visually due to limited teaching spaces for face to face teaching. Manual lecture capture increased in the aftermath of the February earthquake, which led to an increase in requests for downloads from the *QuickTime* Streaming video server. The links to manually captured lectures were hosted on the *Learn* course sites. Academics also posted snippets of video recordings onto the *Learn* course sites. The *Learn* server was therefore streaming multimedia and hosting links to the *QuickTime* Streaming video server, which led to capacity issues.

The merger of Christchurch College of Education with UC resulted in CCE bringing its expertise in POLO to the University. A Professor of e-learning was appointed in the College in 2008 and led a project which resulted in the revamping of e-learning in the College and the development of a Flexible Learning Option (FLO) for teaching and learning. Flexible Learning Option Working Group (FLO WG), established in May 2010, developed Flexible Learning Guidelines for the College. A recommendation from the FLO WG in 2010 that there should be only one *Learn* site for a course no matter the mode of delivery, that is, distance, blended or on-campus, resulted in the College being well-prepared for the seismic events of 2011 which resulted in the loss of teaching spaces. Teaching continued for distance students through the use of e-learning, and on-campus students were able to use the resources that were developed for the distance students.

The *On-Line Marking Terms of Reference* document in 2011 sought to identify the steps, where necessary, that required change or modification to enable assignments to be marked on-line. It identified training requirements for academic and administrative staff arising from the implementation of online marking. The FLO Committee in 2012 also developed guidance on online assessment for the College. The Committee recommended that, from February 2013, all courses (both campus and distance courses) set up a *Learn Gradebook.* In addition, all assessment information for students should be provided in the "Assessment" section on *Learn*. Also, all assignment marks, including exam marks, should be entered in *Learn Gradebook*.

The seismic event of 2011 resulted in the closure of the Distance Material & Assignments Centre (DMAC) of CoE, as this was located in a building that was inaccessible. In 2012 the College Executive agreed that where possible FLO/distance assignments would be submitted via *Learn* drop-box (FLO Guidance on Online Assessment, 2012). "The Academic Services Team in the College Office can receive FLO assignments that are submitted by FLO students by post via the Assignments Room in Ōrakipaoa 116". It is useful to note that, since 2014, submitting assignments through Assignment Dropbox in *Learn* has now become a norm for all students. Exemptions for assignments, such as art portfolios that

cannot be submitted online, need approval from a Head of School. The closure of DMAC after the 2011 earthquake resulted in some of its activities, such as handling of assignments, being taken over by the College office.

Emails made available to me were a valuable source of data, as communications between academics gave an insight into how staff were adapting as a result of the seismic events of 2011. The earthquakes of 2011 resulted in the relocation of video conferencing equipment in a room set up for video conferencing in CoE. A series of emails were sent around the staff to locate the video conferencing equipment for use by staff in CoE. The video conferencing equipment was essential for communicating with other academics in the regional campuses. An email resolved the issue of the missing equipment. "Apologies that you didn't receive this news. Rest assured the video conferencing equipment has not been stolen but is being put to good use in KE06 [one of the temporary buildings in Kirkwood Village, UC that were used by the University for teaching and decant purposes] on a regular basis due to the decisions that had to get made because of the earthquake" (email sent to *CoE10* on 18 July 2011 subject: RE: OT215 videoconferencing gear - due back when?).

The UC *Restart* and UC *Progressive Restart* websites set up to serve as the main source of communication for all information relating to UC response to the seismic events on 2010 and 2011 had postings from the PVC Education to students in the College. These messages were also reposted on *Learn*. As a result, *Learn* was useful as a means of communication in the aftermath of the seismic events.

Some academics in the College who were using e-learning in teaching their courses indicated through research publications how the seismic events of 2010 and 2011 affected their use of e-learning. Some authors reported that, faced with the sudden closure of the campus and the unavailability of physical spaces and resources, CoE staff were generally well placed to respond to the emergency situation they found themselves in at the beginning of the academic year in 2011. The authors used "waves of responses" to illustrate how they reacted to circumstances as a result of the seismic events. Academics in the College, who had expertise in e-learning because of using it in FLO for some programmes in the College,

served as a resource for other colleagues who needed help in using e-learning to engage with students. In adopting e-learning at the College after the seismic events of 2011, resource availability became a problem. There was only one FLA assigned to both the College of Education and another College; consequently support was not readily available.

Staff in CoE also perceived e-learning as useful in the aftermath of the seismic events. This was because of the existing expertise in the use of e-learning in the College for teaching and learning in some programmes that were using FLO delivery. A decision made prior to the seismic events that all courses in the College should have one *Learn* site became of great benefit to the academics. Those with expertise offered support to other colleagues in getting materials onto *Learn*. There was [and still is] only one FLA to offer support to staff in the College as well as another College in the use of e-learning. On-campus students temporarily became distance students in 2011 because there were few teaching spaces and they engaged with materials that were meant for distance students. Some academics also used *Learn* to assure students of their wellbeing.

Some participants of the study perceived the earthquakes of 2010 and 2011 as a motivating factor to increase their use of e-learning as e-learning was the only option for engaging with students. Some began using other technologies such as *Echo360 EchoSystem*, *AdobeConnect*, whilst others increased their usage of *Learn*. Other participants were already using e-learning for teaching hence did not see the earthquakes as a motivating factor in using e-learning. Academics who used e-learning to engage with students reported that some on-campus students enjoyed the experience of having independence in their learning. Academics reported that on-campus students now expect some e-learning in their courses. However, there were some students who were unsure about using e-learning technologies. Some students did not enjoy the experience and reverted to face-to-face interactions with teachers when there were teaching spaces.

Some academics did not experience ease of use of e-learning in the aftermath of the earthquakes. They found that the use of e-learning was a steep learning curve requiring a lot of work. Some academics used multimedia in their *Learn* sites. One participant of the study

reported doing a ten or fifteen minute video introduction to the course to give students an overview of the *Learn* site, and to outline course expectations. Such introduction enabled the students to see the academic since face-to-face meeting was not possible on campus due to limited teaching spaces. An academic visited all education course *Learn* sites in February 2011 to determine those that needed help in setting up their *Learn* site for teaching and learning. Some course sites were just used as a repository of material for students and were not used actively for teaching; thus they appeared cluttered when improvising to use the *Learn* sites for teaching.

These findings of the study will now be interpreted using the Indicators of Resilience Model.

Interpretation of the case study

The Indicators of Resilience Model was used to interpret the CoE resilience to the seismic activities of 2010 and 2011 using e-learning.

Indicators of Resilience Model

Resilience is defined as an ability to recover from or adjust easily to misfortune or change (Jacso, 1997). Chang-Richards et al. (2013) define organisational resilience as "the ability of an organisation to survive a crisis and thrive in a world of uncertainty" (p. 117). It also refers to how organisations improve their ability to respond to and quickly recover from catastrophic events such as natural disasters and terrorist attacks. The results of the study were used to find out how CoE was resilient in carrying out its activities using e-learning in the aftermath of the seismic events of 2010 and 2011.

The IRM posits there are 13 indicators that can be used in assessing the resilience of an organisation (Resilient Organisations, 2012). These 13 indicators are grouped into three categories: Leadership and Culture; Networks; and Change Ready.

Table 23: Resilience Indicators (Resilient Organisations, 2012).

Category	Indicators
Leadership and Culture	Leadership
	Staff Engagement
	Situation Awareness
	Decision Making
	Innovation and Creativity
Networks	Effective Partnerships
	Leveraging Knowledge
	Breaking Silos
	Internal Resources
Change Ready	Unity of Purpose
	Proactive Posture
	Planning Strategies
	Stress Testing Plans

Metadata from the deductive themes from interview transcripts and documents were further analysed and interpreted using the Indicators of Resilience Model (Resilient Organisations, 2012). Table 24 shows the indicators of resilience with metadata from interviews and documents.

Table 24: Indicators of resilience with metadata from interviews and documents

Category	Indicators	Metadata
Leadership and Culture	*Leadership*	Organisation direction theme
	Staff Engagement	Earthquake motivating factor theme
	Situation Awareness	Perceived usefulness theme
	Decision Making	Perceived usefulness theme
	Innovation and Creativity	Engagement theme
Networks	*Effective Partnerships*	Access to support theme
	Leveraging Knowledge	Accessibility of material theme
	Breaking Silos	Communication and interaction theme

	Internal Resources	Resource availability theme
Change Ready	*Unity of Purpose*	UC Website
	Proactive Posture	Evolution of FLO Committee to Blended Advisory Committee
	Planning Strategies	LR Working Group
	Stress Testing Plans	-

Leadership and Culture

The management of the CoE exhibited leadership in advising academics to use e-learning to engage with students after the February 2011 earthquake. The indicators of leadership and culture and an example of selected extracts of data from the study illustrating each of the indicators, where applicable, are shown in Table 25.

Leadership was demonstrated when the PVC Education made postings on the UC Progressive Restart website with regards to the use of e-learning in the College. Academics had *Situation Awareness* because some came together as a group to reflect on their pedagogy as a result of the seismic events and then support other colleagues in using e-learning.

In addition, some academics showed *Innovation and Creativity* by doing personal capture using *Echo360* and posting short clips of lectures on *Learn* so students could hear and see them as they would in a face-to-face class. The indicator *Staff engagement* was evident as the academics informed on-campus students to use the resources on *Learn* that were intended for distance students.

Table 25: Indicators of leadership and culture with selected quotes from data of study

Category	Indicators	Event	Selected quote
Leadership and Culture	*Leadership*	Feb. 2011	"All students enrolled in Flexible Learning Options (FLO) Primary or Early Childhood programmes will continue with their usual programmes from March 14. Any adjustments to assessments will be notified through the *Learn* site for each course. (PVC Education).
	Staff Engagement	Feb. 2011	"… the earthquake happened in September and we had exams in October. Um, so our campus students were going to be hugely disadvantaged because they didn't have face to face so it was really imperative that we got them online into *Learn* to teach them." (Interview, *CoE4)*.
	Situation Awareness	Feb. 2011	"The research group formed voluntarily in response to an invitation to reflect on and analyse our post-quake experiences and with the purpose of crystallizing our own learning in order to support others" (Mackey et al., 2011, p. 832).
	Decision Making	Feb. 2011	"They [on-campus students] didn't, we reinforced, have to change their on campus enrolment, they just kept that in place, but they would use the same material as the distance students to study" (Interview, *CoE12*).
	Innovation and Creativity	Feb. 2011	"So we [academics] would do like twenty minute Personal Captures and put *Echo* and put them online, and they'd [students] watch like a little twenty minute capture of a lecture. (Interview, *CoE2)*.

Networks

Table 25 above shows indicators of Networks with representative selected quotes from data collected during the study. There existed *Effective Partnerships* between the College and other organisations and an example of this was Lincoln University offering the use of its library.

