Assessing the Socio-Technical Impacts of Cloud Computing in New Zealand Organisations: An Exploratory Study

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School of Computer & Mathematical Sciences

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Rohini Gaur

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Abstract

The adoption of cloud based technologies ensures a fundamental shift in the stipulation of resources within organisations. This research studies the socio-technical impact of migrating to cloud technologies and its effects on the organisational culture, people and their relationships and work performance. The following two questions form the basis of this research: (a) what are the key factors which affect cloud adoption in NZ organisations? and (b) what impact on work practices have been noted when cloud technologies are adopted by organisations?

Objective: The main objective was to discover the theoretic attributes from grounded interview data that confirm, refute, or extend the principles and their applications suitable for cloud migration factors and impact.

Methodology: The research design included qualitative research using grounded theory (GT) processes. Twelve interviews were conducted with employees working in small and medium-sized enterprises (SMEs) in New Zealand (NZ). Participants were selected based on purposive sampling as the primary technique and a secondary sampling technique known as snowball.

Data Gathering and Analysis: The transcribed interviews were analysed in three stages: using open coding, axial coding, and selective coding. NVivo software was used to carry out the three coding processes. Reflective memos and constant comparative analysis were used to ensure reliability. Conditional Relationship Guideline (CRG) and Reflective Coding Matrix (RCM) were used as analytical tools to interlink factors through cloud adoption practices.

Findings: Analysis of participants' interview data established and extended the current practices of the factors which drive cloud migration and its impact and offered additional suggestions for more effective practical applications. Using the grounded theory approach, the interview data were categorised into sixteen main categories. Then, the sixteen categories were divided into two abstract themes: cloud adoption factors and impact of cloud adoption on work practices, where the prior affects the latter.

The findings revealed eight categories belonging to the first theme of factors. They were: business continuity, convenience, cost effectiveness, data centres, free from

maintaining IT Infrastructure, Cloud Service Provider (CSP) reputation, speed, and suitability.

The following eight categories belonged to the second theme of impact: best practices create awareness of policies and service-level agreements (SLAs), improved collaboration, job losses, more time for IT managers to strategise, loss of productivity and disturbances due to outages by provider, high degree of satisfaction with CSP, security concerns for business-critical data and skill upgrade.

Contribution: The research findings have important implications for academia and great value to the decision makers such as managers and senior executives, CSPs and IT staff in an organisation, in terms of formulating better strategies for cloud computing adoption. For CSPs, using the research model in this study can assist in increasing their understanding of why some organisations choose to adopt cloud computing services and what implications are felt in the workplace. Also, CSPs may need to improve their interaction with organisations in terms of understanding and meeting SLAs.

Conclusions: The emergence of sixteen categories from the two core themes, cloud adoption factors and impact of cloud migration on work practices is the principal finding. The findings of the research illustrate the challenges that decision-makers and employees face when assessing the practicability of adopting of cloud computing within their organisations; they also describe a ‘conceptual socio-technical cloud strategy framework’ to support cloud adoption in organisations.

Keywords: *Cloud computing adoption, cloud-based technologies, factors, grounded theory, Leavitt’s model, organisational change, socio-technical impact*

Abbreviations

CRG:	Conditional Relationship Guideline
CRM:	Customer Relationship Management
CSP:	Cloud Service Provider
DOI:	Diffusion of Innovation
ERP:	Enterprise Resource Planning
GT:	Grounded Theory
GTM:	Grounded Theory Methodology
IaaS:	Infrastructure as a Service
ISO:	International Organization for Standardization
IT:	Information Technology
ITIL:	Information Technology Infrastructure Library
NIST:	National Institute of Standards and Technology
NZ:	New Zealand
PaaS:	Platform as a Service
RCM:	Reflective Coding Matrix
ROI:	Return on Investment
SaaS:	Software as a Service
SLA:	Service Level Agreement
SME:	Small and Medium-Sized Enterprises
TAM:	Technology Acceptance Model
TOE:	Technological, Organisational and Environmental
QDA:	Qualitative Data Analysis

Chapter 1 Introduction

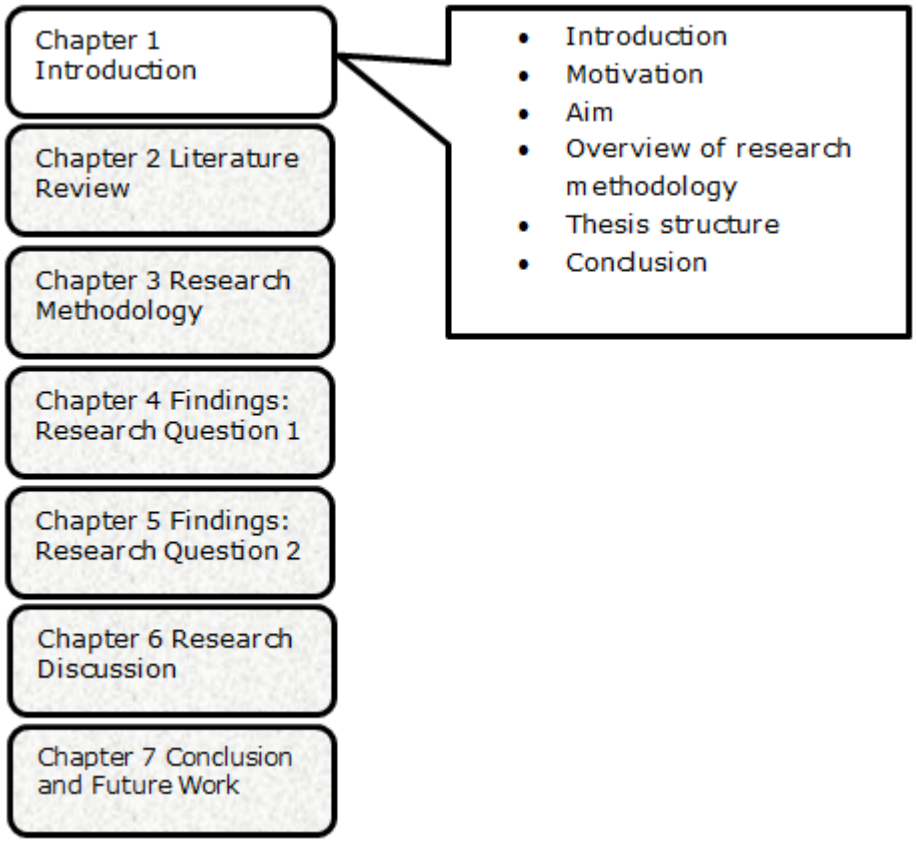

Figure 1.1 Chapter 1 Roadmap

1.1 Introduction

Cloud computing is an evolving paradigm, which allows virtualisation technologies to replace physical infrastructure thus, overall, reducing workload and overhead costs for businesses which are normally associated with managing, operating and maintaining hardware infrastructure and resources (Ivanov, 2013; Khajeh-Hosseini, Greenwood & Sommerville, 2010). Cloud computing is widely accepted now as increasing numbers of organisations have already implemented cloud-enabled infrastructures and services.

However, the influx in the adoption of cloud-based technologies poses numerous challenges to existing organisational processes and infrastructure and can be regarded as a disruptive practice (Ward, Aravamudan, Bhattacharya, Cheng, Filepp, Kearney, Peterson, Shwartz & Young, 2010). This study investigates how the adoption of cloud computing in a number of organisational contexts has impacted the work that people do.

This research shows that the impact of the migration and the key issues involved extend beyond finances and administration, and focus on how emerging IT models embedded

with cloud computing impact organisational strategy, employee skills and proficiencies, business processes, and innovation.

The original contributions of this study are:

- To highlight the factors which contribute to cloud adoption in the organisations and show that decisions on migrating existing IT infrastructure to the cloud are driven by a range of socio-technical factors.
- To show the impact on the adoption in relation to the factors associated with the initial adoption decisions.
- To describe a '*conceptual socio-technical cloud strategy framework*' to support cloud adoption in organisations.

Furthermore, the study provides guidance on modifying organisational strategies for smoother cloud integration. The study validates the experiences described in this research and contributes to the identification of some important research questions for improving growing cloud adoption among organisations.

Hence, the purpose of this chapter is to provide the key motivations behind this study (Section 1.2), the aims of the research (Section 1.3), a brief overview of the research methodology (Section 1.4) and finally to present the overall structure of the thesis (Section 1.5).

1.2 Motivation

Cloud computing has many definitions. According to Baun, Kunze, Nimis and Tai (2011) cloud computing is a 'fuzzy concept' because its definition depends on multi-dimensional viewpoints of the organisation that uses it and the purpose they use it for. Wang, von Laszewski, Younge, He, Kunze, Tao and Fu (2010) have defined the terminology *cloud* as inexpensive pervasive technology which provides easy access to a set of network-facilitated services that are scalable and can be personalised by the organisation using it. In another study, Armbrust et al. (2009) referred to cloud computing as "both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services" (p. 50).

The core concept of 'Lean Thinking' introduced by Comm and Mathaisel (2005) is congruent with this research and the hypothesis that "less human effort, less equipment,

less time, and less space – while coming closer and closer to providing customers with what they really want" (p. 135) is a best-fit technique for cloud adoption.

Most studies focus on service and deployment models that are widely used nowadays. Furthermore, many studies have been conducted on factors that drive cloud adoption barriers and issues regarding adoption.

Trigueros-Preciado, Pérez-González and Solana-González (2013) have pointed out that there is an absence of research in small and medium-sized enterprises (SMEs) which analyse the actual implementation of cloud computing in organisations. Furthermore, Benlian and Hess (2011) have highlighted that most studies lack in the detailing of the effectiveness of cloud adoption factors, their impact on organisational decision-making and response to these factors, and how organisations try to handle the arising issues.

However, this study, besides recognising the factors necessitating adoption also employs a socio-technical adoption model as used by Leavitt (see Section 2.4.4) to identify additional organisation-specific factors.

In knowing what works best for organisations the key motivations are drawn from the following points of interest:

- determining whether the driving force or the factors behind the decision to adopt cloud have the required impact
- determining whether the social and the technical components work together to deliver the functionalities required by the organisation to fulfil its business needs.
- discovering the obstacles which may arise during or after the implementation and
- knowing how work culture and performance are transformed following the implementation of the new technology.

The main focus of this research is the social aspect of people in a workplace and their involvement with the acceptability and adaptability of the technology, that being the cloud model.

This study also demonstrates that the value of the findings (outcome of the research questions) can further be tested by building and using a prototype that allows decision-makers in organisations to assess, evaluate and monitor effectiveness and risk

management in their organisation. The resulting outcomes can be used throughout the organisation as this will greatly contribute to the existing body of knowledge. Finally, this study expects to contribute to the existing body of knowledge by adding new knowledge on cloud adoption and its impact.

1.3 Aim

This research proposes to study the socio-technical impact of cloud migration and its effects on the organisational culture, people and their relationships and work performance. The study aims to answer these two main questions: (a) what are the key factors that affect cloud adoption in NZ organisations? and (b) what impact on work practices have been noted when cloud technologies are adopted in these organisations?

The objectives of using the Grounded Theory Methodology (GTM) have been to discover new emerging theories from the data rather than to compare existing theories from the literature.

The conclusions drawn from the research findings (Chapters 4 and 5) illustrate the challenges that decision-makers and employees face when assessing the practicality of the adoption of cloud computing within their organisations, and describe a conceptual socio-technical cloud strategy framework to support socio-technical issues and constraints.

1.4 Overview of Research Methodology

Central to this study is the selection of methodology. The research is purely qualitative in nature and employs GTM. GTM (see Section 3.4.1) offers a framework for qualitative analysis and is used to develop new theory based on the gathered data. The study seeks to explore the thoughts and perceptions of the participants in trying to understand the reasons behind the transition from traditional IT infrastructure to cloud-based technologies and its impact on work practices and organisational values.

Data are collected through interviews which are unstructured and all interviews are coded and analysed (see Table 1.1) through the use of NVivo10 software. NVivo10 is an analysis tool used to organise large amounts of unstructured interview data into indexed categories. Matrices such as Conditional Relationship Guideline (CRG) and Reflective Coding Matrix (RCM) are also used during the analysis stage to understand the categories and develop core themes (see Sections 3.8 and 3.9).

In accordance with the principles of GTM, the research does not make use of predefined academic theories or frameworks to begin with but instead explores this research area from a fresh perspective using an inductive approach. An inductive approach allows for extensive data sifting and repeated analysis in order to generate new theory. The lack of existing theory concerning the socio-technical impact in the areas of cloud computing adoption assessed on Leavitt's model (see Section 2.4.4) justifies the use of GTM as a suitable research methodology.

Table 1.1 Stages Involved in Data Collection

Data Collection Stages
Phase 1 Pilot Interview • Develop and test pilot interview questionnaire • Conduct a pilot interview and finalise interview questions after refining
Phase 2 Invite Potential Research Participants • Track potential interviewees and invite them to participate in this research
Phase 3 Conduct In-depth Interviews • Conduct and transcribe 12 in-depth interviews (approximately one hour each)
Phase 4 Analysis • Generate final categories and core themes based on codes • Discuss key findings from interview data and compare to literature.

1.5 Thesis Structure

This thesis is composed of seven chapters. The first chapter covers the background of the study, describes the motivations for the research and outlines the aims of the research project. It provides a brief overview of the methodology used in this study and a description of the data collection and analysis processes (see Table 1.1).

Chapter 2 provides a comprehensive review of the literature that is relevant to the main concepts involved in this research. The literature review consists of a brief introduction on cloud computing and why cloud-based technologies may be referred to as a socio-technical system which covers the social and technical aspects of this study (see Section 2.2) and the architecture which includes three types of delivery models and three service models (see Section 2.3). Furthermore it discusses some popular cloud adoption models used in organisations and proposes Leavitt's model as a suitable framework to identify and assess organisation-specific factors and impacts (see Section 2.4). Finally, it describes the factors which drive cloud adoption in organisations (see Section 2.5) and adoption challenges and implications (see Section 2.6).

Chapter 3 explains GTM and its processes in detail as applied in this research (see section 3.4). The exploratory nature of this research has to comply with a qualitative approach and hence an interpretive paradigm is used (see Section 3.3). Twelve participants took part in this research. To narrow down the scope of the study all participants are from small organisations with particular skills needed to provide the necessary information. This chapter also explains how the raw data resulting from this research have been analysed (see Section 3.6). NVivo10 software was used for data analysis in order to categorically place data into themes through three coding stages: Open, Axial and Selective (see Section 3.6.1). Two analytical matrices were also used towards the end of axial coding: CRG and RCM (see Sections 3.8 and 3.9).

Chapter 4 presents the findings of the first research question. It explains the core categories which were derived using the GTM processes. The core theme is described as *cloud adoption factors*. The following eight categories emerged: business continuity, cloud-provider service level, convenience, cost effectiveness, data centres, and freedom from maintaining IT infrastructure, speed and suitability.

Chapter 5 presents the findings of the second research question. The theme of the second question is the *impact of cloud adoption on work practices.* The following eight categories emerged: best practices used, cloud-provider service level, collaboration within company and with clients, job losses, outages by provider, policies and service-level agreements, security concerns for business-critical data and skill upgrade.

Chapter 6 provides a discussion of the two core themes and their categories that are presented in the findings of Chapters 4 and 5. The discussion is centred on Leavitt's model and its associated relationships between the four components: technology, task, structure and people. This chapter also discusses the recommendations for best practices concerned with cloud adoption and the relevance of the findings with the current literature.

Finally, Chapter 7 presents the conclusions of this research project and therefore provides the answers to the two research questions. This chapter finishes with the limitations of the study and recommends directions for further research in the field of cloud technologies with regards to the socio-technical aspects. A list of references and appendices follow. The appendices include the ethics approval letter by AUT Ethics Committee (see Appendix A), the interview questions (see Appendix B), the consent form (see Appendix C) and the participant information sheet (see Appendix D).

1.6 Conclusion

In this chapter the following has been presented: the aims, motivations and a brief outline of the research methodology.

In Chapter 2, a literature review is presented that discusses the background and architecture of cloud computing from a socio-technical perspective. This chapter shows the justification behind the selection of Leavitt's model for measuring the social-technical impact of cloud adoption. While in GTM a literature review is not acceptable, for the purposes of this study it is presented to illustrate current thinking research about cloud computing.

Chapter 2 Literature Review

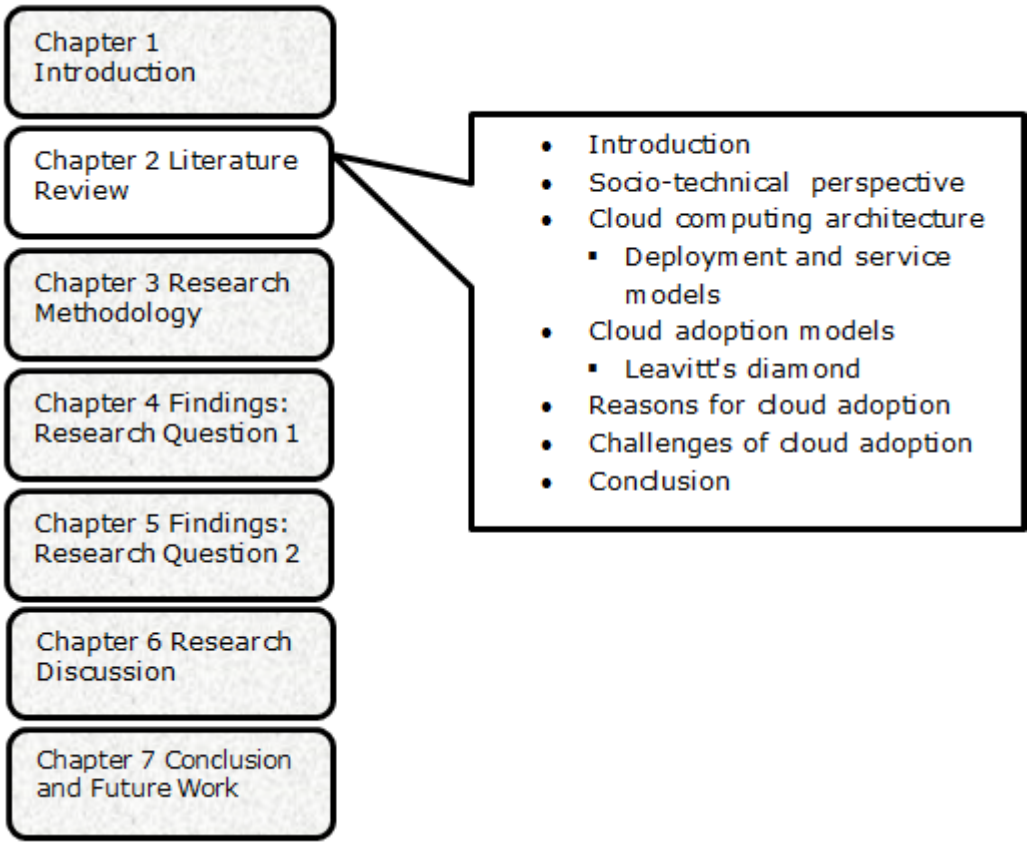

Figure 2.1 Chapter 2 Roadmap

2.1 Introduction

Cloud computing has become extremely popular and has become a major trend for organisations looking for a shift into new technology. Yet, there is a lack of empirical research on the effect of a combination of technical and social elements during the transition from traditional IT architecture to cloud based architecture as most researchers focus on technical and economic viability. While the motivations and factors for cloud adoption are extensively described in research papers and journal articles, research deficiency exists on the underlying social aspect. This chapter will focus on this gap in literature.

Broad research has been done in areas which look at factors that affect the way cloud computing adoption can transform businesses (Armbrust et al., 2009; Phaphoom, Wang & Abrahamsson, 2013; Trigueros-Preciado et al., 2013). The literature suggests several factors that play a major role in cloud computing adoption decisions. This chapter focuses on a critical review of the literature as to what cloud computing is, the factors

which determine its adoption and its impact on organisational culture. In order to better understand how individual, social and organisational factors affect the ways that work is carried out when new technology is introduced in an organisation, the study explores various viewpoints presented in academic sources.

This chapter starts with an explanation of the socio-technical aspects of systems and how they lead to structures that are more suitable to end-users and assist in organisations delivering better value to stakeholders (see Section 2.2). Section 2.3 explains cloud computing and its architecture in detail which includes three types of cloud deployment models and three cloud service categories. Section 2.4 provides an explanation of Leavitt's model which is used as a basis for this study as it encompasses the socio-technical components of an organisation and how each component is affected when new technology is introduced. Section 2.5 explains the benefits of adopting cloud-based technologies in organisations. Section 2.6 describes the issues and challenges organisations face during and after the adoption process. Finally to conclude, this chapter will present a summary of the literature review and describe the structure of Chapter 3 (see Section 2.7).

2.2 Socio-Technical Perspective

The socio-technical perspective has been influenced by the evolution of the concept of open systems (Von Bertalanffy, 1950) which directs attention to the conception that open systems must interact with their environment in order to thrive. The open systems concept considers "technical structures and work roles as two systems that were both part of one inclusive system" (Mumford, 2006, p. 321).

An open system requires that external relationships and dependencies are reflected in its environmental structure. Any modifications in external relationships require internal changes. This approach led to the advancement of a complex method for analysing work systems, starting from groups of tasks to responsibility of a work group, problem areas, coordination and control of the wider system and interpersonal relationships amongst workers (Mumford, 2006; Trist, 1981). These design principles were progressively enhanced and gave rise to socio-technical ideas.

Emery and Trist (1960) originally coined the term *socio-technical systems*, mainly to describe systems that involve a multifaceted relationship and complex interaction between people, machines and the environmental aspects of the work system. The

technical and organisational aspects of socio-technical systems must be considered together to decrease the risks of systems not making the expected contributions and ensure that the goals of an organisation are thoroughly met in terms of delivering the expected support for the real work in the organisation (1960).

The concept of socio-technical systems recognises that organisations exist in order to execute tasks. People use technology to perform sets of tasks which contributes to some overall objective of the organisation. Hence, a social and a technical system can be identified which Trist (1981) described as a joint optimisation or 'goodness of fit'. Social and technical elements are mutually interacting since one requires the other for transformation of an input into an output (Olerup, 1989).

A socio-technical system is referred to as "the interrelatedness of 'social' and 'technical' " (Walker, Stanton, Salmon & Jenkins, 2008, p. 480). The social aspect considers people and society and technical encompasses machines and technology (2008). A socio-technical system is a system that is projected to support some organisational activity (Sommerville et al., 2012). This research portrays the activity as the 'implementation of cloud-enabled technologies'. An organisation consists of managers, operators, technical support, hardware, and software. In an organisation, these socio and technical elements are crucially engaged in purposeful goal-directed behaviour on a daily basis.

Task allocation amongst employees and between employees and systems in an organisation is crucial to the system design (Waterson, Older Gray & Clegg, 2002). By having a structured and systematic design format, the task at hand would become easy to learn, operational, and require minimal training and support (Older, Waterson, & Clegg, 1997; Taylor, 2012). The task should specify what is to be done, how it is to be done and the time allocated for doing it. The success of the task is dependent on the joint effort of the employees and the management (Taylor, 2012).

Decisions on effective system designs and task allocation have a greater impact on the overall performance of the system (Corbett, 1985) and attaining job satisfaction in terms of a good fit between what they are seeking from their job and what they are required to do in their job (Chapanis, 1965; Olerup, 1989). Furthermore, Greenstein and Lam (1985) have stated that dynamic task allocation increases motivation while Waterson et al. (2002) claimed it has an impact on system improvement and practice of skills by workers.

Mumford (2006) stated that one of the main benefits of designs that are socio-technical-centric is that it creates "decentralisation of control and coordination by the user group" (p. 331). The focus in socio-technical design is on "clusters of strongly connected jobs forming a work group and contributing towards a common task which forms a whole distinguishable from other tasks in the production system" (Olerup, 1989, p. 46).

User participation lies at the centre of socio-technical systems. Baxter and Sommerville, (2011) have emphasised that user-involvement should not be seen only as a way to assist in the development of a techno-centric system but as active participants in an integrated systems development process to generate a system that takes appropriate account of social and organisational requirements.

An organisation's work system can be regarded as a socio-technical system built from two correlated systems: social and technical (Bostrom & Heinen, 1977). The social system is composed of people and their attitudes, skills, values and knowledge, the relationships between them, and rewards and authority structures while the technical system is composed of the processes, tasks and technologies needed to transform input into output (1977). Every formation or transformation of an organisation as a system must consider these two correlated systems (Nograšek & Vintar, 2011).

A major problem of measuring success in a socio-technical system is the complexity involved in establishing the evaluation criteria for the social elements of the system. It is easier to carry out benchmark tests on the technical components of the system in order to determine the appropriate criteria, such as response time, comparative effectiveness over a period of time (known as *throughput*), and cost and benefit analysis. By contrast, it is more difficult to establish if a system has increased the quality of the working life of the staff or to verify if a system is a better fit for organisational needs.

Land (2000) has suggested that measuring derived effects, such as observing the change in levels of absenteeism, improvements in health and increases in productivity may provide a solution to this problem. But it is difficult to evaluate such factors because they may be influenced by some other unknown elements and so cannot be linked to the work system and its effect. Moreover, the success or failure of the implementation may be defined by a range of stakeholders who are likely to have different perspectives of the system and different criteria for success.

Hence a model is needed that allows cloud computing to be placed into the centre of the socio-technical system as the key driver of organisational transformation.

Leavitt is regarded as one of the founders of Socio-Technical Theory as his views on organisations and socio-technical theory are heavily entwined (Grant & Mergen, 1996; Smith, Norton & Ellis, 1992; Zha & Xu, 2009). The model that has been selected for this study which describes socio-technical components of an organisation is Leavitt's model (see Section 2.4.4). The role of cloud-enabled technologies during the adoption period and their strong dependency on other elements within the organisation is the key reason which prevents socio-technical theories from providing a satisfactory account of the transformation of organisations during the adoption. Hence a model such as Leavitt's Diamond (see Figure 2.6) is used. This model allows Cloud Computing to be placed in the centre of the socio-technical system as the key component of organisational transformation.

2.3 Cloud Computing

This section provides an overview of cloud computing including its definition and a comparison with related concepts. Furthermore, it describes the architecture of cloud computing (see Section 2.3.1) and elaborates in detail the three different cloud models (see Section 2.3.2).

Cloud computing is best described as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (NIST, as cited in Zhang, Cheng & Boutaba, 2010, p. 8).

The concept behind cloud computing first originated in the 1960s but the term 'cloud' gained popularity after 2006 when Eric Schmidt, the chairman of Google, used the term 'cloud' to describe the provision of services across the internet (Zhang et al., 2010). Other technologies which share similar aspects with cloud computing are g*rid computing* which employs distributed resources at application level and *virtualisation* which allows dynamic resource-sharing by creating illusions of infinite resources to the cloud user (Fernando, Loke, & Rahayu, 2013; Zhang et al., 2010).

Cloud computing influences virtualisation technology to achieve the goal of providing computing resources at multiple levels (hardware and application platform) as a utility

and shares certain aspects with grid computing but differs from both in other characteristics. While grids enable access to shared computing power and storage capacity, the cloud enables access to leased computing power and storage capacity. Research institutes provide services to virtual organisations in grid computing while large individual companies provide cloud-based services to businesses. Grid and cloud computing aim to achieve virtualisation of resources (Dillon, Chen & Chang, 2010).

Virtualisation focuses on managing the consumption of hardware resources, particularly where consumption varies. Virtualisation is software that manipulates hardware, while cloud computing refers to a service that results from that manipulation. Feuerlicht (2010) highlights that private clouds, in its own virtualised environment, gives users more control and the flexibility of managing their own systems, while providing the benefits of cloud computing. Therefore, cloud computing offers distinct benefits and imposes unique challenges to achieve its requirements.

2.3.1 Cloud Architecture

Cloud computing employs a service-driven business model. That is, hardware and platform-level resources are provided as services on an on-demand basis.

Cloud services can be grouped into three categories: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS) which when combined is considered as the cloud architecture (Armbrust et al., 2010; Feuerlicht, 2010; Motahari-Nezhad, Stephenson & Singhal, 2009; NIST, 2014).

The extent to which the user has control over the three categories varies in terms of the type of applications, the hosting environment, storage and data facilities, operating systems, servers and network (Mavodza, 2013).

The subsequent sections explain the cloud service models in more detail.

Software as a Service (SaaS)

SaaS offers software applications as an online service rather than as on-the-shelf software packages that are installed on the user's computer. The users have to pay the vendor for subscribing to their services. An example is Salesforce.com which offers its CRM application as a service online. Google also provides online office applications such as Google Doc and Microsoft online applications include CRM, SharePoint and Office 365.

SaaS focuses on the following services: applications including archive, backup, email collaboration, customer relationship management (CRM) and enterprise resource planning (ERP), e-commerce, entertainment, social media, financial and human resources (Schulz, 2011).

With SaaS, users can customise the applications to suit their needs but do not have control over the operating system and storage or network and servers (Mavodza, 2013; Sharma & Kanungo, 2011). Hence it may be suitable for organisations who may want to lower costs associated with software purchases or need to focus on high-priority projects instead of deployment and maintenance.

Platform as a Service (PaaS)

PaaS allows the customers to use the Internet environment extensively for developing, testing and deploying their own applications and services. Examples of platforms in this category are Microsoft's Azure Services Platform (Cloud Services, 2013), Google App Engine (Appengine, 2013), and Salesforce.com platform (PaaS Overview, 2013). PaaS allows customers to choose the type of platform that best suits their needs but a high risk of vendor lock-in exists because applications are not easily portable between platforms.

PaaS focuses on the following services: developers or solution providers' development tool and environments, software for establishing cloud services (Schulz, 2011).

Infrastructure as a Service (IaaS)

IaaS offers hardware resources such as data centre, networking, physical servers and virtualisation as services to customers (Bellamy, 2013). This means that customers can run any applications they want to on the cloud hardware of their choice. Businesses can lease these resources from the cloud vendors instead of spending money on servers and networking equipment. With IaaS, customers have control over the operating system and the application environment (Sharma & Kanungo, 2011).

IaaS focuses on the following services: physical and virtual resources, servers, storage, networking, hardware and software services, management tools and policies on the leased services (Schulz, 2011).

Figure 2.2 shows a Cloud Architecture diagram and the control that the vendor and the customer have over each services component.

2.3.2 Cloud Delivery Models: Public, Private and Hybrid

Cloud computing is often categorised into the following three forms: public cloud, private cloud, and hybrid cloud.

Public Cloud

A public cloud, also known as an *external cloud*, is where the providers make their cloud accessible to the public and usually offer a self-service web portal where the users can specify their preferred range of services (Baun et al., 2011).