There were examples of *Leveraging Knowledge* as academics had access to materials that were stored on CDs that were sent to students on distance programmes of the College.

Table 26: Indicators of networks with selected quotes

Category	Indicators	Event	Selected quote
Networks	*Effective Partnerships*	Feb. 2011	"Lincoln offered that they [students] could use their library" (Interview, *CoE14)*.
	Leveraging Knowledge	Feb. 2011	"…we've got a colleague in Rotorua, so I asked her to scan the pages of the textbook, the key ones, and we put them up on *Learn*. So it meant the students could keep going when they couldn't actually buy the course text." (Interview, *CoE9)*.
	Breaking Silos	Feb. 2011	PVC Education made initial posting on UC *Progressive Restart* website then then informing students of further directives through *Learn*.
	Internal Resources	Feb. 2011	"The group developed a diagrammatic representation of those experiences to conceptualise the phases and activities which characterised their response to meet student needs via blended learning strategies" (Mackey et al., 2011, p. 832).

Breaking Silos occurred when information for students first posted on UC website were subsequently sent to students via *Learn*. This ensured that all the students had the same message even when different media was used to receive the information. *Internal Resources* became an issue for a while when the *Learn* server could not handle the increased demand. Some academics made audio and short video clips to engage students.

Change Ready

Table 27 shows indicators of being Change Ready with selected quotes from data collected from the study. *Unity of Purpose* was demonstrated when the College Executive established the Blended Learning Advisory Committee as other programmes in CoE now use e-learning to engage with students.

Table 27: Indicators of Change Ready with selected quotes

Category	Indicators	Selected quote
Change Ready	*Unity of Purpose*	The establishment of Blended Learning Advisory Committee in CoE.
	Proactive Posture	A discussion by the College's senior management team of the need to have a more systematic evaluation of course *Learn* sites (Notes from the Blended Education Advisory Committee, 28 May 2015).
	Planning Strategies	A decision to review the "FLO guidelines" and "e-learning guidelines" developed some years ago by the College of Education, to see to what degree they were still applicable (Notes from the Blended Education Advisory Committee, 28 May 2015).
	Stress Testing Plans	No evidence

A more systematic evaluation of course *Learn* sites as envisaged by the Blended Education Advisory Committee will lead to development of *Learn* sites that will be fit for all students whether on campus or distance. A decision made to review the "FLO guidelines" and "e-learning guidelines" developed some years ago by the College of Education, to see to what degree they were still applicable, may be a *Planning Strategy* to entrench the use of e-learning in the College to make it robust for future disasters. The *Stress Testing Plans* indicator was not found in the data collected for the study.

The interpretation of the results using IRM showed that the model was useful, as 12 out of the 13 indicators showed that the College has become more resilient with e-learning in the aftermath of the seismic activities in 2010 and 2011.

CHAPTER 7

DISCUSSION

This chapter discusses strategic findings from the case study of UC in relation to the literature on e-learning during crises. The findings provide an answer to the research question: How has the university changed with e-learning in the wake of seismic activities? Themes that emerged from the findings include: Communication about crises, IT infrastructure, E-learning technologies, Support in the use of e-learning technologies, Timing of crises in the academic year, and E-learning strategy. The six themes will be discussed in subsections which will also elucidate the original research findings. First, an overview of the whole case study, including the two colleges is provided.

Readiness, response and recovery framework

The simple framework of readiness, response and recovery in disaster management provides a means of comparing UC, CoE and CoBL response to e-learning in the aftermath of the seismic events of 2010 and 2011.

Table 28: Readiness, response, and recovery matrix of disaster management with respect to e-learning in the University, including the College of Education (CoE) and the College of Business and law (CoBL), with respect to the three major earthquakes in 2010 and 2011 (EQ1-EQ3).

Matrix	**Readiness**			**Response**			**Recovery**		
	EQ1	EQ2	EQ3	EQ1	EQ2	EQ3	EQ1	EQ2	EQ3
UC	Not prepared	Inadequa-tely prepared	Partially prepared	Not adequate	Partially adequate	Partially adequate			Partially adequate
CoE	Partially prepared	Partially prepared	Largely prepared	Partially adequate	Partially adequate	Largely adequate			Partially adequate
CoBL	Not prepared	Partially prepared	Partially prepared	Not adequate	Partially adequate	Largely adequate			Partially adequate

Table 28 provides a summary of analysis of data using the readiness, response and recovery framework. An explanation is now provided for each cell in the Table beginning with the cell at the top left and using the occurrences of the earthquakes for each of the phases in turn, Readiness, Response and Recovery. Within each phase the UC case is described, then the CoE case and lastly the CoBL case.

Readiness

Data from Marshall's (2009) capability assessment of e-learning in UC indicated that the University was not prepared to use e-learning prior to the first earthquake. The e-Learning Maturity Model Capability Assessment of the University of Canterbury report indicated that the documentation supplied to students consistently failed to convey how courses would support their learning. In addition, where objectives or outcomes were stated, they generally addressed a range of cognitive outcomes. Also, the report showed that facilities such as the Library, LMS and student support were not aptly integrated within course activities so that there appeared to be a presumption that students would know automatically when and how they need to use these additional services. Furthermore, the UC Teaching and Learning Plan 2011-2013 had few instances indicating where e-learning use was planned.

Data collected for the study indicated that the College of Education was partially prepared to use e-learning prior to the first earthquake. The e-Learning Maturity Model (eMM) Capability Assessment of the University of Canterbury report indicated that for courses in CoE, an explicit plan linked e-learning technology, pedagogy and content used in courses. Also, a project for revitalisation of the College's Flexible Learning Options had resulted in only one *Learn* course site for each course, regardless of the range of offerings (see Table 19).

The eMM Capability Assessment of the UC report indicated the explicit plan that linked e-learning technology, pedagogy and content used in courses was not adequate in

CoBL (see Marshall, 2009a). Also, the College of Business and Economics Strategic Plan 2010-2012 had no mention of e-learning.

In the aftermath of the second earthquake in February 2011, there was evidence that the University was inadequately prepared to use e-learning because the information that UC would be using e-learning to complete the academic year had not been received by all academics (see Findings in Chapter 7). Also, access to most of the electronic resources received from publishers in the aftermath of the earthquake in 2010 had been revoked when the main library was reopened. Some courses did not have a presence on the *Learn*. Some academics were not skilled adequately in the use of e-learning (See Todorova and Bjorn-Andersen (2011). Furthermore, there were not enough Flexible Learning Advisors to support academics in their use of e-learning (see Interviews in Chapter 5). After the February 2011 earthquake occurred UC and the CoBL recognised there was a need to complete the 2011 academic year without extending it (students had first indicated that they did not want the academic year extended in the aftermath of the September 2010 earthquake) and all the Colleges in the UC adopted e-learning to complete the academic year on time.

The College of Education was partially prepared to use e-learning in the aftermath of the February earthquake in 2011 because on-campus students were encouraged to use the materials that had been developed for students studying in the distance mode (see Table, 19; Thematic findings, Chapter 6).

The College of Business and Law was partially prepared to use e-learning in the aftermath of the February earthquake in 2011 because some academics that had their lectures manually captured in the 2010 requested that those lectures be made available to the current students (see Table 9).

The University was partially prepared to use e-learning in the aftermath of the third earthquake in June 2011 because academics and students had become aware of the use of e-

learning from the previous earthquakes in 2010 and early 2011. More importantly, the most pressing needs of UC when the June 2011 earthquake occurred was how to conduct examinations without putting staff and students at risk of an earthquake by keeping large numbers of students in a room for summative assessment (see Case setting, Chapter 6). In the College of Education, they used a variety of assessment strategies already used for their distance students and these were adapted for their campus students (see Case setting, Chapter 6). In the College of Business and Law, academics used online quizzes and electronic submission of assignments to assess their students thus the College was partially prepared to use e-learning in the aftermath of the June 2011 earthquake (see Case study setting in Chapter 5).

Response

The response of the University to first earthquake in September 2010 was not adequate. This was because the University had to configure the EZproxy server in order for academics and students off-campus to utilise the gift of electronic resources from publishers. EZproxy is a web proxy server used by libraries to give access from outside the library's computer network to restricted-access websites that authenticate users by IP address. (see IT infrastructure, Thematic findings in Chapter 4).

The CoE response to the September 2010 was partially adequate as the College produced the Flexible Learning Guidelines that recommended the inclusion of short videos and illustrations to complete aspects of course content in *Learn* (see Case study setting in Chapter 6). Data collected for the study did not find that CoBL made any response in relation to the use of e-learning in the aftermath of the 2010 earthquake.

The University response in the aftermath of the second earthquake in February 2011 was to increase support for e-learning technologies such as *AdobeConnect*. Off-campus access to the *QuickTime* streaming server was implemented (see Case study setting in

Chapter 4). The University commissioned more servers to increase capacity in the aftermath of the February 2011 earthquake. In CoE, all students enrolled in on-campus primary and early childhood programmes continued their learning via FLO model for semester one in 2011 (see Website, Thematic finding in Chapter 6). Academics in CoBL increased their use of *Learn*. In addition, a number of academics also used *Facebook*, *Camtasia* and *Audacity* to engage with their students (see Case study setting in Chapter 5).

The response of UC in the aftermath of the third earthquake in June 2011 was partially adequate. This because the University began to pilot use of *Echo360* (see Case study setting in Chapter 5) and continued to use and support it centrally. In the CoE, the FLO guidelines following the first earthquake included guidelines for assessment practices to improve their efficiency by using the *Gradebook* in *Learn*. That work following the first earthquake led to improve preparation for the third earthquake so that little need for response to the third earthquake (see Case setting in Chapter 6). In the College of Business and Law, academics used cumulative assessment such as quizzes and online submission of assignments instead of cumulative assessment to assess their students (see Case setting in Chapter 5).

Recovery

Recovery of UC, CoE and CoBL with respect to e-learning only began after the June 2011 earthquake, the third earthquake. The IT infrastructure in the University has been enhanced including establishment of an increased number of wireless hotspots over the campus. Also, the Free Internet Allowance for Postgraduate students has been increased from 20 GB to 40 GB. The University has also established the e-Learning Advisory Group which has a developed an e-learning within University strategy (Case study setting in Chapter 4). In addition, Library resources have been integrated into *Learn*. In CoE, the FLO Working Group recommended updating the Computer/Internet Access and Course Material on the *Frequently Asked Questions about Programme Entry* to reflect the use of broadband internet

access for distance students. In addition, the FLO Committee has become Blended Education Advisory Committee covering all modes and courses in the College (see Case study setting in Chapter 6). In CoBL, the College has developed new courses and programmes for implementation in 2015 that involve significant use of e-learning (see Case study setting in Chapter 5). In addition, interviews in 2014 with a member of the College Executive in CoBL indicated that e-learning had been incorporated into activities such as large classes having their lectures captured in the College (see Case study setting in Chapter 5).