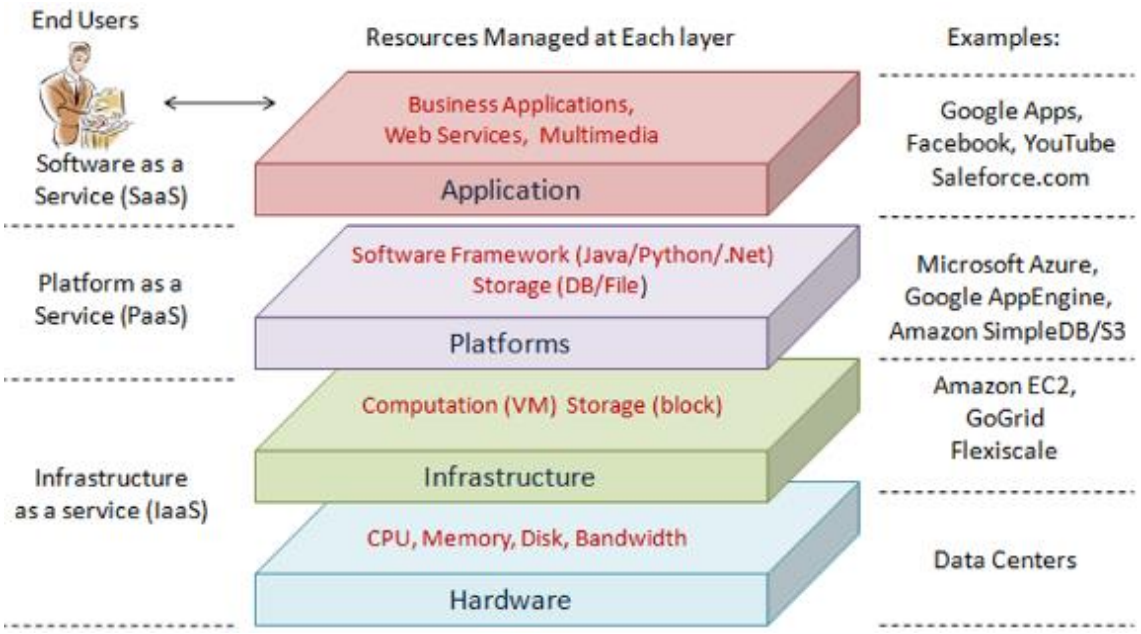

Figure 2.2 Cloud Computing Architecture
Source: Zhang, Cheng & Boutaba, 2010, p. 9

Baun et al. (2011) further explain that because services are acquired externally, there is no need for a general agreement and that the contractual requirements are always within the scope of the performance specifications. So the users only have to pay fees only for the resource used in a particular time period (Schulz, 2011).

Users of the public cloud model do not have to belong to the same organisation. Public clouds are best used in situations when employees use a standardised application such as email and when a lot of collaboration is required.

Private Cloud

A private cloud, also known as an 'internal cloud', maintains the services and infrastructure on a private network (Baun et al., 2011). For a private cloud, high levels of data control access and security are vital. A private cloud may be preferred over a public cloud due to security and privacy reasons, and control over the data which remains with the users or their organisation.

The organisation is still required to buy and maintain all the software and infrastructure. Organisations opt for private clouds when their data is their business, and so they have to conform to strict security and data privacy issues.

Hybrid Cloud

A hybrid cloud is a combination of public and private clouds and offers benefits of multiple cloud providers (El-Gazzar, 2014). A hybrid cloud model allows organisations to store sensitive client data in-house on a private cloud application, but interconnect that application to a billing application provided on a public cloud as a software service. Often a public cloud may be used to interact with the clients but keep their data secured within a private cloud. Having a hybrid model means that organisations have to keep a track of multiple security platforms and ensure that all aspects of the business are able to communicate with each other.

2.4 Cloud Adoption Models

Cloud computing adoption requires organisational readiness on multiple dimensions including process analysis and improvements, governance, cost advantages and hardware and software standardisation (Aleem & Ryan Sprott, 2012; Berman, Kesterson-Townes, Marshall & Srivathsa, 2012; Gangwar, Date & Ramaswamy, 2015). The adoption of new technology in organisations poses challenges and creates gaps that need to be addressed. For this reason, wide-ranging technology adoption models exist which inform us about the multi-dimensional nature of technology adoption such as cloud computing and the need for a comprehensive model to address the observed gaps. This section discusses four adoption models employed by organisations which focus on technology adoption and its impact. It provides the limitations of the models and why it may not be suitable for this study and substantiates the model selected for this research; Leavitt's diamond model.

2.4.1 The Technological, Organisational and Environmental Framework

The Technological, Organisational and Environmental (TOE) framework (DePietro, Wiarda & Fleischer, 1990; Tornatzky & Fleischer, 1990) is used to explain an organisation's context which influences adoption decisions using three constructs: technological context, organisational context, and the environmental context.

All three act as stimuli for technological innovation (see Figure 2.3). The technological context characterises the internal (in current use by the organisation) and external (available in the market but not in use) technologies of an organisation. The organisational context is associated with the resources and the structure of the organisation. The environmental context refers to the surrounding elements such as competitors and third parties such as service providers and government (Baker, 2012; Borgman, Bahli, Heier & Schewski, 2013).

While TOE is quite flexible (Baker, 2012) it does not have clear constructs (Wang, Wang & Yang, 2010) that address the social and cultural perspective of the adoption process.

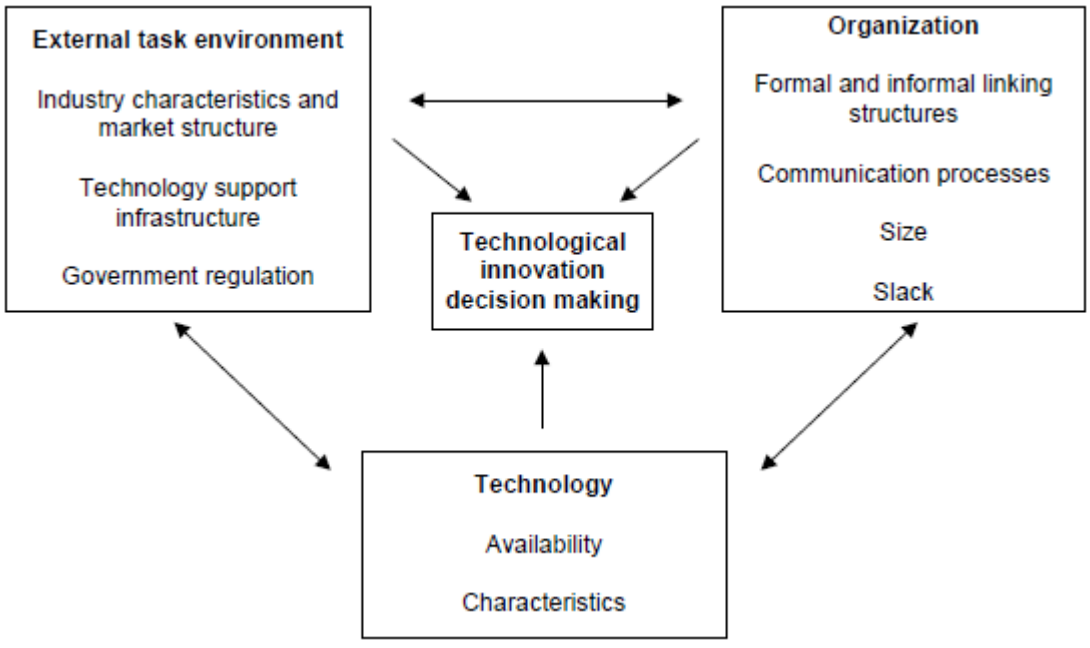

Figure 2.3 The TOE Framework

Source: Baker, 2012, p.236

2.4.2 Diffusion of Innovation (DOI) Theory

Oliveira and Martins (2011), found the TOE framework consistent with the Diffusion of Innovation (DOI) theory as it "provides a useful analytical framework that can be used

for studying the adoption and assimilation of different types of IT innovation" (p. 112). The DOI theory (see Figure 2.4) was developed by Everett M. Rogers in 1962 and considers two perspectives: the decision of an organisation to adopt an innovation and diffusion. DOI theory considers diffusion as the "process in which an innovation is communicated through certain channels over time among members of the social system" (Rogers, 2003, p.5). DOI theory contains five attributes – "relative advantage, compatibility, complexity, trialability and observability" (Rogers, 1983, p. 16-17).

To describe this further, relative advantage is the degree to which innovation is perceived as better than the idea it supersedes; compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experience and needs of potential adopters; complexity is the degree to which an innovation is perceived as difficult to understand and use; trialability is the degree to which an innovation may be experimented with on a limited basis; and observability refers to the degree to which the results of an innovation are visible to others (Rogers, 1983).

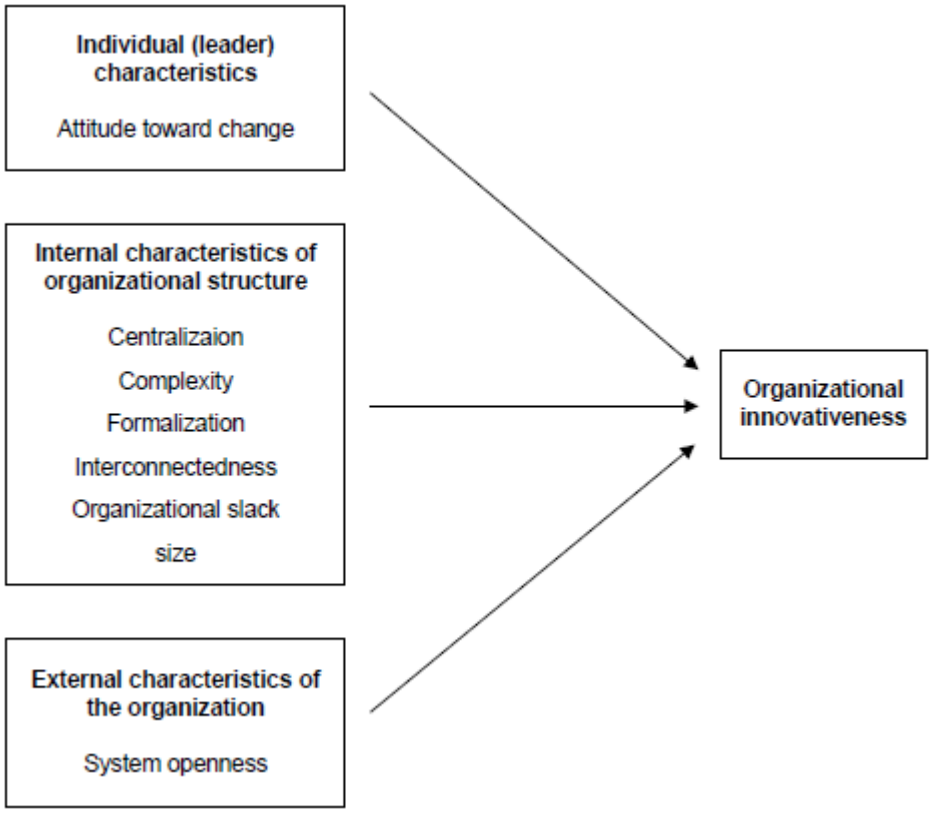

Figure 2.4 Diffusion of Innovations

Source: Rogers, 1995

The diffusion process begins with the spreading of the innovation (that is, a targeted approach to increase awareness of an innovation such as a CSP introducing a new

cloud-based service into the market. This is followed by the actual adoption decision of an organisation, for example, decision-makers decide to use the new service to reduce costs or overcome competitive pressure. The acquisition, implementation and the actual and continued use of the innovation completes the adoption process (Reinhardt, Hietschold, & Spyridonidis, 2015).

While DOI is a very robust model, this study does not measure the speed of the rate of innovation at different stages of adoption. Hence, all of the five attributes cannot be tested fully.

2.4.3 Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Fred Davis in 1986. TAM is one of the most widely used models and shown to have a high validity across various studies (Bt Mustafa, Harun & Endin, 2014; Chau, 1996; Money & Turner, 2004) and compares favourably with alternative models (Venkatesh & Davis, 2000). TAM uses two determinants (see Figure 2.5) to explain how and when users decide to accept and use a technology.

They are: (a) perceived usefulness (PU) defined as “the degree to which a person believes that using a particular system would enhance his or her job performance" and (b) the perceived ease-of-use (PEOU) defined as "the degree to which a person believes that using a particular system would be free from effort"(Davis, 1989, p.320).

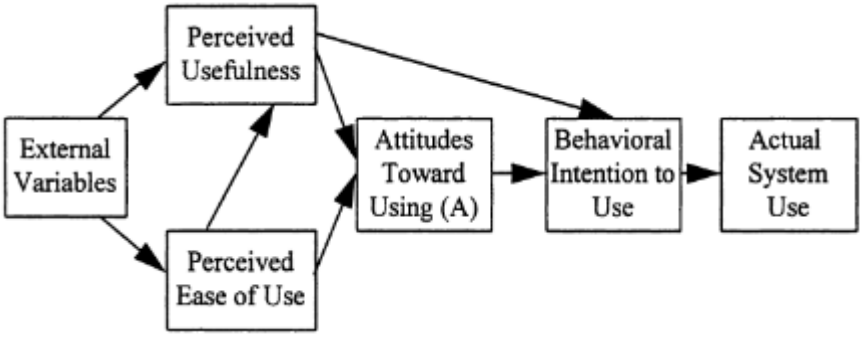

Figure 2.5 Technology Acceptance Model

Source: Davis, 1989

Chau (1996) has emphasised that attitudes towards using a technology have a direct influence on behavioural intentions. Thus while the focus is on training users in a technology and how the training many be beneficial, the delivery of technology must also be emphasised. He further stressed that the direct effect of ease-of-use diminishes over time as users become more familiar with the technology.

The TAM model has been extended to TAM2 by Venkatesh and Davis to further explain PU and PEOU in terms of social influence and norms, job relevance and output quality. Job relevance is a function of the "importance within one's job of the set of tasks the system is capable of supporting" (Venkatesh & Davis, 2000, p.191) and output quality refers to how well the system performs the tasks when matched against job relevance (2000).

According to Gangwar et al. (2015) external variables in the extended models of TAM are not clearly defined but can be strengthened if combined with TOE model. This is not simple as the variables and constructs vary across each context of the two models (2015). Hence, this study does not adopt the TAM model.

2.4.4 Leavitt's Model

Leavitt conceptualised four components - People, Task, Structure, and Technology - to form Leavitt's Diamond (Leavitt, 1964). He emphasised that any change in any one of these components will have a direct effect on all the other parts, initiating further changes to accommodate for that one change. This model is used for managing change in an organisation.

It is the interaction between these four parts that determines the fate of an organisation. The technical aspect is concerned with the tasks, structure and technology and the social aspect is concerned with the people and organisational structure such as culture, norms, skills and values.

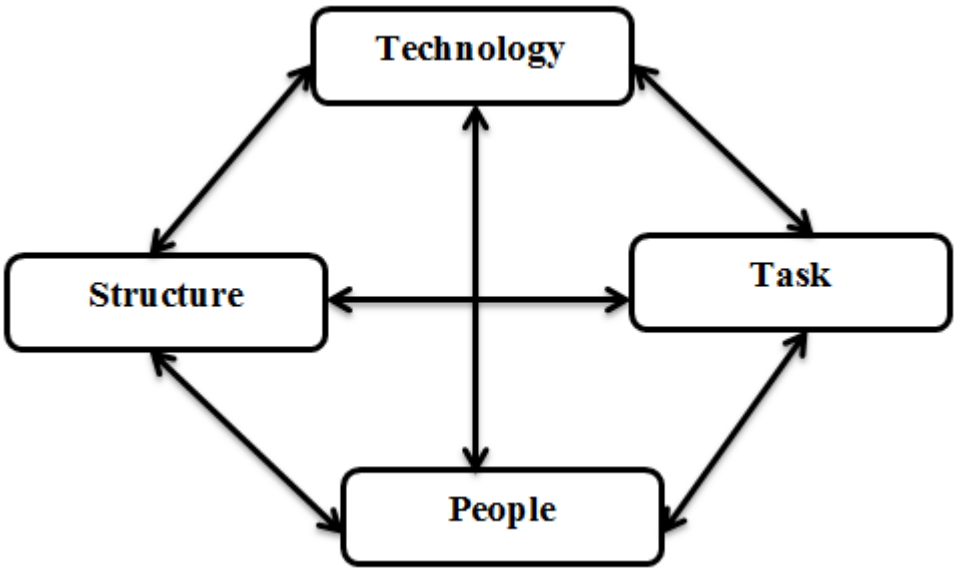

Figure 2.6: Leavitt's Diamond Model
Source: Leavitt, 1964

This section explains in detail the four components of Leavitt's model and how they interact with each other.

People are defined as the employees of the organisation. For this component, employee roles combined with their skill sets, competence, knowledge and productivity are considered to be key aspects. People perform the tasks in an organisation.

Technology is that component of the organisation such as hardware and software applications and data centres, which provides support to or facilitates the employees to perform tasks.

Task is the component that looks at how things are being done, their relevance and their benefits, the processes being used to carry them out and what is the organisation trying to achieve (productivity).

Structure is the component which shows the levels of hierarchy within an organisation. It includes the relationships, communication and organisation between the managerial, departmental and employee levels. Structure defines a clear level of power and accountability within the organisation (Appelbaum, 1997; Bostrom, & Heinen, 1977; Leavitt, 1964).

Table 2.1 presents an example of the modifications made to technology and subsequent changes in the other three components.

Table 2.1 Example of Modification of Component Technology
Source: Nograšek, & Vintar, 2011

People	**Tasks**	**Structure**
Technological shifts may require extensive training of employees so they can efficiently handle the new technology. This could also lead to hiring new or experienced and specialised employees.	A technological shift may entail in changes to the way tasks are conducted. It may elevate goals or change goals completely to reap benefits and be productive.	New technology may require a makeover in organisational structure to benefit from the technology upgrade. Jobs may be lost or interdepartmental coordination may change.

The different perspectives of these four components with regard to the socio-technical aspects are taken into account for this study. Technological modifications or new innovations, such as adoption of the cloud, may have a direct bearing on issues of

people skills, and roles in organisations, and also on authority and personal and professional fulfilment (Bass & Leavitt, 1964; Leavitt, 1964). A radical shift towards change in organisation signifies that employees are “developing means for predicting technical and educational qualifications that will be needed in the future” (Bass & Leavitt, 1964, p, 17) and may become “increasingly concerned about social implications, well beyond the bounds of their own individual firms, of what may be a generally reduced need for people of "lower skills"” (Bass & Leavitt, 1964, p71).

Furthermore, the implementation of new technology or modification of existing technology within the organisation almost always results in a significant impact upon the business policies and structure, its financial performance and the employees’ working conditions (Doherty & King, 2005; Markus & Robey, 1983).

Thus, Leavitt’s Diamond model (see Figure 2.6) is in line with this research and is used to measure the changing dynamics between the four organisational dimensions. The organisation is conceptualised as a diamond and used to show the relationships between various aspects of the organisation using the four dimensions.

2.5 Reasons for Cloud Adoption

According to recent studies, organisations are becoming progressively more aware of the many benefits offered by cloud computing and are gradually adopting cloud solutions to reduce IT costs, improve business agility, enhance flexibility and scalability and develop collaboration with stakeholders (Bharadwaj & Lal, 2012; Pyke, 2009).

Based on the literature review and theoretical background, six key constructs have been identified to be key reasons for businesses to shift to the cloud. They are competitive pressure, cost reduction, CSP credibility, compatibility, better collaboration and suitability. The following subsections explain them in detail.

2.5.1 Competitive Pressure

Competitive pressure is a strong motivation to adopt relevant new technologies (Alshamaila, Papagiannidis, & Li, 2013). External factors such as competition from other organisations and market demands have a direct effect on an organisation’s decision. Competition exerts strong pressures on organisations to search for new alternatives to improve their production.

Rader (2012) has suggested that competitive strategies increase the value of what organisations can do with the new cloud technology that they could not do before. He further emphasised that competing organisations "can reach global labour markets – best talent, best rate, pay for use, no overhead costs – and supply sources, execute work around the clock, and tap extra capacity for short-duration projects" (p. 39). This is crucial in bringing newer innovations in products, processes, promotion, advertising and costs that move the competing organisations to an increased level of overall performance.

To enhance competitive advantage, developing cloud computing capability is an important undertaking because it is not only rapidly changing the way that enterprises do business, but it is also becoming a more integral part of an organisation's business tactics (Pyke, 2009).

2.5.2 Cost Reduction

Cost is a key reason for many organisations to adopt the cloud (Berman et al., 2012). One of the main reasons why organisations are shifting towards the cloud is because it enables an organisation to reduce overheads on IT and focuses on delivering support applications rather than developing and maintaining extensive large-scale IT systems (Bellamy, 2013; Feuerlicht, 2010).

For an organisation, buying hardware and maintaining in-house data centres is expensive. Through third party cloud infrastructure solutions, many benefits in terms of cost are possible as organisations have more choice over pricing models of cloud services (Khajeh-Hosseini et al., 2010). The pay-per use mechanism of cloud services are more favourable than installing and maintaining equipment on-site (Armbrust et al., 2009; Rader, 2012). By freeing up internal resources the organisation saves a lot by automating services through the cloud (Low, Chen & Wu, 2011).

2.5.3 Compatibility

One of the key factors in adopting cloud computing is compatibility (Wang et al., 2010). According to Rogers (1983), compatibility signifies the degree to which innovation fits with an organisation's existing values, previous practices and current requirements. If cloud-based technologies are incompatible with an organisation's existing system, major adjustments in processes that involve considerable learning are required.

2.5.4 Cloud Service Provider Credibility

Credibility forms part of the overall prestige of an organisation which provides cloud services. Provider credibility is crucial in reducing both privacy risk and consumer security and reliability concerns. Credibility of the service provider can be described in terms of their expertise and trustworthiness (Bharadwaj & Lal, 2012).

An organisation's honesty, reliability, trustworthiness, and dependability with respect to carrying through on service premise, is described as expertise (Newell & Goldsmith as cited in Bharadwaj & Lal, 2012, p. 124).

Habib, Hauke, Ries and Mühlhäuser (2012) have indicated that consumers must have sufficient information for reliably predicting the quality of services and establishing trust in its provider. Trust also requires the provider to have well defined policies that follow known standards (Srinivasan, 2014).

As a part of their Trusted Cloud initiative, Cloud Security Alliance (CSA) has formulated a self-assessment framework for cloud providers to publish their cloud platform's security controls and capabilities (Habib, Varadharajan & Muhlhauser, 2013).

2.5.5 Suitability in Terms of Range of Services Available

Before implementing cloud technologies, organisations need to consider the specific context of the service, the inherent information risks and the needs of the user. When selecting Cloud Computing Services, organisations should consider a range of supplier information assurance issues including user and employee access control, protective monitoring, collection of digital evidence, clarity on roles and responsibilities, having a security incident management policy, organisational standards for data encryption, and a sanitisation policy to ensure that data is securely removed when the use of the cloud service ceases (Bellamy, 2013).

2.5.6 Improved Collaboration

Cloud computing helps improve virtual communication, exchange of information and collaboration within teams (Brown, 2013) and lessens issues like travelling expense and added technical costs or time issues (Tantatsanawong, Kawtrakul & Lertwipatrakul, 2011). Better collaboration through use of cloud improves process efficiency and reduces costs. Organisations can easily communicate with multiple projects teams

spread across the country. Group collaboration becomes easier through document sharing. Since the documents are hosted on the cloud any device with Internet connectivity will allow access. Collaboration can happen amongst multiple users, simultaneously in different geographic location (Miller, 2008).

2.6 Challenges of Cloud Migration

The migration of long-established IT networks and infrastructure - in which systems directly control IT procurement, deployment, operation, management, and utilisation - to a cloud computing model holds many challenges. These difficulties are multi-dimensional as they involve financial, technical, operational and organisational aspects.

With the increasing use of Information Technology (IT) in areas such as remote access, collaboration and eLearning, there is always the need for organisations to upgrade to newer less costly technologies. While most conventional forms of IT infrastructure frameworks meet requirements for organisational development and progression, they still lack in the ability to foster the changes in the growing demands, such as providing remote access to networks through a Wi-Fi enabled iPad or iPhone, tablets and laptops or have enough data storage in terms of company expansion. Many issues and challenges arise when organisations try to provide a fully configured and efficient network performance. It is anticipated that a lot of hardware and computers in use currently will become outdated soon as most platforms and services become directly accessible from the cloud (Xiao et al., 2011; Wang et al., 2010).

As outlined in Section 2.5, organisations can leverage considerable benefits by switching to applications run in the cloud but a number of concerns contribute to the adoption decision. According to Habib et al. (2013), confidence in the new technology still has to grow.

Khajeh-Hosseini et al. (2010) have raised a number of socio-technical issues linked to the cloud migration from traditional IT services. These are described as: too much dependency upon the cloud service provider by in-house IT personnel, a lack of in-house knowledge and awareness of cloud operations leading to over-use of resources to carry out the migration and overcome problems that emerge after the migration, a longer time to resolve customer issues by the organisation's customer representatives since their queries may require involvement from the external cloud services provider and

finally, a reduction in job satisfaction for IT personnel due to the change in role from a hands-on practical role to overseeing external service providers.

Armbrust et al. (2009), have also identified several specific obstacles regarding the adoption of cloud-based services, namely availability, data lock-in, data confidentiality and auditability, data transfer bottlenecks, performance unpredictability, scalability storage and software licensing

The following subsections address a number of major problems and unexploited opportunities regarding the implementation, effective operation, and use of cloud infrastructures.

2.6.1 Security and Privacy

One of the major cloud migration challenges is security (Andrikopoulos, Binz, Leymann & Strauch, 2013; Pearson, 2009). Vulnerability of data being hosted by the cloud provider opens up security risks. Exposure or defects in one organisation's applications could negatively affect other applications hosted by the same service provider leading to vendor management issues (Freedman, 2009). Lack of control over the physical infrastructure leads to most of the security and privacy issues in cloud computing which in turn leads to legal issues such as data protection and software licensing risks that are affected by a cloud's physical location (Khajeh-Hosseini et al., 2010).

Armbrust et al. (2010) have stated that cloud computing is "the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services" (p. 50). Data centres hold information that businesses would more traditionally have stored on their computers and servers. Since data are being outsourced, this raises serious concerns regarding data privacy protection.

Freedman (2009) has emphasised that service agreements must be fully met by cloud providers when organisations identify what is required to integrate the cloud service with their existing IT infrastructure and that a proper policy which describes the infrastructure, application and the security that is required of the service provider reduces technical integration risks.

2.6.2 Compliance Issues

Compliance is seen as a major issue for cloud adoption (Andrikopoulos et al., 2013). A NZ Cloud Computing Code of Practice has been developed to address similar concerns around the integrity of cloud computing and to provide consistent standards of adherence by cloud providers (NZ CloudCode, 2015). Although supported by leading NZ cloud providers as well as international cloud leaders such as Microsoft and Google the code of practice is voluntary. It is not clear if cloud computing will follow or infringe code of practice especially in cases like organisations storing data on third-party facilities that are shared with other organisations.

Learning to cope with new ways of managing information on the cloud is another issue faced by organisations being no longer in charge of software support and hardware maintenance (Khajeh-Hosseini et al., 2010).

2.6.3 Reliability of Services

Reliability and dependability of services by CSPs are key issues for organisations. Losing Internet connectivity and organisations being subject to outages raises questions about reliability and network dependency. Loss of services can be caused by power failures, hardware faults, software bugs, network outages or security breaches and the compensation provided by the CSP may not reflect the actual cost to an organisation in terms of lost revenues or damage to customer relationships. Compliance with service quality criteria needs to be measured in a systematic way and standards for cloud architectures to be established (Hill, Hirsch, Lake & Moshiri, 2013; Yang, Wallom, Waddington, Wang, Shaon, Matthews, Wilson, Guo, Guo, Blower, Vasilakos, Liu & Kershaw, 2014).

2.6.4 Cloud Interoperability Issues

Cloud interoperability refers to the ability of applications, operating systems, management tools and workloads to move from one cloud provider to another as per organisational requirements (Dillon et al., 2010).

Organisations face many obstacles when moving applications between clouds, such as, rebuilding applications, setting up the same network support as the previous cloud, setting up security to match the capabilities provided by the new cloud provider, managing the applications running in the cloud environment and handling data

movement and the encryption of data during transfer from one cloud provider to another (Di Martino, 2014; Mezgár & Rauschecker, 2014; Ranjan, 2014).

Standardisation techniques to allow secure, portable, efficient, and generic format for packaging and distributing applications has been offered as a solution to reduce interoperability problems. (Di Martino, 2014; Dillon et al., 2010; Ranjan, 2014) Overcoming interoperability challenges may create a resource-sharing environment consisting of multiple cloud data centers by different CSPs (Ranjan, 2014). Standardisation also prevents vendor lock-in issues (Mezgár & Rauschecker, 2014).

2.6.5 Data Management

Data loss is another key issue for organisations opting for cloud. Maintaining the integrity of data through proper control and access is of utmost importance to an organisation especially if it has a third party access (Hill et al., 2013). Yang et al. (2014) have suggested that data be replicated across multiple CSPs in order to mitigate for loss of service or corruption while Halpert (2011) recommended a proper audit to ensure operational integrity and customer data protection are addressed for cloud based resources. An audit may expose effective ways to evaluate the data security and management practices of cloud-based services (2011).

Location of data storage in the cloud is another concern for organisations. Differing legal requirements in countries with respect to data privacy and protection may require that organisations store data within the country. Since CSPs are responsible for storage and backup of data and ensuring high service availability, they might choose locations that are geographically apart making it difficult for organisations to know where their data is stored (Srinivasan, 2014).

Andrikopoulos, Binz, Leymann and Staruch (2013) have emphasised that trust in the cloud provider depends on two aspects: (a) how long the data is available in the cloud and (b) how to reliably erase it. The provider has to build this trust by setting up suitable mechanisms for management of data and in particular, ensuring that all duplications, backups, and archived records are reliably destroyed as well. This is important in cases where a client has to change the provider because the provider has been acquired by a competitor of the client. Data deletion is also imperative in situations where data is only temporarily migrated to the cloud to cover peak loads. Many cloud providers fail to provide information on data deletion (Andrikopoulos et al., 2013).

2.7 Conclusion

This chapter has reviewed important points which are the socio-technical perspective, cloud architecture which include the deployment and service models, four different types of cloud adoption models, including Leavitt's model which was selected for this study, and reasons for cloud adoption benefits and challenges. The literature was reviewed in order to understand and identify the method, the appropriate model, and concepts that could be applied to this study.

It was found that many organisations meet their technical requirements but fail to be productive because the relationship between the organisation, the people creating and endorsing business processes and the system that supports these processes are not properly considered (Norman, 1993; Sommerville, 2012). Hence, Leavitt's model was chosen to identify the interaction and changes between organisation, structure and people when a new technology was introduced.