The increased adoption of e-learning in the University was influenced by seismic events and is expressed most coherently in the strategic planning and academic services for staff and students. However, those took time to evolve and this discussion starts with the most urgent developments following an earthquake, which are the strategies that universities use to communicate about a crisis as it develops. These strategies are now discussed staring with communication about crises.

Communication about crises

In the event of a disaster/crisis in an organisation it is important for the organisation to communicate with its members and the wider society about how the disaster/crisis is being resolved. Communication can contribute to the empowerment of citizens in crisis situations by supporting preparedness, enhancing societal understanding of risks and increasing cooperation (Vos, Lund, & Reich, 2011). Also, crisis communication is a human-centred approach that is based on what people want and need to know (Vos et al., 2011).

For a university like the University of Canterbury, the communication about the crises that began with the first seismic event in September 2010 involved reassuring students, staff, stakeholders, including students' parents and guardians, as well as national stakeholders, such as Ministry of Education and Tertiary Education Commission, that the University was taking

the necessary reorganizational steps to ensure that teaching, learning and research would continue in the aftermath of the crises.

The use of social media and dedicated websites to inform the University community of the UC response to the seismic events confirmed Bird, Ling, and Haynes' (2012) findings in their Australian study of the importance of disseminating effective and rapid emergency information in times of natural disasters, as these are part of everyday life for many Australians. This study relates to the floods in Queensland and Victoria in 2011 when the Queensland Police Service used their *Facebook* page to disseminate information. Likewise, in research conducted after the 2007 Southern California Wildfires, Palen (2008) also established that people in the affected region used social media to learn critical information about the fires. In addition, Spicer (2008) established that, in an emergency, the ability to communicate – internally and externally – becomes a key service for an organisation. Social media and websites are important channels of communication to students as most of them are already "in that space" and using tools of the digital age (Prensky, 2001; Seville et al., 2012).

Findings

The use of email was problematic. Although all UC students were informed during enrolment that the main form of communication would be through their university email address, this was not possible in the crisis that unfolded. Todorova and Bjorn-Andersen (2011), academics of UC CoBL, reported that, "some email accounts exceeded their quotas under the pressure of increased email traffic and access to email accounts was blocked by pre-earthquake automated routines" (p. 598).

Seaton et al. (2012), academics at Christchurch Polytechnic Institute of Technology, who were also affected by the seismic events, confirmed that communication was seen as critical following the earthquake on 22 February 2011 and facilitated the ability of individuals, and the organisation as an entity, to communicate both within and outside the

organisation. Dabner (2012), an academic in UC CoE, confirmed that the *Facebook* community enabled "on- going dialogue and information sharing between staff at the Institution and the wider educational community (p. 69). Seville et al. (2012), another UC academic, reported, "we found social media to be very effective, particularly in keeping staff and students engaged and interested, not only in what the University was doing, but also how it was going about reopening campus" (p. 34). Cloud computing was essential as it was one of the communication channels the University used in disseminating the information that UC would be using e-learning as one of the options to complete the first semester.

DiCarlo, Hilton, Chauvin, Delcarpio, Lopez and McClugage (2007) reported that, in the aftermath of Hurricane Katrina in 2005, communication with dispersed faculty, staff, students, and residents at Louisiana State University (LSU) School of Medicine was essential, so the IT staff were mobilised and immediately established an emergency website with daily messages from the chancellor and vice chancellors. Similarly, UC *Restart* and UC *Progressive Restart* websites were used for communication in the aftermath of the seismic events in 2010 and 2011. Both Universities saw an advantage in communicating with their members using a website. However, in UC's case, two different websites were set up for communication, as the seismic event of 2010 was followed by two major aftershocks. The website used for communication during the second seismic event in February 2011 was also used during the third seismic event in June 2011. The use of the UC *Progressive Restart* website was also essential in disseminating the information that UC would be using e-learning as one of the options to complete the first semester.

However, there was a problem with communication from SMT/College Executive to academics regarding the use of e-learning to engage students. For example, the information that courses were expected to be using e-learning (VC UC, *Progressive Re-start*, 2011) was not received by all members of the University community, some academics claiming they did

not receive any information from SMT/College Executive to use e-learning (see Organisational direction, Interviews in Chapter 5). The process to initiate the use of e-learning unfolded over time, as it involved both the policy decision to use e-learning and the development of appropriate practical skills of academics. This will be discussed further in the subsection: Support in the use of e-learning technologies.

Communication about the seismic event in 2011 using *Facebook* adopted a different strategy to the first use in 2010. It was found in 2010 that the use of *Facebook* by the University was resource-intensive and could not be sustained. Seville et al. (2012) reported that "social media was a 24/7 operation and took a huge amount of resource and energy to sustain. The mode chosen for this instance of *Facebook* lacked administration tools, making it difficult to track, categorise and sort discussion threads into a more coherent format" (p. 34). According to Dabner (2012, p. 75) "the university communications team worked on the site for 18 [hours] a day over the initial 2 weeks and at all hours of the day". In 2011, the design of the flow of information on *Facebook* was improved to become systematic and well-managed and there appeared to be greater emphasis upon providing a broader range of support for students from different organisations via the *Facebook* site (Dabner, 2012).

It is important to communicate strategically during a crisis and, by 2011, UC's communication strategy during the crises was greatly improved. Vos et al. (2011) recommend that organisations, "in order to ease emotional turmoil, have a well-functioning communication structure with designated spokespersons" (p. 20). In 2011, as reported by Seville et al. (2012), "very early in the response process, our leadership team made a conscious decision to invest a lot of effort in communications" (p. 32). This included a cascading effect. With so many sources of information operating simultaneously, communications were centralised and the University created a policy that its website, UC *Progressive Restart*, would be the single source of "truth" (Healey, 2011; Seville et al., 2012)

and the main method of communication. The VC was prominent in all the communications and a top-to-bottom approach was used as all communications were from the SMT. (see Thematic findings, Website in Chapter 4).

However, it appears that academics found that their authority was undermined because of their inability to communicate freely with their students (SMT4, interview transcript, 2014). Having to direct students to the information from the Vice Chancellor also frustrated the Pro-Vice-Chancellors, in particular, who felt that they could not communicate formally with their staff without messages being vetted, and this made their task of providing leadership to their staff much more difficult (Seville et al., 2012).

The overall finding is that communication to members of an organisation and the general public about crises and the recovery from crises is important. The use of communication channels, which students were familiar with and already using, aided the dissemination of the information that UC would be using e-learning as one of the options to complete the academic year. Students who were not using e-learning received the information about the University's decision from social media and UC websites. In addition, students who were using e-learning had initial communication of the University's decision to use e-learning from the learning management system (*Learn*) and were directed to other sources of information. Finally, it was important to be coherent about the information on the recovery from each of the earthquakes across all channels of communication.

As well as a strong need to communicate with their community about a crisis, at UC,the use of e-learning was increased as a response to the crisis and this needed to be communicated. Moreover, those already studying in an e-learning mode were easier to reach electronically; these tools were already part of their everyday life.

Most of this communication would not have been possible without a stable IT infrastructure, which is the focus of the next section.

IT infrastructure

IT infrastructure services play a critical role in enhancing organisational outcomes and growth, enabling communication and enhancing the traditional curriculum (Alsabawy, Cater-Steel, & Soar, 2013; Todd, Verbick, & Miller, 2001). The availability of an IT infrastructure in an organisation, such as communication using Voice Over IP (VOIP) telephony systems, Internet and intranet, has tangible benefits. In addition, the IT infrastructure provides server support including Active Directory, Mail services and Database hosting. Active Directory and Database management are essential to authenticate users on the University network to access services such as accessing library resources on and off campus for research and teaching. In addition, entry to buildings using an access card and wireless connectivity require a functioning IT infrastructure. As noted by Schmidtlein and Taylor (2000), in relation to the costs of instructional technology in higher education, "institutions require a communications network and associated equipment to link classrooms, buildings and dormitories together. Campus networking requires a major institutional commitment and a significant share of institutional resources" (p. 295).

The ability of the infrastructure to provide continued services in the aftermath of a disaster is essential, particularly in an organisation such as UC, which was closed due to safety concerns in the aftermath of the seismic events of 2010 and 2011. From lessons learned in the aftermath of Hurricane Katrina at Louisiana State University School of Medicine, DiCarlo et al. (2007) were of the opinion that all administrative units and schools within a tertiary institution must have their own disaster plans, that include communication systems and data back-ups. In the aftermath of Hurricane Katrina, IT staff at Louisiana State University School of Medicine backed up critical data and records with tapes, to support all administrative operations remotely (DiCarlo et al., 2007). Beggan (2010) also identified the need for institutions to have contractual arrangements with utility providers and consultants

whose services are necessary to enable the provision of teaching and learning. Telecommunications, IT and building services are obvious starting points, but many more could be pre-planned. IT infrastructure is essential to e-learning since the e-learning tools require an IT infrastructure.

Findings

University of Canterbury now has a robust IT infrastructure which includes two data centres (Marshall, 2009b; Thomas & Hollis, 2013), confirming observations that institutions require a communications network and associated equipment to link classrooms, buildings and dormitories together (Schmidtlein & Taylor, 2000). The loss of power to the IT infrastructure as a result of the seismic event of February 2011 created a security issue as the electronic locks on buildings were set to "unlock" in an event of power failure. Parts of the IT system needing backup power supply could be identified for redundancy (see IT infrastructure, Thematic findings in Chapter 4). A redundancy in the IT infrastructure whereby electronic locks in buildings revert to an alternate power supply in an event of a crisis would aid in securing buildings in the University.

The University now has a backup plan as recommended by DiCarlo et al. (2007). The University has IBM® Scale Out Network Attached Storage (SONAS), a scale out network-attached storage offering that is designed to manage vast repositories of information in enterprise environments that require large capacities, high levels of performance, and high availability. All data on the SONAS is backed up using IBM's Tivoli Storage Manager to backup destinations (disk and tape libraries). All data is duplicated and ejected for offsite shipping.

In 2012 the University was totally reliant on a single Internet Service Provider and looking to have a second ISP on standby. The subsequent decision thus acknowledges the

views of Beggan (2010) for the need for institutions in the wider sense to have contractual arrangements with utility providers.

This is the first study to include the aspect of university-wide IT infrastructure, stressed by repeated earthquakes, alongside academic implications of the earthquakes. This is because the focus of this study is on the use of e-learning, and IT infrastructure is essential to e-learning since e-learning tools require an IT infrastructure.

The technologies that were supported by the infrastructure will be discussed next.