To make important decisions about cloud adoption and use, organisations need to consider the benefits, shortcomings and the consequences of cloud computing for their organisations and usage practices. Fellowes (2008) emphasised that cloud adoption within the organisation is very much reliant on the maturity of the organisational, technical and cultural processes including legislative standards. Hence, the first research question is derived, indicating the importance of the factors which affect decision making during cloud adoption.

Joint (2009) emphasised that many organisations when opting for cloud-based technologies are not fully aware of the effects after implementation. Joint further stressed that once these effects are recognised and ways to tackle the cause of these effects are dealt with clearly, organisations can make more informed decisions about using cloud computing services. Reviewed literature revealed the need to derive the second research question in order to find the impacts of the cloud adoption in organisations and how it affects work practices from a socio-technical perspective.

Chapter 3 explains in detail GTM as the chosen methodology and why it is best suited for this study. This chapter discusses similar published work on GTM including the research model and its processes, data collection through interviews, and strategies for data analysis.

Chapter 3 Methodology

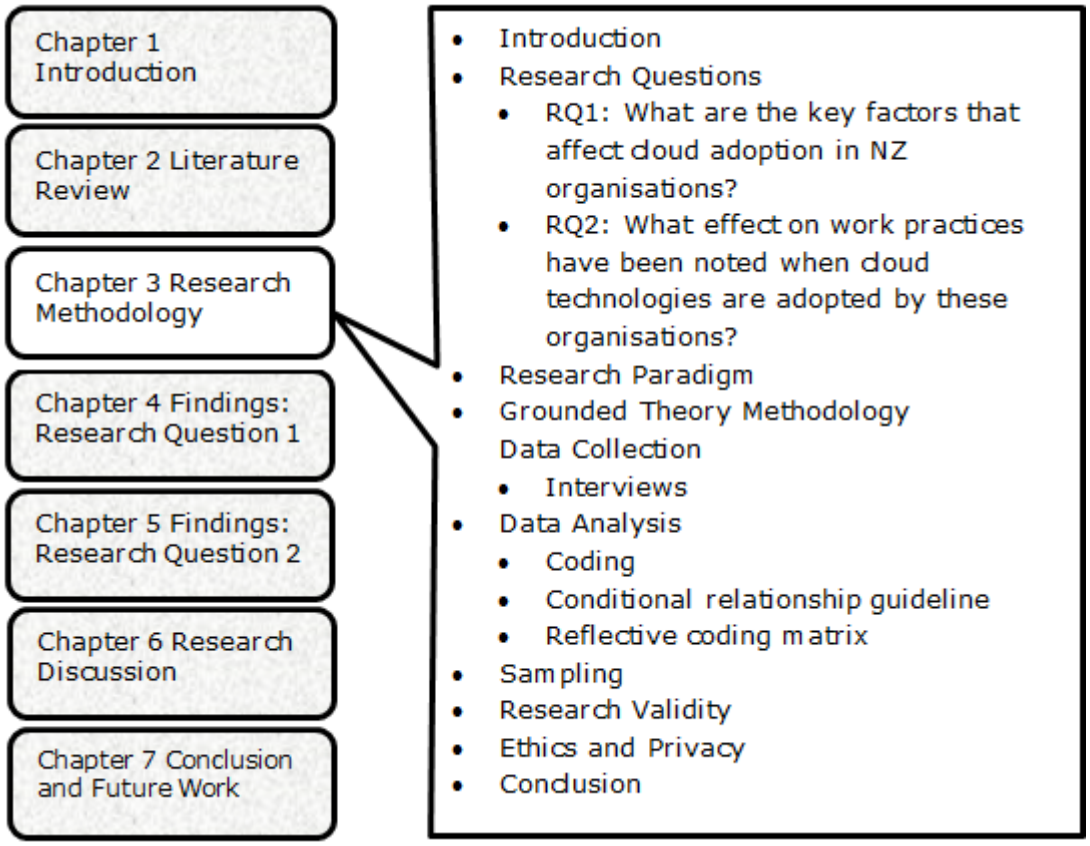

Figure 3.1 Chapter 3 Roadmap

3.1 Introduction

Chapter 2 reviewed literature relating to cloud computing architecture, the socio-technical perspective of adopting a new technology such as cloud computing, benefits for organisations which adopt cloud technologies and the associated risks and challenges. This chapter pointed out the relevance of this study in terms of deriving the two research questions.

In Chapter 3, the argument is made for the selection of grounded theory as a method for building a new theory to explain phenomena observed in cases where cloud computing applications have been adopted by organisations.

This chapter describes in detail the research methodology used for this study. A grounded theory approach, which guides the data collection, analysis and finally emergence of theory, has been chosen for this research. The justification as to why this methodology is best suited to this research is also explained.

The basis of the two main research questions and the subsidiary questions are provided first (see Section 3.2). The research paradigm, which is interpretive, is explained next (see Section 3.3). Then some background information on GTM including its different approaches and evolution over the years is provided (see Section 3.4). Section 3.5 describes the data collection stage for this study, which consisted of in-depth interviews. Then, the data analysis approach for the collected data is explained which includes all the coding phases (see Section 3.6) and then a description of the two research instruments applied, namely the *conditional relationship guide* (CRG) and the *reflective coding matrix* (RCM) are presented (Section 3.7). Section 3.8 provides the sampling techniques used in this study. Finally, the measure of the validity of this study is clarified (Section 3.9); this is followed by the ethical and privacy considerations (see Section 3.10) and conclusion (Section 3.11).

3.2 Research Question

This research explores on organisational perceptions of the adoption, use, and role of the cloud. Moreover, this research proposes to study the socio-technical impact of cloud migration and its effects on the organisational culture, employees and their relationships and work performance.

The following questions form the basis of this research:

1. ***What are the key factors which affect cloud adoption in NZ organisations?***
2. ***What effects on work practices have been noted when cloud technologies are adopted by these organisations?***

These two main research questions engender other subsidiary questions (please refer to Appendix B) to allow for an in-depth understanding of ideas, views, and work-related or individual experiences shared by the participants during the data collection and analysis processes. The approach while conducting the research is passive so as to let the theory emerge on its own rather than through probing (Strauss & Corbin, 1990). The research questions necessitate the need to know how research participants construct their view of reality.

The rationale behind the two questions was explained in Chapter 1 (see Section 1.2). This study provides an in-depth understanding of views and perceptions regarding cloud adoption at an organisational level, and identify the key factors and impacts of cloud adoption through qualitative research, which may help to promote successful operations

within organisations. By creating an alignment of the views and perceptions at an organisational level with a *conceptual cloud adoption framework* (see Figure 6.2) that supports organisational needs, it is expected that new theory or differences between the literature and real-world practices may emerge.

3.3 Research Paradigm

This study uses a qualitative approach. According to Myers (2009), qualitative research can be either positivist or interpretive. In positivism, theory is tested in an attempt to understand phenomena, while interpretivism attempts to understand phenomena through the meanings that people assign to them. This study aims to focus on the meaning in the context as described by Bryman and Bell (2007) and hence follows an interpretivist approach. The research analysis is interpretive and is an attempt to understand the meaning of phenomena through descriptions provided.

An interpretive approach relies on methods like interviews and observations. These methods ensure an adequate dialog between the researcher and the research participants in order to collaboratively construct a meaningful reality. Qualitative methods are interpretive and allow meanings to emerge from the research process (Denzin & Lincoln, 2011; Guba & Lincoln, 1994). The interpretivist paradigm emphasises qualitative research methods where words and descriptions are used to describe situations. Interpretivism aims to understand (Lather, 2006)

This research study conforms to an interpretive paradigm because it allows the participants to explain their views based on their individual understanding of requirements in relation to the cloud adoption process. An interpretive paradigm supports the qualitative research methodologies that focuses on active and descriptive methods of collating and analysing and hence is more suited to this study. According to Cohen, Manion and Morrison (2007), “interpretive approaches focus on action” (p. 20) and should be through the “eyes of the participant rather than the researcher” (p. 21). Hence, the data collated are from participants’ personal experiences rather than some imposed thoughts or beliefs from outside and the task of the researcher is to accurately represent the participants' intentions. The tasks and practices based on organisational structures are described through an interpretive process.

Walsham (1995) emphasised the importance of using interpretive investigations for research that involves addressing social issues and focuses particularly on human interpretations and meanings, which is similar to what this study concentrates on.

Interpretive research does not predefine dependent or independent variables or set out to test hypotheses, but targets an understanding of the social context of the phenomenon by focusing on the complexity of the human evaluation and interpretation as the situation emerges (Kaplan & Maxwell, 2005; Walsham, 1995).

Walsham (1995) has pointed out that an interpretive study involves the challenging task of accessing other people's interpretations, filtering them and providing feedback on a version of events back to others. Knowledge is gained, or at least filtered, through social constructions such as language, consciousness, and shared meanings (Klein & Myers, 2001). One advantage of an interpretive approach is when the researcher is not seen as having a direct personal stake in the various interpretations and outcomes, and thus participants will often be relatively frank in expressing their views, provided a rapport based on trust can be established (Charmaz, 2006; Walsham, 1995).

Grounded theory resonates with the processes of interpretive research (Hughes & Jones, 2003). According to Hughes and Jones, both constant comparative analysis, which is a technique for identifying conceptual categories that may be embedded in the data, and development of a hierarchy of integrated categories through data analysis techniques linked to qualitative inquiry such as open, axial and selective coding are described as interpretivist. This study employs these processes.

The next section explains the GTM in detail.

3.4 Research Methodology

This research is qualitative in nature and uses Grounded Theory as its underpinning methodology. The study has been initiated from an underlying interest in cloud technologies and the study provides the opportunity to observe the actual effects on participants, which is a view supported by Marshall and Rossman (1999).

The quote from Marshall and Rossman captures the essence of when to apply a qualitative methodology to a research project. “In qualitative enquiry, initial curiosities for research often come from real world observations emerging from the interplay of the researcher’s direct experience, tacit theories, political commitments, interest in practice

and growing scholarly interests" (1999, p. 25). Furthermore, they also listed the following characteristics of GTM and which are in line with this research:

- emphasis on daily life experiences (employees provide information regarding cloud implementation and the skills they had to acquire along the way as well as the challenges they faced),
- emphasis on valuing participants' perspectives,
- enquiry as an interactive process between researcher and participants,
- description
- trust in participants while interpreting data (there is no way to exclude biased views),
- problems brought into focus through tacit theory (one's personal understanding) and formal theory (from the literature review) , and
- ideas are refined, conceptual ideas categorised and theories developed

Hence, the qualitative methodology is most appropriate for this study as it is focused on carefully chosen participants who could provide in-depth information of their perceptions, experiences, ideologies and beliefs.

The reason for choosing GTM was to "gain a fresh perspective in a familiar situation" (Stern, 1980, p. 20) because its processes do not bind themselves to age-old or existing assumptions. In other words, theory is not verified, it emerges. The study seeks to find the refined viewpoints of participants and explain what develops. From the information gathered, selected keywords or phrases are emphasised, and then categorised and finally a framework or model is used to derive a definitive pattern.

The next subsection explains grounded theory in detail and illustrates the model used to conduct this study (see Figure 3.2).

3.4.1 Grounded Theory

Grounded theory was originally developed by sociologists Barney Glaser and Anselm Strauss in 1967. It is a qualitative research methodology built on conceptual aspects of categories by systematically acquiring and analysing data which eventually leads to the discovery of theory (Glaser & Strauss, 1967). Since its origination, GTM has undergone many different interpretations and adaptations.

A divergence between Glaser and Strauss occurred in the 1980s, after which Strauss along with Corbin, developed a different viewpoint on GTM (Corbin and Strauss, 1990; Strauss and Corbin, 1998). Depending on the experience, views and values of the researcher, for Strauss the emphasis is placed on the researcher actively acquiring theory from data and allowing the researcher to place the focus on different aspects of the data collected. On the other hand, Glaser emphasised the emergence of data and the data offering the same factual meaning to every researcher as impartial truth (1978, 1992, 1998 & 2001). For Strauss it was the importance of validation criteria and a systematic approach whereas Glaser emphasised creativity within a clear set of phases. Hence, the two approaches to GTM vary in process, analytical technique and outcome.

The main reason for this being the preferred methodology for this study is to form or derive theory from the patterns of a set of potential themes that the interview data generates and draw inferences from the patterns available. According to Charmaz (2000), categories are grounded in the data, not from ideas that pre-exist or from the implications that the researcher may impose on the data.

With grounded theory, meaning which is grounded in the data takes its place in emerging theory. Glaser (1998) emphasised that emerging theories come from an exploration of what is going on throughout a particular area of research, rather than seeking to align the data with logical or existing patterns of thought. Hence, forcing empirical data to match an existing body of knowledge is to be avoided, when deriving patterns and developing categories.

The focus of this research is on classifying participants' concerns regarding cloud adoption and how they perceived the problem and resolved it. Thus, research issues become known from data collected in the participant interviews (Glaser, 1992).

Grounded theory does not support a review of the literature as its initial phase of research. Glaser (1978) stressed that a literature review should not be conducted until after the coding process has finished and initial findings have been made in order to protect the researcher from predetermined ideas. In this way, the researcher has the liberty to enter the research field and discover the main concerns of participants and analyse the ways they resolve these problems and is not in any way hindered by the development of research problems, theoretical considerations or literature review. Charmaz (2006) on the other hand has argued that delaying the literature review contradicts traditional requirements for reporting research.

As per the requirements of AUT's research and ethics committee, a preliminary literature review was undertaken before the interviews took place. The aim was to find out if similar areas of research had been conducted or not. This research, however, aims to uphold the integrity of GTM. So in order to maintain validity, a comprehensive literature review was conducted after writing up the findings of this research. This reduced the possibility of bias with respect to forming preconceived opinions about the research topic.

GTM aims to focus on participants' perceptions of cloud adoptions and the issues faced, and explore the subject area through the participants' eyes through its processes. With cloud infrastructures already in existence globally, the adoption process in NZ is known to be increasing and now appears to be a good time to establish some foundational understandings of what factors are taken into account in cloud adoption and how these are perceived.

Urquhart (2001) stresses that grounded theory is a rigorous, time consuming method and demanded a chain of analysis, particularly in the transcribing, coding and comparing associated with the data analysis. So it had to be applied in the 'correct' way signifying that GTM processes must be followed closely (Hughes & Jones, 2003).

Keeping the GTM challenges in mind, a research model was developed to follow processes associated with grounded theory which could stimulate the researcher to discover the underlying assumptions, the contexts and the experiences of those involved in the study and to encourage research participants to question their own underlying assumptions through self-evaluation.

Figure 3.2 illustrates the GTM model used for this research. The model draws on three frameworks for guidance in the research. The open and selective coding processes are adopted from Glaser and Strauss (1967); the constant comparative analysis method from Glaser (1998); and axial coding from Strauss and Corbin (1990). The framework has four processes: data collection, coding processes, analysis strategies on coding and theory emergence.

The initial stage of the model was data collection through interviews (see Section 3.5.1). The interviews were then transcribed. As part of the analysis process, the transcribed data went through three stages of coding: open, axial and selective (see section 3.6.1). At the axial stage of coding, the two matrices CRG and RCM were applied (see Section

3.7) and constant comparative analysis (see Figure 3.4) were performed as a measure to strengthen the categories and themes that emerged in the final stage of the coding process. The stages depicted in Figure 3.2 are explained in the following sections.

3.5 Data Collection

The initial stage of this study was data collection. Data was collected via unstructured open-ended recorded interviews that were transcribed prior to analysis. In order to construct and finalise the interview questions, a pilot interview was also conducted. The pilot interview gave an indication of what kind of subsidiary questions the key questions could lead to and also assisted in removing the inappropriateness of the proposed questions. The interview process and the pilot study are explained next.

3.5.1 Interview

According to Bryman and Bell (2007), the most commonly used data collection technique in qualitative research is interviews. Bell (2005) stated that a major benefit of having interviews is the *adaptability* of the process, as it encourages the research participants to convey their points of view openly. The method for gathering data was through a series of unstructured interviews.

Adapted from Glaser and Strauss (1967), Glaser (1978) and Strauss and Corbin (1990).
An unstructured interview process was conducted to gather credible data comprising the participants' insights on cloud use, and its role and assimilation into the organisation. Furthermore, it allows participants to share what is significant to them rather than to the researcher and also allows for flexibility to ensure that all the key research questions have been covered in the interview process (Bell, 2005).

The subsidiary questions (see Appendix B) were prepared but not asked in the order presented in the appendix. The unstructured nature of the interviews allowed further questions to be asked in response to significant answers from participants.

In the interview phase of this research, the researcher was involved as an interviewer asking questions, an observer listening to participants' views, an interpreter and, finally, as an assessor to evaluate participants' answers and ideas. These in-depth interviews allowed participants to voice their individual opinions regarding the cloud implementation and its impact on their work. All the interviews were recorded for later reference and/or interpretation. Each interview was approximately one hour in duration.

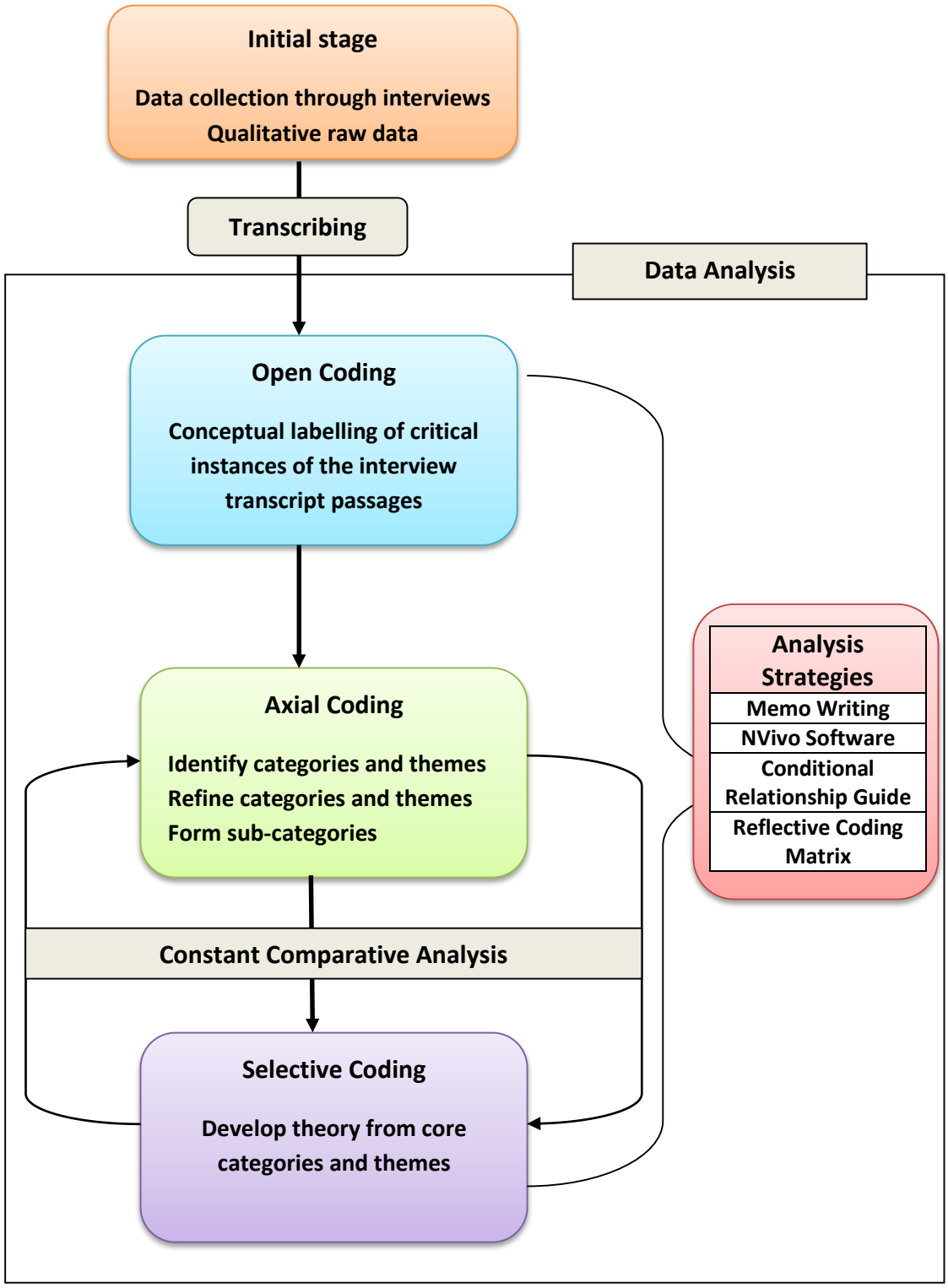

Figure 3.2 Grounded Theory Research Model
Adapted from Glaser and Strauss (1967), Glaser (1978) and Strauss and Corbin (1990).

3.5.2 The Pilot Study and Modifications

A mock interview was conducted initially. A random participant (not included in the main study) was chosen and an in-depth dialogue was carried out. The pilot interviewee went through the actual process and this helped in reviewing and refining the approach to future interviewees. The pilot interviewee's preliminary views and ideas were taken into account when designing the interview questions.

It was found from the pilot interview that closed questions were not compatible with the chosen grounded theory approach. It was noted that more information may be gained if open-ended questions were used.

Some changes to the testing process included removing closed questions such as "Is it…?" and changing them to open ended questions like "How were you...?". The 'go with the flow' routine was chosen as the most appropriate. The interview process with each participant was kept in the range of thirty minutes to one hour, so as to not exhaust the interviewee.

Some changes to the research participant selection process included narrowing down the type of organisation they were selected from for the research, so only small and medium-sized enterprises (SMEs) were chosen. Choosing participants with similar roles who had knowledge about cloud computing through experience or management of cloud adoption and integration processes and who could contribute to the area of research effectively through the questions was also a decisive factor.

3.6 Data Analysis

The data analysis included many stages. After the interview and transcription phase, the first step in analysis was to identify critical instances for each question. In order to do that, key passages for each interview question were highlighted and then coded. Coding was done in three stages: open, axial and selective (see Section 3.6.1) using NVivo10 software. Throughout the phases of analysis, memos captured the ideas and concepts produced from the data. The *conditional relationship guide* and *reflective coding matrix* (see Section 3.7) were the two matrices which were applied as part of the analytical process.

Figure 3.3 shows a graphical representation of the coding and analysis processes. These processes are discussed in detail in the subsequent sections.

3.6.1 Coding

The initial phase of grounded theory is open coding (Glaser & Strauss, 1967; Strauss & Corbin, 1990). *Open coding* was applied to the interview transcripts with the help of qualitative analysis software NVivo10. Open coding was used to assign passages of the transcript to categories; this is also referred to as *conceptual labelling* (Glaser, 1978). The meticulous process of line-by-line coding assisted in opening up the participants phrases. Many descriptive quotes were collected to *saturate* the concepts whereby several codes were grouped into abstract categories which eventually formed the basis for the generating theory. Saturation of concepts was reached when no new information could be obtained further from the interview data. The categories derived from the open coding process were linked and organised by relationship through the axial coding process.

Axial coding was used to identify properties and dimensions for each category. This was helpful in refining the initial list of categories by either deleting or combining them and helped to define the relationship as sub categories.

The final stage of the coding process was *selective coding* (Strauss and Corbin, 1990). Here, core categories and themes were identified, the relationships between the categories were validated and theory was derived. Selective coding allows the researcher to filter, sort and code data that are determined to be pertinent to the emerging theory. Selective coding is the interpretive process from which dimensions are developed and theory emerges (Glaser, 1978; Strauss & Corbin, 1990).

The coding of transcribed interview data or any thematic data collected through open-ended questions from interviews was carried out using NVivo10 software. Described as a systematic analysis tool, NVivo10 is helpful in aiding the researcher to break down, examine, compare, conceptualise and categorise data (Strauss and Corbin, 1990), and also assists in summarising participant responses. This is valuable in terms of deriving patterns from the analysis.

Theoretical sampling is recommended after selective coding. Glaser (1978) described theoretical sampling as "the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges" (p. 36).

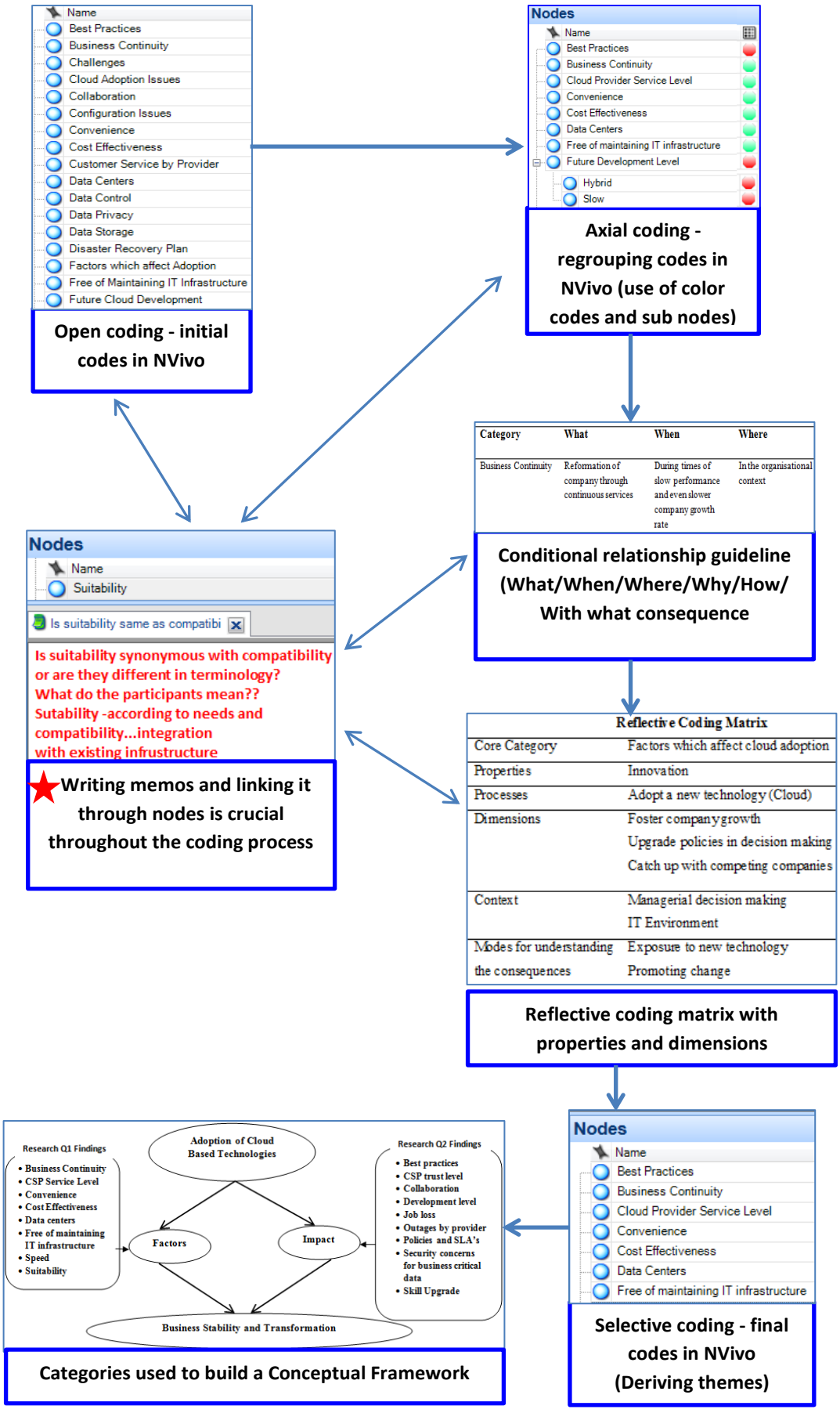

Figure 3.3 Graphical Representation of Data Analysis Strategies

This analysis technique was not adopted because further interviews after the coding process were not conducted due to time limitations.

C*onstant comparative analysis* (Glaser, 1998) occurs during axial and selective coding stages (Strauss & Corbin, 1998) where careful comparisons between codes and categories are carried out after similar data are grouped and conceptually organised during the open coding process. The advantage of this is that the researcher is not limited to deriving inferences from participants' words within only one structural dimension. Constant comparisons (see Figure 3.4) between empirical data, codes and categories assist in crystallising ideas and reduce conflicts in the researcher's thinking (Glaser, 1965). Figure 3.4 depicts an iterative approach whereby codes derived from interviews undergo multiple refinements through use of NVivo and memo writing. This removes any unwanted misconceptions and allows data to be examined critically (1965).

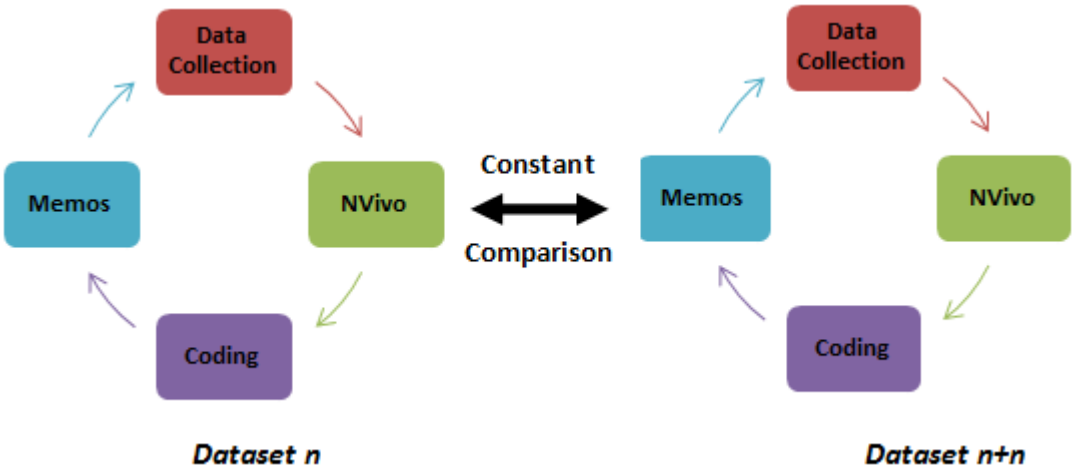

Figure 3.4 Constant Comparison
Adapted from Glaser (1978)

The *memo writing* process was used for recording the thoughts and ideas of participants as they progressed throughout this research. Memos can be thought of as extensive notes and comments, that assist the researcher to structure categories, specify category properties and identify relationships between themes, sub-categories and categories (Glaser, 1978). Therefore, memos are an important aid in the conceptualising process. During the open-coding process, memos tend to be very open and as the coding process advances, they tend to focus increasingly on core concepts and repeatedly capture the

"researchers thought process as he goes through his data, codes, sorts, or writes" (Glaser, 1978, p. 83). This transparency in the flow of ideas is used to extract concepts from complex descriptive levels.