Availability of e-learning technologies

Disasters and crises have stimulated higher education institutions to evolve and become more resilient in order to carry on their mandate of teaching and research under adverse circumstances. One of the ways in which Technology Enhanced Learning (TEL) is used in education is in e-learning. E-learning is a global phenomenon fuelled by a variety of economic, technological and social forces as well as student demand (Butterfield et al., 2002). Watkins (2005), writing about the impact of devastating hurricanes along the Gulf Coast on academia, believes that since many distance education programmes operate on web-based delivery systems that are typically not maintained on-campus, their access and operational requirements are less likely to be impacted by the ravages of a disaster. There are however, some institutions of learning that still use first and second generation distance education (B. Anderson & Simpson, 2012) to engage with students and this may be detrimentally affected in times of crises.

There has been rapid growth in the range of technologies available to support learning in universities worldwide, including New Zealand. According to New Zealand Ministry of Education (2004), tertiary organisations are increasingly including Technology Enhanced Learning components in the programmes of study they offer their students. New Zealand Ministry of Education (2013) acknowledges that “e-learning is now widely available in

tertiary education in New Zealand especially in courses at degree level and higher, where around three-quarters of all courses make provision for e-learning" (p. 35). In a Ministry of Education report, Wright (2010) states that "learning in an e-Learning-rich environment may make peer and collaborative learning opportunities easier, thus supporting students' cognitive, affective and social interactions. These ways of working also appear to suit many New Zealand students" (Wright, 2010, p. 6).

Findings

E-learning had been available in UC since 2000 when a Learning Management System (LMS) was used in the Commerce Faculty. The merger of UC with the Christchurch Teachers College in 2007 increased expertise in e-learning in the University (see Case study setting in Chapter 4). However, there has been little research into the evolution of e-learning in a university that has been subjected to a disaster such as a series of earthquakes. There were two categories of e-learning technologies used by academics in UC in the aftermath of the February 2011 earthquake to engage with students. These consisted of technologies supported centrally by the UC e-Learning support team and IT tools that were not supported. A set of technologies was centrally supported (see Case study setting in Chapter 4). These supported technologies included:

1. LMS that had been available since 2000. In 2000, the LMS were *WebCT*, then *Blackboard* (proprietary LMS) in the University, and *StudentNet* (LMS developed in-house) in CCE. *Learn* (an instance of Moodle open source software) became the only LMS in early 2010. Additional embedded analytic tools such as *LearnTrack* and *Turnitin* were added over time.
2. Manual lecture capture by academics was streamed using a *QuickTime* server that had been available since 2002. In addition, there had been the use of DVDs since 2007 in the College of Education (CoE).

3. The web conference software, *AdobeConnect*, was available since 2007 but only became centrally supported in 2010 after the September 2010 seismic event.

4. Automatic lecture capture, *Echo 360*, was added in July 2011, including personal video capture and a streaming server(s).

Some academics posted multimedia files on the LMS in the aftermath of the February 2011 seismic event. Some of the technologies academics used were *Camtasia* for video recording and *Audacity* for audio recordings. These technologies were, however, not supported by the e-Learning support team.

Nevertheless, there were many limitations to the use of e-learning in UC in the aftermath of the February 2011 seismic event. First, changes in the mode of teaching to use e-learning required permission from the Tertiary Education Commission. This fell under Type 2 changes of The New Zealand Qualifications Authority (NZQA) guidelines which relate to "changes to components that have an impact on an accredited programme as a whole" (New Zealand Qualifications Authority, 2015, p. 14). The New Zealand Qualifications Authority recommends that "Type 2 changes must be approved by the NZQA before they can be implemented" (New Zealand Qualifications Authority, 2015, p. 15). In addition, the College of Business and Learning (CoBL) was required to seek permission for the use of e-learning in the UC School of Law from The Council for Legal Education because e-learning had not been offered this way before (see Case study setting in Chapter 5). Fortunately the CoE had established programmes using FLO that are likely to have strengthened the University's arguments that it was able to deliver quality education in this alternative mode.

This study revealed that ineffective use of e-learning during crises can also cause increased stress. For example, it was found that the *Learn* server was used as a streaming server for audio and video recordings using manual lecture capture. This had the effect of

slowing down the server (see IT infrastructure). Therefore, *Learn* sometimes became inaccessible and delays made it less usable as the media stream stalled when served from the *Learn* server.

Engagement with e-learning varied across Colleges. In the CoBL, *Learn* sites for some courses had to be developed from the very beginning. Also, as some *Learn* sites in the CoBL were only used as a repository of course materials, they needed rapid development to serve a wider function (see Case study setting in Chapter 5). The College Executive in the CoBL responded to the crises by directing that courses that had large student enrolment should use online learning (see Documents, Findings in Chapter 5). Academics in CoBL, Nesbit and Martin (2011), reported that "a decision was made [by the executive] that the courses that make up the core of the first year of the Bachelor of Commerce would commence online delivery as soon as possible" (p. 198). Individual academics in this College responded in a number ways. Some academic staff used *Facebook* to engage students even though *Facebook* had remained unsupported by the UC e-Learning support team. A Flexible Learning Advisor (FLA), who supported academics in using e-learning in the aftermath of the earthquakes, remarked, "…academics saw *Learn* as a vehicle for resources and providing audio and video" – *LR*1 (interview transcript, August 2014) (see Documents, Findings in Chapter 5). Audio recordings of lectures were made using *Audacity* and were made available on *Learn.* Also, some weeks when no or limited lectures were feasible, lecturers talked over PowerPoint slides and made these recordings and slides available on *Learn*. In addition, for some courses there was an opportunity to make previous years' manual lecture captures available on the *QuickTime* server. These lectures were burnt onto DVDs by Learning Resources for students who could not download the lectures from the *QuickTime* server due to poor or no internet connectivity.

In contrast, the CoE engaged much more with e-learning. The primary programme of Initial Teacher Education already had FLO distance mode and this enabled on-campus students to switch to distance mode. Some CoE on-campus students, therefore, were asked not to return to campus. The second year primary ITE students moved directly into the phase of the programmes where they studied in partner schools, thus releasing teaching spaces for other students on campus (see Case study setting in Chapter 6). In addition, other programmes in the CoE were able to develop e-learning faster because every course had a *Learn* site prior to the seismic events of 2010 and 2011. Also, the CoE had FLO Guidance, thus having some established strategic practice in the use of e-learning. As recalled by a participant of the study, "…the decision in 2009 [by the College Executive] for every course to have a *Learn* site made all the difference to us then [in 2011]" (*CoE4*, June 2014). By September 2010 the CoE had a FLO working group which rapidly developed into a sub-committee of the College Executive and then expanded to cover all programmes. This was aptly renamed the Blended Education Advisory Committee (BEAC) (N. Davis, personal communication, 2015) (see Case study setting in Chapter 6).

The use of *AdobeConnect* to engage students increased in the aftermath of the February 2011 earthquake. The tool had been available since 2007 but was not centrally supported until 2010 (see case study setting in Chapter 4). Data from the study indicated that some academics employed *AdobeConnect* to engage with students. In an interview, a participant of the study remarked, "we had another lecturer who actually started using *AdobeConnect* and had started talking about how she really enjoyed it" – *CoE* 2 (interview transcript, February, 2014).

Echo360 was one of the e-learning tools that were available for use by the University when it was given as a gift in July 2011 (see case study setting in Chapter 4). On the use of *Echo360* for teaching, a participant of the study commented, "for example right now campus

students will come to a lecture, we'll record that using *Echo360* and make that recording of the lecture available to our distance students later in the day" (CoE 3, interview transcript, 2014). Another participant remarked, "…our distance students expect to get access to not just books anymore. They want lectures to be recorded so they can feel part of the experience of a lecture" (CoE 11, interview transcript, 2014). Some academics did not have any issues about being recorded, which also suggests that others did. As one participant revealed, "I personally don't mind being recorded, but if I don't see benefit then I don't use it" – CoB 2. The participant added,

> I have checked the reports on *Learn* as well to see who has logged in, how often they log in, what they use and I have noticed that even though the class is quite full they still go to the recording so obviously they need some of the repetition (CoB 2, interview transcript, 2014).

From the study it seemed the uptake of *Echo360* was student-driven as they came to expect more interaction from their lecturers. On-campus students appeared to enjoy the convenience of being able to listen to and view a recorded lecture in order to make lecture notes from the recorded material. Distance students also benefitted from watching recordings of more lectures.

In conclusion, the e-learning tools were invaluable during the crises and facilitated teaching and learning whilst freeing limited campus space for essential activities. A range of e-learning tools evolved, and there was support from the e-Learning support team for a limited set of tools. However some tools that were introduced after the earthquakes were not centrally supported whereas others fulfilled an urgent need to reduce manual support and increase reliability of the access. Support in the use of e-learning technologies will be discussed next.

Support in the use of e-learning technologies

The literature indicates that lack of time, inadequate academic staff knowledge, lack of funding, and university and/or departmental culture are some identified barriers to the

uptake of Technology Enhanced Learning (Walker et al., 2012; Walker et al., 2014). The effect of development and implementation of TEL technologies on the academic workload can be quite variable and is appreciably affected by the technological capacity of individual academics. (Gregory & Lodge, 2015). In a literature review on academic workloads in online learning, Haggerty (2015) identified a scarcity of research that takes into account the preparation required for the delivery of educational material within the online environment. Haggerty (2015) recognised that concerns of academics to manage increasing workloads while increasing their own technological expertise can be a barrier to the implementation of e-learning. In addition, learning how to use new technology includes not only the time the teacher needs to become competent with the computer as a personal tool, but also as an instructional tool (Brand, 1998) and that is true for each additional tool. The provision of a tool is not sufficient, if staff don't know what it is for or how to use it. However having tools available can precipitate more effective learning relationships (OECD, 2005).

Law (2010) identified that "the skills and knowledge that teachers need to have differ depending on the perceived purpose and anticipated impact of technology integration in the curriculum" (p. 211). There are also similar impacts on students. Motteram and Forrester (2005) research on opportunities and constraints provided by technology found that "the online environment brings its own benefits, limitations, and challenges to learners. The first technical hurdle students encounter when commencing their online studies is becoming familiar with the computer telecommunications procedures and learning how to access, enter, and navigate sites" (p. 286). Therefore both staff and students would appear to require support in the effective uptake and use of TEL.

Findings

It was revealed from the study that having support in the use of e-learning technologies was indeed essential to its uptake by academics and students. Also, lack of

knowledge in the use of e-learning by some academic staff negatively influenced their engagement with students through the use of available e-learning tools. The availability and ease of use of tools were both factors that influenced the use of those tools. Moreover, the University found it challenging to provide professional development on e-learning technologies during crises, especially when the crises continued over two years and included three closures of the University campus. Academics in the CoBL, Nesbit and Martin (2011), confirmed "there were many challenges involved in enabling delivery to commence with many of these surrounding the lack of experience of some of the staff in delivering courses online" (p. 198).

Two categories of support were available for academics to use e-learning in UC. These consisted of a centrally supported e-Learning support team delegated to particular Colleges and support from academics who had expertise in the use of e-learning (see Access to support Interviews, Findings in Chapter 5; Access to support, Interviews, Thematic findings in Chapter 6). The central e-Learning Support team provided expert online course design advice from Flexible Learning Advisors, and technical and administrative support from Educational Technology Consultants. Academics in CoBL, Todorova and Bjorn-Andersen (2011), reported that "the e-learning teams quickly provided short courses and tutorials for academics on how to convert to an e-learning platform" (p. 559). The support has been on-going. The e-Learning Support team also provides help for staff using *Learn*, such as course design or re-design (including assessment), *LearnTrack* and engagement. Request for assistance can be placed through the *AssystNET* web form. However, it was impossible to provide assistance to all academics who made requests for a Flexible Learning Advisor during the crises as there were only three available to provide assistance. The number of FLAs is still the same in 2015.

The study also revealed that academic staff were motivated to use e-learning to engage with students by observing other colleagues using e-learning. A member of the CoE Executive stated that,

> some staff have really enjoyed that experience [of using e-learning] that was stimulated by the seismic events [of 2010 and 2011] and have continued to develop [their use of e-learning tools]. For example, there are plans for a new Bachelor of Criminal Justice degree programme in the CoE to be fully online.

Brand (1998), in a review of literature on professional development of teachers and educational technology, found that after the teachers become knowledgeable about using technology, they need time to transfer the skills learned into infusing technology into the curriculum. However, this is likely to be dependent on context. Writing of the challenges of going virtual in UC following the 2011 February seismic event, Todorova and Bjorn-Andersen (2011) found that "academics have definitely learnt that when under pressure they have the capacity to develop and change quickly" (p. 599).

From the perspective of students, the study also revealed that students' engagement and familiarity with the technologies was essential for uptake. Some students who had enjoyed having webinars from some lecturers asked other lecturers, "…well you know, why can't we have them in your course?" (CoE 12, interview transcript, September 2014). However, not all students reacted favourably to the use of e-learning. Nesbit and Martin (2011) warned that "students who do not choose to be enrolled in an eLearning delivered course will sometimes react adversely to being forced to learn in this mode" (p. 208). Kennedy, Laurillard, Horan, and Charlton (2015) advised that allocating time for studying online follows a different pattern than attending face-to-face. A participant of the study remarked, "…they [students] had signed up for something face to face, not by distance" – *CoE 13* (interview transcript, November, 2014).

In conclusion, e-learning adoption in an institution following repeated crises was facilitated by the availability of both centrally located support for e-learning tools, as well as

more localised support and collaboration with colleagues. Students also needed support in using e-learning tools. Adoption of e-learning is also dependent on the motivation for implementation of e-learning during crises, the time of the academic year, and the particular needs at that time of year. It is challenging to provide support during a crisis. Relevance of the support and uptake of e-learning depends on the university community and its needs.

Timing of crises in academic year

Academics' use of technology differs within an academic year and thus the support they require for using technology will also differ within the academic year. In the aftermath of the September 2010 earthquake, there was the need for support for staff and students in utilising the gift of online resources. Following the February 2011 earthquake, there was the need for support for academics and students to use e-learning for teaching and learning. In the aftermath of the June 2011 earthquake, there was the need to support academics to assess students using e-learning.

The time a crisis/disaster occurs is important as the crisis determines the response required to fulfil the needs of an educational organisation, which vary within the academic year. It is conceded that organisations have little control over natural catastrophes. Pearson and Mitroff (1993) indicated that the survival of the whole organisation can be in jeopardy when a crisis imposes severe strain on the organisation's financial, physical, and emotional structures. Xavier, Loyola, and Tulane Universities in USA faced challenges in 2005 as Hurricane Katrina arrived when students were just returning to campus at the start of the academic year. The University of South Florida (USF) in the USA considered using e-learning to overcome the threat of H1N1 flu closing down the University in 2009, during the second week of classes.

The difference between disasters caused by earthquakes and other disasters such as hurricanes and H1N1 flu is that there are continuing aftershocks after a major earthquake

occurs, thus the disaster is ongoing and its effects continue to unfold over time. The impact and severity of seismic events on people are also different and in the case of UC, the crises was repeated thrice in two years. SchWeber (2008) observed that organisations faced with crises adopted certain characteristics appropriate to the particular crisis, such as "adapt to the situation and problem-solve" (p. 41).

Findings

The adaptations of UC to the seismic events were on-going from the occurrence of the first seismic event in September 2010. The major activities in the academic year in UC are shown in Table 29 below. The table also shows the time in the academic year when the three major seismic events occurred and how they impacted on the activities of the University. The southern hemisphere academic year closely follows a Gregorian calendar year.

In September 2010 there was realisation in UC that there would be loss of access to buildings in the aftermath of the seismic event. Library access was vital for students at the end of the academic year when they were working on complex assignments and theses. Thus, the gift of extensive online library resources until the end of the year [2010] from some publishers fulfilled a vital need. Some publishers offered free access to their resources while other publishers gave access to their databases until the end of February 2011 (see Case study setting in Chapter 4).

Table 29: The academic year in University of Canterbury

Calendar month	Semester/Term	Main activities	Seismic event
January	Summer, very little teaching in 2011	CoE Secondary ITE induction to e-Learning and library in final week	
February	S1, T1 begin mid Feb		22 Feb 2011
March	S1, T1		
April	S1, T1	Lectures end, Mid-semester break starts, graduation.	
May	S1, T2	Lectures resume	
June	S1, T2	Lectures end – semester Mid-year exams start and end. Semester 1 break starts	13 June 2011
July	S2, T3	Lectures start	
August	S2, T3	Lectures end, mid-semester break starts	
September	S2, T4	Lectures resume	4 September 2010
October	S2, T4	Lectures end, end of year exams start	
November	S2, T4	End of year exams end, summer school starts	
December		Graduation	

The gift of the electronic resources was of great benefit to the University as the main library was inaccessible to staff and students over the summer. The library reopened in time for Term 1, 2011 on 21 February. The use of online video clips by the VC and reports of the media emphasised the extent of the loss and damage and problems for students. The Colleges in the University do not appear to have responded with e-learning to the first seismic event because of the time of the year the event occurred when lectures were over, or nearly over. Most programmes in both Colleges were able to cope with teaching until the end of the year utilising the gift of extensive online library resources. The CoE, however, moved strategically towards online assessment with the implementation of the CoE Flexible Learning Guidelines

(see Case study setting in Chapter 6), stimulated by reduced staff space and financial resources.

In February 2011, there was a massive loss of access to most buildings on campus and although buildings were progressively re-opened, teaching spaces were limited for four years. The VC informed members of the University that not all UC teaching facilities would be certified safe within the next six to eight weeks after the earthquake but the certification of buildings as safe took longer than expected and some remained closed four years after the last major seismic event in June 2011. The need of the University in the aftermath of the February 22 seismic event was teaching spaces, and e-learning was seen as a viable option for students who did not need to be on campus and thus compete for the limited teaching spaces.

The message from the Senior Management Team (SMT) was that the University was in "a new sort of normal" and e-learning was relevant to the "academics' job". The re-start of teaching began almost three weeks after the scheduled beginning of semester one and some courses were launched for the first time in fully online mode. The University of Canterbury was determined to complete the first semester of the academic year without extending the semester. As reported by Danielson (2009), the possibility of the University of South Florida resorting to e-learning in the H1N1 flu crisis was to prevent students from losing a semester due to a closure, and Administrators also were concerned about an extended closure that could affect the spring semester or even graduation. For the University of Canterbury it was essential that the academic year of 2011 restarted in earnest to save the year and avoid the cascading effect of losing student enrolments.

There was disruption of the examination process as a result of the seismic event in June 2011 (see Table 29). The seismic event at that time of the academic year, therefore, elicited a need for a long-term plan on assessment and resulted in an increase in resilience in the University with e-learning. The increase in resilience was as a result of the use of e-

learning for assessment in the CoBL. The seismic event occurred during study week when all lectures and assessments other than the final exam had been completed and examinations were about to begin. The timing of the seismic event led to innovation in using e-learning for assessment in the CoBL. This was to avoid having large numbers of students in a room in case an earthquake occurred. As highlighted by CoBL academics, Hickson and Agnew (2013), "moving to a more online format is common in times of natural disasters" (p. 289). The move to use e-learning for assessment involved weekly quizzes, and take home exams as opposed to having exams in class in some courses (see Documents, Findings in Chapter 5). Some academics requested students to send in assignments online. An academic in the CoBL commented, "…in the [aftermath of the] earthquake a lot of people set up take home exams as opposed to having exams in class" – *CoB 2* (interview transcript, August, 2014). In the UC case, students had prepared in June 2011 for a paper-based summative end of semester examination. Students were therefore not prepared for assessment using e-learning.

In contrast, there was no mention of innovations with e-learning for assessment in the CoE. The College was already using the College of Education Flexible Learning Guidelines after the September 2010 earthquake when the Guidelines were adopted (see Table 28, Case study setting in Chapter 6). Academics were, therefore, already implementing assessment using e-learning. The College of Education Flexible Learning Guidelines encouraged lecturers to consider using Learn for assignment submission. The use of e-learning for assessment was beneficial to some academics. An academic remarked, "I probably wouldn't have ever marked online, but I did, and because I couldn't meet with them [students] face to face so used track changes Dropbox, Turnitin" – CoE 4 (interview transcript, June, 2014). The adoption of the College of Education Flexible Learning Guidelines in 2010 made the College resilient in the use of e-learning for assessment in the aftermath of the June 2011 seismic event.

The study revealed that some academics in the CoBL and the CoE acknowledged the effect of seismic events on students' assessment. In CoBL, Hickson and Agnew (2013) confirmed that "in the event of an unanticipated disruption to normal life, universities tend to shift to an online environment in both delivery and assessment" (p. 297). In CoE, Mackey, Gilmore, et al. (2012) also pointed out that "the possibility of further earthquakes prompted a university-wide move to replace exams and tests with take-home or online tests or assignments to avoid having large numbers of students sitting in lecture theatres" (p. 130).

In conclusion, the reasons and/or rate of e-learning adoption in an educational institution during crises varies depending on the time of the academic year and the needs of the institution at the time. The duration of the crises also affects the adoption of e-learning. All of the themes that emerged from the findings and were discussed earlier in the chapter are pieces within the puzzle of how universities change in response to crises. The final theme to be discussed is the strategic planning for e-learning in UC.