3.7 Research Instruments

Since grounded theory analysis is qualitative in nature and cannot be reduced to formulaic procedures, research tools such as integrative diagrams are generally used to clarify the process and showcase all of the detail together, to help make sense of the data with respect to the emerging theory. CRG and RCM are two frameworks used for this study. Both CRG and RCM were used after the axial coding stage in order to understand the relational dynamics of the categories. The following subsections provide a detailed explanation of the role of the two frameworks.

3.7.1 Conditional Relationship Guide

The CRG "contextualises the core categories" (Scott, 2004, p.120) around which all the other subcategories relate and it assists in connecting structure with process and specifically employs Strauss and Corbin's (1998) investigative questions: what, when, where, why, how, and with what result or consequence.

Table 3.1 shows how the six investigative questions describe the relationship of the category 'business continuity' using Scott's (2004) CRG matrix.

Table 3.1 Example of Conditional Relationship Guide
Source: Scott, 2004

Category	What	When	Where	Why	How	With What Consequence
Business continuity	Reformation of company through continuous services	During times of slow performance and even slower company growth rate Competing companies have already embraced new cloud technologies	In the company	Foster business growth Competition –do not want to be left behind	Shift perception Open to possibility Risk taking Focus on what's important for future	Develop business agility Innovation Perception (use of "I think..." and I suppose...")

Research based on grounded theory is applied to "identify the relationships and interactions of the categories with one another, and also describe how the consequences of each category are understood" (Scott, 2004, p.120).

The CRG is used during axial coding to provide an understanding of relationships between the categories for RCM, which captures the highest level of abstraction.

3.7.2 Reflective Coding Matrix

The RCM acts as a bridge to the final stage of grounded theory analysis, that is selective coding and eventually to theory emergence (Scott, 2004). The RCM was valuable for this study in not only describing a relational hierarchy from the core category established by the CRG but also by identifying the descriptors: the properties, processes, dimensions, contexts, and modes (see Table 3.2) to understand the consequences derived from a CRG (see the last column of Table 3.1) which aid in developing theory. In other words, it helped to understand the reasoning behind the decisions to adopt cloud technologies.

The reflective coding matrix is used for this study to define, describe and finalise the core categories, in a manner sufficient to account for the research data holistically while interpreting and explaining the emerging theory from the core categories.

Table 3.2 Example of High Self-Efficacy Reflective Coding Matrix
Source: Scott & Howell, 2008

Reflective Coding Matrix	
Core Category	Factors which affect cloud adoption
Properties	Innovation
Processes	Adopt a new technology (cloud)
Dimensions	Foster company growth Catch up with competing companies Upgrade policies
Context	Managerial decision-making IT environment
Modes for understanding the consequences	Exposure to new technology Promoting change

The RCM demonstrates that categories can express so-called properties and dimensions. Strauss and Corbin (1998) have described a property as a common or specific characteristic of a category, whereas a dimension signifies the position of a property along a range. For example, the category ‘business continuity’ could have the property ‘innovation’ with dimensions ranging from ‘foster’ to 'upgrade’.

3.8 Purposive Sampling

Purposive sampling was chosen for this study. In purposive sampling participants are selected according to predetermined criteria relevant to a particular research objective (Patton, 2002). Research subjects were selected because of their particular roles and skills in the company. The research required specific people - such as IT managers and IT technicians - who were directly involved with the cloud adoption decision and had insights to the processes and issues faced by the organisation. This kind of sampling method suited the purpose of this study.

Snowball sampling was also used in this research as a secondary sampling technique. Snowball sampling (a subset of purposive sampling) or chain referral is used to identify social groupings (Biernacki & Waldorf, 1981). A snowball sample is created by asking a participant to suggest someone else who might have suitable knowledge and who would be appropriate for the study. Participants are likely to have a network and could recommend a peer from another organisation.

3.8.1 Research Participants

The research participants included members of NZ organisations which were using cloud-based technologies. One member from each organisation was chosen for this study. All participants were adults and were employed in the NZ workforce. The participant selection criteria were based on whether the company had adopted cloud-based technologies and whether the participant had enough knowledge to answer the interview questions (see Figure 3.5).

Participants were recruited through professional contacts while others were sourced from publicly available sources. Twelve interviews were conducted for this study. The choice for this number was due to the spread of voices in the interviews, that is, fewer interviews might result in a skewed analysis, whereas too many voices only make it more difficult to find the ‘patterns’ and ‘truths’.

Participants were sent a general invitation by email. The invitation contained details about the research and its value (see appendix D). On acceptance the research participants were requested to sign consent form (see Appendix C).

COMPETENCIES	Participants (Role)					
	MANAGERIAL	INFORMATION TECHNOLOGY	TECHNICIANS	CLOUD SERVICE PROVIDERS	CLOUD MANAGEMENT	CLOUD IMPLEMENTATION
Industry Experience						
Infrastracture Development						
Technical Capabilities						
Operational Experience						
Stakeholder in organisation						
Awareness of NZ Laws						

Figure 3.5 Participants and their Competencies

3.9 Research Validity

Whittemore, Chase and Mandle (2001) suggested that qualitative research needs to integrate both rigour and ingenuity into a study, because it deals with in-depth descriptive information about real experiences rather than objective data. This was further emphasised through providing a solid foundation of ample rich data revealing an overall view of the participants including their feelings and actions as well as the social context in which they function (Charmaz, 2006).

To promote validity in this research, these practices were considered. Firstly a thoughtful approach was taken and a pilot interview was conducted to construct the research questions. Secondly, preventive measures were taken to ensure that the privacy of all participants and ethical standards were maintained at all times. The names of the participants were not revealed – a pseudonym was used – and interview data was used only if permitted by the participants. Thirdly, by clearly stating the methodological perspective used, the research conformed to the processes as a guide towards the construction of the themes from the data. Finally, the integrity of the grounded theory approach was upheld by employing the major foundational procedures encompassing systematic coding and analysis of data, constant comparisons, category development, memo writing, saturation, and sorting.

The researcher has elected the following criteria stated by Charmaz (2006, p. 182-183), for judging the validity and rigour of the study.

Credibility

- Are the data sufficient to merit claims?
- Do the categories cover a wide range of empirical observations?
- Are there strong logical links between gathered data and the argument and analysis?
- Has the research provided enough evidence for the researcher's claims to allow the reader to form an independent assessment?

Originality

- Are the categories fresh and do they offer new insights?
- What is the theoretical significance of this work?
- How does grounded theory challenge, extend, or refine the research findings?

Resonance

- Does research analysis offer the participants deeper insights about their lives and worlds?

Usefulness

- Can the analysis spark further research in other substantive areas?
- How does the researcher’s work contribute to knowledge?

3.10 Ethics and Privacy

Ethics approval was granted before the study commenced. Prior to conducting this research, it was made clear to all research participants that any personal information supplied by them such as their name, company name and addresses would not be made public. Their personal values were respected while conducting the research. An assurance of confidentiality was given through a signed form (AUT Ethics Form). It was made clear that any data or information analysed through interviews would be published only if agreed upon and permitted by the participant.

Participants were made fully aware of the fact that they were volunteers, taking part in this study without having been coerced or deceived. Participants had a choice to divulge

answers through their experiences or just comment about the research topic in general. It was important for this study that their viewpoints were conveyed openly. They were also reminded throughout the interview process that they could stop the interview at any stage. A degree of mutual respect was maintained throughout the interview process by giving due deference to participants' judgments and ensuring that they were free to respond without interference. The focus of the research design was to encourage participants to feel comfortable and relaxed while answering questions and the study aimed to profit from responses derived from the participants. This study was not judgemental or critical of the participants' answers during the interview, instead placing the facts as they were presented by the participants.

Protection was ensured by keeping both the participants' and organisations' identities private. The main ethical issue presented by this research relates to the privacy of all the participants involved. In order to maintain discretion at all times, no names or personal details of any participant were revealed in this study. Instead pseudonyms were applied.

3.11 Conclusion

This chapter presented grounded theory as an appropriate research methodology for this study. A grounded theory model that guides this research was developed (see Figure 3.2). This model provided the steps and processes for deriving patterns for the phenomena under study: the factors that affect cloud adoption and its impact on NZ companies.

The chapter explained the data collection phase, including sampling and ethical considerations, the data analysis phase through NVivo coding and each of the three coding phases in detail. A pilot study and twelve interviews were conducted to learn about individuals' perceptions and ideas on cloud adoption in their respective companies.

After performing the processes of GTM as described in this chapter, chapter 4 presents the analysis of the interview data and details the findings of the first research question.

Chapter 4 Findings: Research Question One

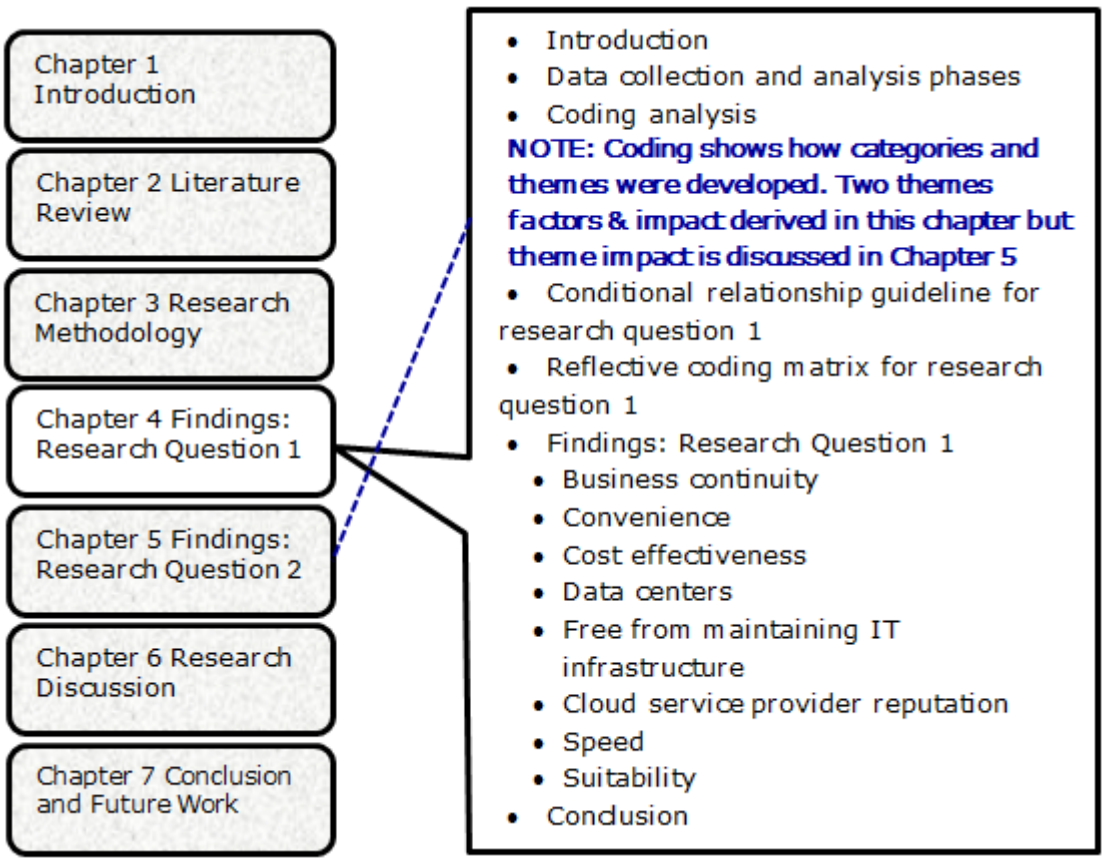

Figure 4.1 Chapter 4 Roadmap

4.1 Introduction

GTM, as discussed in the previous chapter, guides the data collection and analysis for this chapter. This chapter reports the findings of the first research question in this study: What are the key factors that affect cloud adoption in NZ organisations? It presents in detail each step of the coding process and how theory emerges from it. In order to understand how the final core categories are developed, an insight is provided through codes, memos and graphical representation of ideas. The core categories are derived and presented using two analytical frameworks: the conditional relationship guideline and the reflective coding matrix. The findings are further discussed in detail and supported with the relevant academic literature in Chapter 6.

4.2 Data Collection and Analysis Phases

An unstructured questionnaire and interviews were used to collect empirical data. As explained in the previous chapter, data collection and analysis took place in several

stages (see Table 4.1). This is a crucial requirement and a beneficial element of the GTM.

Table 4.1 Data Collection and Analysis Phases

Data Collection	**Analysis**
Conduct twelve interviews (one from each company) and transcribe the data	Content analysis through note taking and highlighting important points in transcripts.
Analyse findings	Use NVivo software to conduct the first two stages of coding: open and axial
Develop core categories and write analysis report	Use conditional relationship guide and reflective coding matrix frameworks to find and present core categories
Develop abstract themes	Use NVivo software to conduct the first two stages of coding: selective

Twelve interviews were conducted and transcribed. Memos were written throughout the data gathering and collection phases. The transcripts were imported into NVivo software. Memos enabled reflection on the collected data.

To narrow the scope of this project all the research participants were chosen from small companies (defined as 5-50 employees for this study). Table 4.2 presents the number of years each participant had been using the cloud and how long since cloud services were implemented in their companies. Seven participants had been actively involved during the cloud adoption process, and managing and making decisions about the adoption. Three were IT personnel and had technical expertise and two were solely decision-makers in managerial roles. They are all active users of the cloud technologies and services that have been implemented in their companies.

4.3 Coding Analysis

Conceptual labelling of critical instances of the interview transcripts occurred during the open coding stage (see Section 3.6.1). The participants' words and phrases were broken down and categories were assigned to them.

At the end of the open coding process, a total of 67 codes were formulated at a conceptual level. Table 4.5 (p. 59) depicts the codes produced at this stage.

Table 4.2 Research Participants

Participant (Pseudonym)	No. of years in the company	No. of years using cloud services	Active participation in the adoption process	Decision-Maker
A	5	3	Y	Y
B	2	2	Y	-
C	1.5	1.5	-	Y
D	16	5	Y	Y
E	1	1	-	Y
F	10	2	Y	Y
G	7	1.5	Y	-
H	12	2	Y	Y
I	2	2	Y	Y
J	3	3	Y	Y
K	10	4	Y	-
L	5	5	Y	Y

The code labelling is done by picking out keywords and phrases directly from the transcript passages. Because a comprehensive literature review would be done after writing this chapter, the chance of codes being forced upon the data to match past or current literature was minimal. This is staying true to the rules of GTM as theory must be grounded in data and not the other way round (Glaser & Strauss, 1967).

Miles and Huberman (1994) stressed the importance of code verification assigned to transcript passages for consistency. By doing open coding the second time around with more transcripts, it was noticed that many of the codes matched. The codes were also matched with the points highlighted and notes and memos written while skimming through the transcripts before NVivo was used. This process of recoding, reconfirming and refining the codes was beneficial in terms of maintaining consistency in the next two stages of coding.

The next coding stage, axial coding (see Section 3.6.1**)**, allowed for the rearrangement of codes in new ways by making connections between the categories. Axial coding assisted in refining and forming subcategories.

In this stage, a constant comparative analysis (see Figure 4.2) was conducted to group similar categories together. This comparison was done to saturate categories. A degree of saturation was achieved when no new information could be further obtained from the transcribed data.