Strategic planning for e-learning

Some organisations develop strategies to guide their engagement with e-learning. The interest in implementing e-learning is influenced by various drivers such as improving the quality of teaching and learning, and increasing flexibility (Akaslan & Law, 2011). Also, challenging issues concerning the integration of e-learning into the current practice of institutions of learning are barriers that these institutions strive to overcome (Akaslan & Law, 2011). A strategy can guide the essential infrastructure for the use of e-learning in a more systematic and centralised manner. However, tertiary institutions have evolved with either top-down or bottom-up approaches (Conole & Oliver, 2006; McNaught & Kennedy, 2000). Salmon (2005) advocated that an institution-wide implementation includes the development and application of an e-learning strategic framework by each organisation. E-learning technology decisions can be guided by an explicit plan and it is generally accepted that

effective implementation of e-learning depends on explicit institutional visions and goals (long-term aims that guide current practice), along with well-established procedures and standards (Marshall, 2006a, 2009b). For example, The University of Glasgow E-Learning Strategy 2013-2020 sets out a vision for the future learning environment at the University of Glasgow and outlines how e-learning can support this vision (University of Glasgow, n.d.) The E-Learning Strategy identifies specific strategic priorities for the coming years and the enablers that will allow the delivery of these priorities.

The Ministry of Education, New Zealand, has encouraged the use of e-learning with the view that e-learning offers neither a replacement of, nor a simple adjunct to, existing educational systems. Rather, e-learning has the potential to transform current practice (New Zealand Ministry of Education, 2004, 2013). Reward is seen as crucial for any e-learning initiative although there has been some debate over what are considered the most appropriate rewards, including promotion, accreditation or opportunities to publish (Sharpe, Benfield, & Francis, 2006). As a result of the seismic events of 2010 and 2011, the University now has a vision on the implementation of e-learning as incorporated in the Learning and Teaching Plan 2013-2017.

Findings

The University of Canterbury has been using e-learning since 2000, however, an institutional definition of e-learning by UC was not found in this study because an e-learning strategy for the University was not explicitly stated in any document. Several documents of the University however, have support for e-learning. As described by Marshall (2009b):

> Canterbury has adopted an approach to the use of technology that is informal, driven primarily by the use of core infrastructure to support primarily administrative activities within courses, and dependent on the skills of individual teachers, rather than a systematically driven and supported core aspect of learning and teaching (p. 12).

The use of e-learning at UC resulted in the establishment of the e-Learning Working Group in December 2012. The Group had the goal of reviewing the current status of e-learning, identifying potential e-technologies for the support of learning and teaching at UC, and where appropriate supporting implementation of e-technologies. The e-Learning Working Group also had a goal to develop an e-learning strategy for UC and present it to the University Learning and Teaching Committee. In the Learning and Teaching Plan 2013-2017, the e-Learning Working Group became the e-Learning Advisory Group (see Case study setting in Chapter 4).

The Learning and Teaching Plan 2013-2017 had several instances of the use of synonyms of e-learning such as online, blended learning, and flexible learning. More than 20 terms synonymously used with e-learning have been identified in some studies (Guri-Rozenblit, 2009). The Learning and Teaching Plan 2013-2017 had provision for the establishment of an e-learning advisory group by mid-2013 and increased provision of blended learning by the end of 2014. An implicit e-learning strategy for the University has provided the basis for flexibility in using e-learning in various forms, such as fully online courses, blended learning in course delivery, and flexible learning options for courses and programmes offered by Colleges in the University. In its Learning and Teaching Plan 2013-2017, UC planned to "complete a strategic review of e-learning on campus, blended and distance learning within and across Colleges" (University of Canterbury, 2013b, p. 9). These progressive developments in the use of e-learning in UC challenge the analysis of data by Marshall (2014), who identified that "the vast majority of students in New Zealand are clearly expected to attend physical classrooms" (p. 5).

As discussed earlier in the chapter, there are several e-learning technologies in use at UC and these are supported by the centrally located e-Learning support team. During data collection for this study, academics reported immediately after the earthquakes that students

had difficulty finding links for course outlines and assessment information on *Learn* sites. This was because academics were not consistent in placing those links in their *Learn* sites because there was no guidance on how to place the links. The e-Learning support team have consequently developed *Learn* templates for departments, schools and Colleges. The templates have standard blocks such as Course Menu; Activities; Search forums; Course categories and students can expect to see a consistency among courses, particularly with placement of particular blocks.

Colleges have developed different approaches in their use of e-learning. In the aftermath of the February 2011 earthquake, the CoBL decided that large classes, especially in level 100, were to use e-learning in delivery of their courses. There were some academics in CoBL with expertise in e-learning who supported their colleagues (see Thematic findings, Interviews and other sources of data, Pedagogy in Chapter 4). In the CoBL Strategic Plan 2013 – 2017, a working group was to be established to develop a College-wide vision and approach to e-learning (College of Business and Law, 2012) but to date the working group has not been established. In the CoE, the FLO Committee has now developed into the Blended Education Advisory Committee covering all modes and courses in the College (see Case study setting in Chapter 6). UC CoE and UC CoBL have progressively developed their own e-learning strategy, which complements the university-wide e-learning strategy as envisaged in the Learning and Teaching Plan 2013-2017.

In conclusion, the University's lack of an explicit e-learning strategy made the CoE and the CoBL develop college-specific e-learning plans. The College plans complement the incorporation of e-learning in the University's teaching and learning as envisaged in the UC Learning and Teaching Plan 2013-2017. Embedding e-learning into normal teaching practice in UC will increase the adoption of e-learning in the University.

Conclusion

The themes that emerged from the data indicated that communication was essential for propagating a consistent message across the University community on UC's response to the seismic events. Communication channels, including dedicated web sites and the introduction of social media, were utilised in disseminating information to members of the university and stakeholders who were widely spread within and beyond the country. The learning management system was one mode of communication that was used in the aftermath of the seismic events, but email was not. The resilience of the IT infrastructure was essential to the University and facilitated the rapid growth and uptake of additional centrally supported e-learning tools. The University developed several actions to reduce the stress on the IT infrastructure. Limitations to the use of e-learning in UC in the aftermath of the February 2011 seismic event included the requirement for external permission from the Tertiary Education Commission to change the mode of study to use e-learning, and further negotiation with professional bodies to assure them that quality outcomes would continue. Professional development and support in the use of e-learning technologies was also essential to its uptake by academics and students in line with their evolving needs. There was central support for the use of e-learning tools. There was also support from academics who had expertise in e-learning to their colleagues. The time of the academic year in which the crises/disasters occurred informed the response in using e-learning on an ongoing basis. Further needs are likely to develop depending on the time a disaster occurs in an academic year. Three major crises occurred in 2010 and 2011 and e-learning provided a viable option to overcome the crises in all instances. The University's lack of an explicit e-learning strategy made CoE and CoBL develop college-specific e-learning plans that complement the incorporation of e-learning in the University's teaching and learning as envisaged in the UC Learning and Teaching Plan 2013-2017.

The next chapter provides the summary, conclusions and recommendations from the study.

CHAPTER 8

SUMMARY, CONCLUSION AND RECOMMENDATIONS

In this concluding chapter, a summary of the research is made and the important findings are highlighted. Limitations of the study are also identified and the chapter ends with recommendations drawn from the study.

Summary

Overview of Research Problem and Methodology

The study focussed on how a university responded with e-learning in the wake of seismic activities which took place over two years. It sought understanding into policies and practices that might promote the adoption of e-learning during crises. The various roles played by Senior Management Team, Flexible Learning Advisors and academics that influenced the adoption and resilience in e-learning in the aftermath of the seismic events of 2010 and 2011 were also investigated.

The study sought insight into how the University had adopted e-learning following the E-Learning Maturity Model Capability Assessment in late 2008/09, and how it communicated about crises and the viability of implementing e-learning. The resilience of the IT infrastructure during the crises was also investigated. In addition, insight was sought on e-learning technologies that were on offer in UC in the aftermath of the seismic events in 2010 and 2011, as well as the ways in which academic staff and students were supported to use these e-learning technologies. The influence of the timing of crises in the academic year on the adoption of e-learning was also considered. Finally, e-learning strategy and theories about e-learning adoption during crises were discussed.

The study followed a qualitative intrinsic embedded/nested single case study design. There were multiple sources of data, including documentary analysis of the university policy statements and reports and interviews of management and academics. The multiple units of

analysis that were considered in the study were two Colleges in the University and their staff, and the service units in Learning Resources such as the Information and Technology Services, including the Library.

Key Findings

In this section, both the new knowledge generated from the study and the key findings that contribute to the existing knowledge are highlighted under five themes.

Communication with members of an organisation and the general public about crises and recovery from these crises

1. Communication about crises and about the recovery from crises with members of an organisation and the general public is extremely important. Its primary purpose is to provide reassurance about how the organisation will recover from the damage caused by the crises.
2. It is important that the information about the recovery from crises – in this case earthquakes - across all channels of communication is coherent. However this strategy is most successful if it is relaxed as soon as possible in order to reduce the undermining of other leaders within the organisation, including the academic leadership of students.

IT Infrastructure

1. IT infrastructure is essential to e-learning and must not be ignored during disasters.
2. The IT infrastructure may be made more resilient by decentralisation of services and hosting some applications utilising Cloud computing.
3. It is useful strategically to have off-campus backup, security and established preferential service agreements with organisations that can provide IT services in times of crises.

4. Despite sustained stress from repeated seismic activities, the UC IT infrastructure served well as the backbone for the deployment of e-learning for academics and students.

E-Learning tools

1. The e-learning tools were invaluable during the crises and facilitated teaching and learning whilst freeing limited campus space for essential activities.
2. A range of e-learning tools evolved as well as support from the central e-Learning support team for a limited set of tool such as *Learn*, *AdobeConnect* and *Echo360*.

Support in the use of e-learning technologies

1. There were also some tools that were introduced after the earthquakes, some of which were not centrally supported. For example *Audacity* and *Camtasia*.
2. Academics' use of technology differs within an academic year. Thus the support they required for using technology also differed within the academic year.
3. Following repeated crises, e-learning adoption in the institution was facilitated by the availability of centralised support for e-learning tools provided by the institution as well as more localised support and collaboration with colleagues.

Timing of crises in academic year

1. The time in the academic year when a crisis occurs has an influence on the adoption of e-learning.
2. The duration of the crisis also affects the adoption of e-learning.

Strategic planning for e-learning

1. The decision of the University not to have an explicit e-learning strategy influenced the College of Education and the College of Business and Law to develop college-specific e-learning strategies.

2. The Colleges' strategies complemented the incorporation of e-learning in the University's teaching and learning as envisaged in the UC Learning and Teaching Plan 2013-2017.
3. Embedding e-learning into normal teaching practice in UC is likely to further increase the adoption of e-learning in the University.
4. The findings of this study revealed that online learning became the cornerstone of "restart" teaching after a crisis in a university where most teaching had been on campus.

Conclusions

The findings from the study lead to a number of conclusions about adoption of e-learning as a result of influences of a series of seismic events in 2010 and 2011. First of all, the findings suggest that UC had been using the Marshal report (Marshall, 2009b) as a baseline to update its e-learning planning.

Communication about crisis and subsequent recovery to members of an organisation and the general public is important. The use of communication channels which students were familiar with and already using aided the dissemination of information that the University would be using e-learning as one of the options to complete the academic year.

The availability of an IT infrastructure in an organization has tangible benefits. Also, having a robust IT infrastructure is essential to e-learning. The ability of the infrastructure to provide continued services in the aftermath of a disaster is essential.

E-learning was invaluable to UC in its crises. A variety of tools were used in the aftermath of the seismic events. There were some e-learning tools that were already available in the University; there were also tools that were introduced after the earthquakes, some of which were not centrally supported thus the tools may not have been efficiently used by academics to their fullest potential.

Adoption of e-learning will increase if academic staff are motivated to use e-learning to engage with students. In addition, students' engagement and familiarity with the technologies are essential to its adoption. This is evident in the adoption of e-learning post-earthquakes in UC.

Limitations of the Study

The research was time bound in order to be completed within the stipulated time-frame. Therefore only two UC Colleges were purposively selected for the study. The research interviews were conducted two to four years after three traumatic events had occurred. The seismic events had a number of effects on the participants who had to recollect emotionally-charged events in order to respond to the items in the interview schedule. Thus, the timing of the data collection is noted as a limitation of this study. In particular, it is notable that some participants of the study were confused about the time-line relating to the introduction of e-learning tools in UC. The interviewees' comments indicated their thoughts at the time of the interview, and there may have been other factors that they did not mention. In addition, the evidence was incomplete and most participants had deleted their emails of 2010 and 2011 when the crises occurred.

Audit NZ produces a process audit report of universities in New Zealand however these reports are confidential. Access to such reports for University of Canterbury may have enhanced the study.

The two theoretical frameworks, TAM2 and IRM, that were adopted to inform the analysis were not themselves a focus of research; and while a third, eMM, informed the baseline, it was used to frame the case studies but was also not a topic of the research.

Finally, the outcome of the case studies should be interpreted with caution since the participants were selected purposively. There may have been other academics in the Colleges who used e-learning extensively following the seismic events but were not identified through

the snowball technique used to select participants of the study and therefore were not interviewed.

Recommendations

From the findings of this study the following recommendations are offered under the same five thematic headings used earlier in this concluding chapter.

Communication with members of an organisation and the general public about crises and the recovery from these crises

Recommendations for managers/Senior Management Team

It is recommended that in times of crisis, educational institutions take advantage of Cloud computing to communicate with members of the institution and stakeholders. Also, an alternative website for the institution may be hosted externally that can be activated when required. It will also be important to be coherent across all channels of communication about information on the recovery process from each event within a continuing crisis. In addition, it is recommended that the SMT communicate their strategy to the staff so that they understand and can better reinforce the approach.

IT Infrastructure

Recommendations for managers/SMT

IT Infrastructure should not be ignored in disaster planning. The architecture for an IT infrastructure can be made more resilient by increasing redundancy, backup and security, centralisation and Cloud computing. However Cloud computing can be contentious because it has implications for security and control of sensitive data.

The Civil Defence Emergency Management Act 2002 of New Zealand requires lifeline utilities to be able to continue functioning to the fullest possible extent during and after an emergency. Installation of backup power source(s) is recommended for parts of the IT system such as access cards, including building security.

Ongoing disasters such as earthquakes cause repeated surges in Internet traffic, which can be planned for by increasing redundancy. Having an alternative Internet Service Provider on standby is recommended in case internet connectivity is lost through the main Internet Service Provider.

Key data including student databases and other applications are best located on centralised servers, rather than on individual PCs, so as to enable the running of services from a Data Centre, thus eliminating the need to access and switch on individual servers in compromised buildings. Backup can be further enhanced by maintaining a security copy in another location, possibly with an additional copy in the Cloud when that risk is acceptable.

Recommendation for research

IT research is recommended into increasing resilience of IT infrastructure in tertiary institutions. It may include issues such as redundancy, backup and security of the infrastructure.

E-Learning tools

Recommendations for managers/SMT

When under stress it is recommended that new tools are only introduced when they are essential. Also, ways in which existing and new partnerships may be leveraged to facilitate access though e-learning may be considered. However, it is also important to recognise that adoption of a gift, such as the free use of *Echo360* and *AdobeConnect*, sets in motion long term expectations that need to be managed. Consideration of the rapid adoption of additional library resources and digital lecture capture described in the UC case study may assist such longer term planning.

Support in the use of e-learning technologies

Recommendations for managers/SMT

E-learning adoption in an institution depends on the availability of centrally-located support for e-learning tools that are used in the institution. Adoption of e-learning also depends on the motivation for the adoption of e-learning, which will vary with the crisis and the time of the academic year because of varying needs within the academic calendar.

When an e-learning tool is introduced, or updated, it is recommended that there is also an ongoing plan to support that tool which takes account of users' changing needs and their ability to support one another. It is challenging to provide support during a crisis so it is recommended that all courses have an online site that can be enhanced, should the mode of learning become more blended or off-campus for a period of time following reduced access to the campus or other educational space.

It is also recommended that organizations and their staff plan for the simultaneous occurrence of multiple crises. In addition, they should plan for a single crisis event that could set off a chain reaction of crises. This should include access to e-learning and its support.

Strategic planning for e-learning

Recommendations for managers/SMT

E-learning adoption in an institution can be enhanced with the adoption of an explicit or implicit e-learning strategy and support, including encouragement for effective use of e-learning. Embedding e-learning into normal teaching practice will increase the adoption of e-learning in an educational institution. The presence of an e-learning strategy or its embedding within the institution's policy for learning and teaching is recommended so that it may guide practice following a crisis. It is also recommended that such a strategy is updated to reflect the evolution of practice within the institution and its programmes.

In addition, the senior management teams of educational organisations are recommended to apply the Indicators of Resilience Model (Resilient Organisations, 2012) to aid them to become more resilient. Additional frameworks and models such as the Technology Acceptance Model2 (Venkatesh & Davis, 2000) may also be useful at times. This study also provides a case study that can be used for illustrations of particular value to earthquake-prone institutions at various stages of e-learning evolution.

Recommendation for research

Further educational and/or management research is recommended into increasing resilience of tertiary institutions to multiple disasters such as earthquakes. Within such research, it is recommended that access to Audit process audit report be part of the data collection, if possible. However, it is acknowledged that there are sensitivity issues with regards to the Audit process reports.

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APPENDICES

Appendix 1: Interview protocol for the study

Interview Schedule

Date: __/___/___

I am conducting a PhD study on ***Resilience, e-learning and change*** at University of Canterbury supervised by Professor Davis and Dr Cunningham. I understand that you supported staff of UC with e-learning within your role and I would like to interview you about that to find out how it changed with the earthquakes that impacted this University and College you support.

1. What is/are your role(s) in relation to e-learning? I see from the UC web site that your job is _____. Please describe what you do.
    - What was your role in 2010?
    - What was your role in 2011?
2. In responding to the conditions following earthquakes, in what ways were e-learning considered?
    - September 2010
    - Feb 2011
    - June 2011
3. What tools did you support for e-learning and how did you provide that support?
    - Learn/Moodle
    - Echo 360 (post July 2011?)
    - Adobe Connect
    - Other
4. Who did you support and how did they engage with you?
    - Who:
        - Which colleges and units? (Education?)
        - Did the enthusiasm and demand change at times?
        - Leaders and committee/working group support?
        - How do they get to know about your support?
    - How?
        - How has your use of e-learning changed in provision of support?
        - F2F
        - …

5. According to Resilient Organisations framework, partnerships are important for resilience. Please can you tell me about any partnerships that you have found to be of value responding to the challenges of earthquakes?
    - September 2010
    - Feb 2011
    - June 2011
    - Now?
    - Internal (e.g. Library)/external (e.g. Lincoln University/CPIT)
    - The structure of your work unit changed over time. These names are found in documents: Learning Technologies Support; Electronic Learning Media and Digital Media Group
6. Was there technical support for who wanted to use e-learning for teaching?
7. If Yes: How accessible were the technical support?

    If No: Why were the key people not accessible?
8. In your opinion, to what extent was UC positioned to use e-learning for teaching before, during and after the earthquakes?
9. Do you have any documents to share or refer me that is related to this topic?
    - Course material, including older materials
    - Publications or newsletters
    - Policy, guidance or design documents you have archived?
    - Emails you have stored?
10. Who else do you suggest that I interview to gather evidence on how the college/university developed e-learning in response to earthquakes?

Thank you.

I will let you have a copy of the transcription of the interview to amend as you wish.

I will also be happy for you to use it in your own reflective practice and research.

I plan to write an article with my supervisors using this and other data and also integrate it within my PhD research where relevant. I will review material with you in which you may be identified before it is published.

Interview Schedule for Senior Manager

Date: __/___/___

I am conducting a PhD study on ***Resilience, e-learning and change*** at University of Canterbury supervised by Professor Davis and Dr Cunningham. I would like to interview you about that to find out how it changed with the earthquakes that impacted this University and College the ways you have worked and led with e-learning

1. **What is/are your role(s) in relation to e-learning? I see from the UC web site that your job is _____. Please describe what you do.**
    - What was your role in 2010?
    - What was your role in 2011?
    - Now
2. **In responding to the conditions following earthquakes, in what ways were e-learning considered?**
    - September 2010
    - Feb 2011
    - June 2011
    - Present
        - What would have happened (to e-learning) if there was no earthquake?
3. **Please can you illustrate the different opportunities/challenges and their variations according to college and support unit**
    - College Ed
    - College of Engineering – Forestry/ Coll. of Bus./ Coll. of Ed.
    - Learning Resources support of e-learning
    - Quality challenges

4. **What changes in attitudes and approaches to e-learning have you observed**
    - Leadership
    - Policy / Learning and Teaching Committee
    - Staff
5. **According to Resilient Organisations framework, partnerships are important for resilience. Please can you tell me about any partnerships that you have found to be of value responding to the challenges of earthquakes?**
    - September 2010
    - Feb 2011
    - June 2011
    - Now?
        - Otago Uni, Victoria Uni of Wellington accepting students
        - Lincon Uni …
6. **In your opinion, how was/is UC positioned to use e-learning for teaching before, during and after the earthquakes?**
7. **Do you have any documents to share or refer me that is related to this topic?**
    - Course material, including older materials
    - Publications or newsletters
    - Policy, guidance or design documents you have archived?
    - Emails you have stored?
8. **Who else do you suggest that I interview to gather evidence on how the college/university developed e-learning in response to earthquakes?**
9. **Anything else you would like to tell me or advice?**

Thank you.

I will let you have a copy of the transcription of the interview to amend as you wish.

I will also be happy for you to use it in your own reflective practice and research.

Appendix 2: Information sheets/consent forms for the participants of the study

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

July 12, 2013

Resilience, e-learning and change in tertiary education

Information Sheet for Head of the Digital Media Group

I am, Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as Head of the Digital Media Group at University of Canterbury. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: the university use of e-learning before, during and after the seismic activities of 2010 and 2011, assistance offered to early adopters of e-learning in the colleges and the colleges' policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee. If you would like more information or have any questions about the research, you may contact me or my supervisors, Professor Niki Davis (niki.davis@canterbury.ac.nz) and Associate Professor Una Cunningham (una.cunningham@canterbury.ac.nz). If you have any concerns or complaints about this research, please contact **The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz). Office Phone: (03) 364 2987 ext. 45588.**

If you are willing to participate in this project, please sign the consent form and return it to me in the envelope provided. Please retain this information sheet. Thank you for considering this request.

Kofi Ayebi-Arthur

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

Resilience, e-learning and change in tertiary education

Consent Form for Head of Digital Media Group

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR***.**

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
- I understand that I can withdraw from the study at any time, and that I do not have to give any reason for withdrawing.
- I understand that all information will be treated in the strictest confidence and that participants will remain anonymous. I understand that material collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.
- I understand that within these restrictions, the findings may be submitted for publication to national or international journals or presented at educational conferences.
- I understand that the results of the study will be made available to me at _____ and that I can request additional information at any time.
- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

College of Education

School of Educational Studies and Leadership

Tel: +64 33 642987 ext 3464

Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

July 14, 2013

Resilience, e-learning and change in tertiary education

Information Sheet for early adopters

I am Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on Resilience, e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as an early adopter of e-learning in a college in University of Canterbury. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: your use of e-learning before, during and after the seismic activities of 2010 and 2011, your interactions with the flexible learning advisor to the college before, during and after the seismic activities, the triumphs and challenges of being an early adopter of e-learning in the college and the college's policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed. Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee. If you would like more information or have any questions about the research, you may contact me or my supervisors, Professor Niki Davis (niki.davis@canterbury.ac.nz) and Associate Professor Una Cunningham (una.cunningham@canterbury.ac.nz). If you have any concerns or complaints about this research, please contact **The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz). Office Phone: (03) 364 2987 ext. 45588.**

If you are willing to participate in this project please sign the consent form and return it to me in the envelope provided. Please retain this information sheet. Thank you for considering this request.

Kofi Ayebi-Arthur

College of Education

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Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Resilience, e-learning and change in tertiary education

Consent Form for early adopters

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR.*

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
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- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

July12, 2013

Resilience, e-learning and change in tertiary education

Information Sheet for Flexible Learning Advisor

I am, Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as Flexible Learning Advisor in a college in University of Canterbury. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: the college use of e-learning before, during and after the seismic activities of 2010 and 2011, your interactions with the to the college staff before, during and after the seismic activities and the college's policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed. Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee. If you would like more information or have any questions about the research, you may contact me or my supervisors, Professor Niki Davis (niki.davis@canterbury.ac.nz) and Associate Professor Una Cunningham (una.cunningham@canterbury.ac.nz). If you have any concerns or complaints about this research, please contact **The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz). Office Phone: (03) 364 2987 ext. 45588.**

If you are willing to participate in this project please sign the consent form and return it to me in the envelope provided. Please retain this information sheet. Thank you for considering this request.

Kofi Ayebi-Arthur

College of Education

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Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Resilience, e-learning and change in tertiary education

Consent Form for Flexible Learning Advisor

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR.*

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
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- I understand that within these restrictions, the findings may be submitted for publication to national or international journals or presented at educational conferences.
- I understand that the results of the study will be made available to me at _____ and that I can request additional information at any time.
- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz
July12, 2013

Resilience, e-learning and change in tertiary education

Information Sheet for Head of the Learning Technologies Support

I am, Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as Head of the Learning Technologies Support. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: the university use of e-learning before, during and after the seismic activities of 2010 and 2011, assistance offered to early adopters of e-learning in the colleges and the colleges' policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee. If you would like more information or have any questions about the research, you may contact me or my supervisors, Professor Niki Davis (niki.davis@canterbury.ac.nz) and Associate Professor Una Cunningham (una.cunningham@canterbury.ac.nz). If you have any concerns or complaints about this research, please contact **The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz). Office Phone: (03) 364 2987 ext. 45588.**

If you are willing to participate in this project, please sign the consent form and return it to me in the envelope provided. Please retain this information sheet. Thank you for considering this request.

Kofi Ayebi-Arthur

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Resilience, e-learning and change in tertiary education

Consent Form for Head of Learning Technologies Support

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR.*

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
- I understand that I can withdraw from the study at any time, and that I do not have to give any reason for withdrawing.
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- I understand that the results of the study will be made available to me at _____ and that I can request additional information at any time.
- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
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UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

July 12, 2013

Resilience, e-learning and change in tertiary education

Information Sheet for Pro Vice Chancellors

I am, Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as a Pro Vice Chancellor in a college in University of Canterbury. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: the college use of e-learning before, during and after the seismic activities of 2010 and 2011, interactions of the flexible learning advisor with the college before, during and after the seismic activities, early adopters of e-learning in the college and the college's policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed. Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee. If you would like more information or have any questions about the research, you may contact me or my supervisors, Professor Niki Davis (niki.davis@canterbury.ac.nz) and Associate Professor Una Cunningham (una.cunningham@canterbury.ac.nz). If you have any concerns or complaints about this research, please contact **The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz). Office Phone: (03) 364 2987 ext. 45588.**

If you are willing to participate in this project please sign the consent form and return it to me in the envelope provided. Please retain this information sheet. Thank you for considering this request.

Kofi Ayebi-Arthur

College of Education

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Tel: +64 33 642987 ext 3464
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Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Resilience, e-learning and change in tertiary education

Consent Form for Pro Vice Chancellor

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR***.**

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
- I understand that I can withdraw from the study at any time, and that I do not have to give any reason for withdrawing.
- I understand that all information will be treated in the strictest confidence and that participants will remain anonymous. I understand that material collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.
- I understand that within these restrictions, the findings may be submitted for publication to national or international journals or presented at educational conferences.
- I understand that the results of the study will be made available to me at _____ and that I can request additional information at any time.
- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

July 12, 2013

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Resilience, e-learning and change in tertiary education

Information Sheet for Senior Management Team (Vice-Chancellor/Assistant Vice-Chancellor (Academic)/Director of Learning Resources)

I am, Kofi Ayebi-Arthur, a PhD student at the College of Education, University of Canterbury, Christchurch. I am conducting a study on e-learning and change in tertiary education at University of Canterbury. Disasters and crises have required higher education institutions to evolve and become more resilient in order to carry out their mandate of teaching and research. E-learning has the potential to help higher education overcome crises yet there has been little research into the development of e-learning following such disruptions and, in particular, little longitudinal research even though it is well known that disasters have long term impacts. The purpose of this longitudinal study is to research the evolution of e-learning in a research-intensive university that was subjected to severe earthquakes.

Your experience and ideas would make an important contribution to this research. I therefore invite you to participate in the study. If you agree to be part of this project, I will interview you about your experiences as a member of the Senior Management Team in University of Canterbury. The interview, which will be audio recorded and take about 20-30 minutes, will focus on the following: the University's use of e-learning before, during and after the seismic activities of 2009 and 2011 and the University's policy on e-learning.

Your participation in this project is voluntary and you may withdraw from the study at any time. If you withdraw, I will do my best to remove any information relating to you, provided this is practically achievable. All participants are assured of anonymity and confidentiality of the data gathered. Names will be changed into pseudonyms and identifying details in any verbal, written or published reports will be removed. Material gathered will be kept in locked and secure facilities and/or in password-protected electronic form and will only be accessible to me and my supervisors. A copy of the interview transcript will be made available to participants to check for accuracy. A summary of the results will be made available to participants. These materials will be kept for 5 years and then destroyed. Any published or reported results from this study will not identify any participant.

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Kofi Ayebi-Arthur

College of Education

School of Educational Studies and Leadership
Tel: +64 33 642987 ext 3464
Email: kofi.ayebi-arthur@pg.canterbury.ac.nz

UNIVERSITY C
CANTERBUR
Te Whare Wānanga o Waite
CHRISTCHURCH NEW ZEALA

Resilience, e-learning and change in tertiary education

Consent Form for Senior Management Team (Vice-Chancellor/Assistant Vice-Chancellor (Academic)/Director of Learning Resources)

I understand the aims and purposes of the research study being undertaken by *KOFI AYEBI-ARTHUR.*

- The study has been explained to me and I understand the information that was given to me on the information sheet.
- I am aware that my participation in this project is voluntary and I have had all questions answered to my satisfaction.
- I understand that my involvement will include an individual interview.
- I understand that the interviews will be audio recorded and I can ask for the recordings to be stopped at any time temporarily or permanently.
- I understand that I will be provided with a copy of the interview transcript to check for accuracy.
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- I understand that all information will be treated in the strictest confidence and that participants will remain anonymous. I understand that material collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.
- I understand that within these restrictions, the findings may be submitted for publication to national or international journals or presented at educational conferences.
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- I understand that the study will be carried out as described in the information statement, a copy of which I have retained.
- I have read the information sheet and consent form. I agree to participate in the study.

Name: _____

Signature: _____ Date: _____

*Please **return this completed consent form** in the envelope provided.*

Appendix 3: Ethical approval letter for the research

UNIVERSITY OF CANTERBURY

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: 2013/49/ERHEC

12 August 2013

Kofi Ayebi-Arthur
School of Educational Studies & Leadership
UNIVERSITY OF CANTERBURY

Dear Kofi

Thank you for providing the revised documents in support of your application to the Educational Research Human Ethics Committee. I am very pleased to inform you that your research proposal "Resilience, e-learning and change in tertiary education" has been granted ethical approval.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 9 August 2013.

Should circumstances relevant to this current application change you are required to reapply for ethical approval.

If you have any questions regarding this approval, please let me know.

We wish you well for your research.

Yours sincerely

Nicola Surtees
Chair
Educational Research Human Ethics Committee

"Please note that Ethical Approval and/or Clearance relates only to the ethical elements of the relationship between the researcher, research participants and other stakeholders. The granting of approval or clearance by the Ethical Clearance Committee should not be interpreted as comment on the methodology, legality, value or any other matters relating to this research."

E S