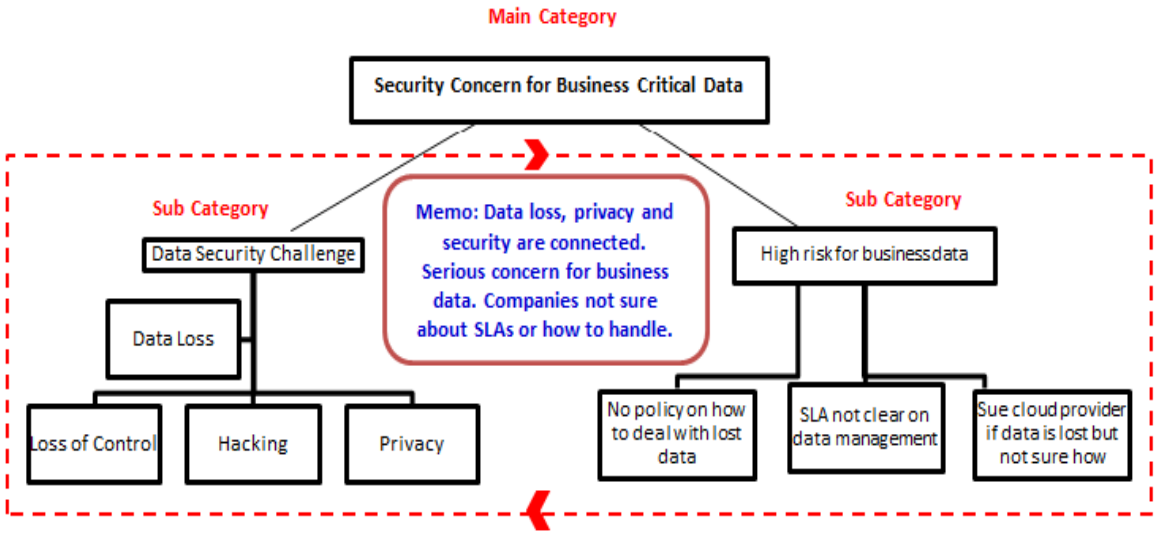

Figure 4.2 Diagrammatic Representation of Constant Comparative Analysis

Glaser and Strauss (1967) describe four stages in the constant comparative method which are:

- to compare incidents applicable to each category
- to integrate categories and their properties
- to delimit the theory and
- to write the theory.

For example, in Figure 4.2, the starting point was to code each incident in the data into as many categories of analysis as possible. As the categories emerged, it fit an existing category. The category of ‘data security challenges’ emerged quickly from comparisons of responses such as loss of data control with regards to hacking, risks of data loss and privacy. This subcategory was also compared to another subcategory ‘high risk for business data’ from responses such as lack of understanding of SLAs and policies. Each relevant response involved the participants' consideration of the degree of ‘security concerns for business-critical data’.

After the categories and subcategories were formed, they were further regrouped with two abstract themes: cloud adoption factors and impact of cloud adoption on work practices (see Table 4.5).

The coding for ‘factors’ was chosen based on the decisions that organisations had to make before the adoption process began. The coding for ‘impact’ was based on the effect it created or the impact on the organisation as a whole after the implementation was completed. The impact category will be discussed in detail in Chapter 5.

The final phase, selective coding, integrated of all the interpretive work of analysis. The primary objective of selective coding is to explain the storyline in order to achieve an advanced level of abstraction (Strauss & Corbin, 1990). The storyline and explanation was done using CRG and RCM.

4.4 Conditional Relationship Guide – Research Question 1

After producing code from the axial coding stage a CRG matrix was used in order to understand the dynamics of the eight core categories derived. Starting with the ‘business continuity’ category, the matrix is designed to provide responses to each question about the category named in the far-left column (see Table 4.3).

A CRG is developed using Scott’s six questions (Scott, 2004, p. 113-114).

- What is [category]? (Using the informant's words helps avoid bias.)
- When does [the category] occur? (Using “during …” helps form the answer.)
- Where does [the category] occur? (Using “in …” helps form the answer.)
- Why does [the category] occur? (Using “because …” helps form the answer.)
- How does [the category] occur? (Using “by …” helps form the answer.)
- With what consequence does [the category] occur or is [the category] understood?

These six questions allowed us to understand the involvement of the participants with the adoption processes (please refer to Table 4.3).

Table 4.3 Conditional Relationship Guide – Research Question 1

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Business Continuity	Reformation of company through continuous services	During times of slow performance and even slower company growth rate Competing companies have already embraced new cloud technologies	In the organisational context	Complications part of current business model Foster business growth Competition - do not want to be left behind	Shift perception Open to possibility Risk taking Focus on what's important for future	Develop business agility Innovation Perception (use of "I think..." and I suppose...")
Convenience	Accessing cloud services and applications anytime, anywhere	Anywhere Anytime	Within company and outside of company While travelling	Problems with accessing applications remotely, network speed is slow. Trying to liaise with clients	Through cloud provider	Choice Development Professional Commitment

Table 4.3 (cont.) Conditional Relationship Guide – Research Question 1

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Cost Effectiveness	Reduction in company resources	During cloud adoption process When current operations are high in cost	In the organisational context	Growth limitations Advancement opportunities	Operations of Business Providing better and faster services through CSP	Choice Development
CSP Reputation	An initial investigation into SLAs and type of services by cloud provider	Decision to adopt cloud technologies	In the organisational context Cloud provider company/Third parties	Investigate the choices and make preferences depending on suitability	Open to upgrade organisational resources and upskill employees to liaise with CSPs	Suitability Choice Decision-making
Data Centres	Company wants to have data storage services with good backup and security features	Growth of company data	Data backup within company and with Cloud Service Provider	Company does not want to refresh existing storage instead opting for newer cloud data centres	Through cloud provider	Development Upgrade

Table 4.3 (cont.) Conditional Relationship Guide – Research Question 1

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Free of maintaining IT infrastructure	Reduction in organisation's physical resources	When current maintenance is high-cost	In the organisational context	Saving cost Creating an environment free of hardware resources	Through cloud provider	Choice Upgrade Decision-making
Speed	Faster network and quicker access to shared documents within company and with clients	During times of slow network speed and slower access to resources	In the organisational context Affects client's company(third party)	Infrastructure getting out of date Network speed is slow and cost of network maintenance high	Ubiquitous high speed internet connectivity Through cloud provider	Development Professional Commitment
Suitability	Match the type of cloud services with company goals and objectives	Within company During cloud adoption process	In the organisational context	Business growth Generate business value	Open to possibility	Innovation Perception Choice

4.5 Reflective Coding Matrix – Research Question 1

After completing the CRG, the next step was to identify descriptors which were contingent upon the relationships established by the CRG. As explained in Chapter 3 (see Section 3.7.2), the RCM (see Table 4.4) aims to show what caused these key factors described in the CRG to evolve in the first place. The consequences developed with the CRG (refer to the last column of Table 4.3) further contextualise the central phenomenon on the RCM and enable the core categories to be understood in detail.

Scott and Howell (2008) have stated that the RCM serves as a relational bridge from the analysis of axial coding to the interpretation of selective coding. Furthermore, Charmaz (2003) has indicated that these propositions (CRG and RCM) make the emerging theories denser and more precise. Glaser (1978) also pointed out that theoretical saturation is reached through the emergence of these key properties and modes of understanding the consequences. This process continues until no new properties or dimensions are emerging. At this point, a concept has been theoretically saturated.

Five categories emerged from the matrix. The RCM descriptors were categorised as: choice, professional commitment, development, perception and decision-making. These five descriptors are dependent upon the relationships established by the CRG. The abstract theme was identified as: factors which affect cloud adoption in NZ organisations.

The last phase of the analytic process is selective coding which involves the integration of all the interpretive work in this research. Table 4.5 presents the coding for each stage which includes sixteen main core categories which belongs to two main abstract themes. The findings are presented in two chapters. The theme factor is discussed in the current Chapter while the theme impact in relation to the second research question is discussed in Chapter 5. Chapter 5 also includes the CRG and RCM analysis for the second theme impact in order to show how emerging theories were strengthened.

The subsequent sections validate the relationship between the CRG and RCM and the categories and themes which emerged from this study with actual interview data from the participants.

Table 4.4 Reflective Coding Matrix – Research Question 1

Reflective Coding Matrix					
Core Category	**Factors which affect cloud adoption**				
Properties	Choice	Professional Commitment	Development	Perception	Decision Making
Processes	Adopt a new technology (Cloud)	Implement a new technology	Cultivate business agility Increase productivity	Insight into innovation	Make proper choices, plans and policies to carry out tasks effectively
Dimensions	Foster company growth Upgrade policies in decision making Catch up with competing companies	Sharing ideas Upgrade knowledge and skill Open to learning	Upgrade technology and resources Reduce cost	Awareness of newer technologies and its advantages Foresee future development plans	Make sound choices Start something new Work out innovative policies Make effective risk management plans
Context	Managerial decision making IT environment	Everyday professional life	Overall organisation	Personal view or idea Creative acumen	Managerial decision making Challenging situation Overall organisation
Modes for understanding the consequences	Exposure to new technology Promoting change	Serving the organisation	Necessary for organisation growth	Knowledgeable Intuitive	Experience In authority

Table 4.5 Open, Axial and Selective Coding Nodes

Selective Coding	Axial Coding	Open Coding
1. Cloud Adoption Factors	1. Business continuity	1. Innovation 2. More growth 3. Productivity 4. Solutions moved to cloud 5. Need of disaster-recovery plan 6. Choose good deployment model
	2. Convenience	1. Access services anytime anywhere 2. Services do not rely on the hardware infrastructure
	3. Cost effectiveness	1. Save money 2. Cut costs 3. Cost reduction 4. Decision-making strategy 5. High productivity 6. Cost of owning hardware infrastructure high 7. Reduce maintenance cost
	4. Data centres	1. Running out of storage 2. Lease storage 3. Upgrades are costly
	5. Free of maintaining IT infrastructure	1. Less equipment less maintenance cost 2. Getting rid of hardware infrastructure and physical resources
	6. CSP reputation	1. Lease service as per business needs 2. Research on service provides necessary assurances 3. CSP reputation 4. High level of expectation
	7. Speed	1. Fast network 2. Faster access to company data
	8. Suitability	1. Services required for business to function 2. Promote business values 3. Innovation strategy 4. Decision of what to keep, what to put up on cloud

Table 4.5 (cont.) Open, Axial and Selective Coding Nodes

Selective Coding	Axial Coding	Open Coding
2. Impact of Cloud Adoption on Work Practices	1. Best practices create awareness of policies and SLAs	1. Apply best practices during implementation 2. Sometimes conform to code of conduct of CSP 3. Integration smooth 4. Configuration issues minimal due to best practices 5. Conforming to SLAs
	2. Improved collaboration	1. Better collaboration with company and with clients 2. Less travelling 3. Promotes efficiency
	3. Job losses	1. Job losses on IT administrator side 2. Job re-shift 3. Hiring more specialised staff leads to job losses among less skilled
	4. More time for IT managers to strategise	1. Frees up time to make strategies and act upon them 2. Less overseeing of network and infrastructure
	5. Loss of productivity and disturbances due to outages by provider	1. Lack of services 2. Three-day outage 3. Intermittent service due to outages
	6. High degree of satisfaction with cloud service provider (CSP)	1. High trust in CSP 2. High reliance on CSP 3. Satisfaction rate high 4. No problems in dealing with customer service. 5. Good customer service by CSP

Table 4.5 (cont.) Open, Axial and Selective Coding Nodes

	7. Security concerns for business critical data	1. Challenge 2. Issue of data privacy and data control 3. No policy on how to deal with lost data 4. SLA not clear on data management 5. Data loss not fail proof 6. Sue cloud provider if data is lost but not sure how 7. High risk
	8. Skill upgrade	1. Formal training paid by organisation 2. Skill transfer 3. Mainly learn on the job 4. Upskill as per job demand 5. Upgrade techniques and skills from internet

4.6 Findings: Research Question One - Core Categories

Eight core categories emerged from selective coding which answers the first research question, that is, *what are the key factors which affect cloud adoption in NZ organisations?*

Factors that influence cloud adoption at the final coding phase are presented in Table 4.6.

Table 4.6 Core Categories of Theme Factors

Cloud Adoption Factors
• Business Continuity • Cloud Service Provider Reputation • Convenience • Cost Effectiveness • Data Centres • Free of Maintaining IT Infrastructure • Speed • Suitability

In order to gain clarity on the core categories, excerpts from the interview transcripts were used to explain each category. To protect participants' anonymity pseudonyms are assigned and were used to state who said what.

4.6.1 Business Continuity

The participants' perceptions on account of their experiences linked the concept of business continuity to the reason for cloud adoption.

> PJ: I think the main reason was business continuity...there are solutions that you can move into the cloud if the cloud provider supports it.

> PK: We wanted our business to continue with better services on offer. This builds resilience and upholds the interests of our clients, I suppose.

These comments arose from the fact that, in the view these organisations, protecting their company data and the continuous use of services such as "virtual applications as part of the business continuity solutions" (PK) were regarded highly in their risk management plans. Risk management plans detail contingencies in the event of natural disasters such as an earthquake, the premises burning down or being flooded, or having a lightning strike blowing everything up as indicated by PH.

> PH: [the] cloud helps continue delivery of services at satisfactory levels following disruptive incidents…[the] Christchurch earthquake was bad enough. We don't have storage providers there…company data backups are covered in the risk management document.

Furthermore, PG explained 'continuity of business' as "doing more fundamental things with less time and effort that basically adds value to our business and our customers."

> PG: I think we adopted a service that adds value and moves the business forward. If it doesn't add value then what's the point. If you don't like the service, you either ditch the provider or ditch the technology.

4.6.2 Cloud Service Provider Reputation

The participants felt that initial research into the services by the cloud provider was necessary because it provided the assurances required for the move towards the cloud. The participants' comments indicated that reputation and trust was important in deciding the CSP selection.

PB: They were found to be [a] reputable cloud storage and email service provider. We believe Google has their vision and solutions on security and data storage backups. What can go wrong? We trust them not to mess up.

PD also indicated that their company "was very satisfied with the cloud [services] offered to them."

Along with the reputation of CSPs, the participants stated further that the policies drawn up by the service provider and the company encompassed their organisations' needs in terms of suitability of applications.

PC: Strong SLA and assurance helped, of course, in terms of the applications we use and it quite well merged with our organizational discipline at an operational level.

PF: We were pretty happy with the service-level agreements. A high level of expectation was set. It suited our business needs and we could merge it into our policies.

4.6.3 Convenience

One participant indicated that a key factor was convenience. Cloud services were seen as a model for enabling access to a pool of resources, such as company servers, data storage, and cloud applications at employees' convenience.

PB: The main factor would be convenience, definitely. People can access their services anywhere, any time and the services don't rely on the hardware infrastructure so you don't have to be in the office to access all of the important information. Basically [it] makes the work easier for all the staff to meet their commitments even from a distance. That's why we chose to move onto cloud. It is convenient in the sense that company data is up in the cloud and accessible to anyone, anytime.

4.6.4 Cost Effectiveness

The most frequently stated factor for cloud adoption was cost (PB, PC, PD, PH, PL and PK). Cost reduction is mainly seen as an "effective decision making strategy" (PB) and a "starting point for cloud adoption" in the company (PC).

The factor cost could also be related to the dimensions productivity and time, as per comments made by PD and PH.

> PD: Cost, because staff actually can't do their activities, so if they can't find a Word doc file they can't do their job, therefore that's loss of productivity, time….

PD's experience with the change process mirrored that of PH as they both looked at cost in terms of productivity. From the comments made by PH the size of the company and the background of its employees appeared significant.

> PH: The best ROI is where organisations invest in applications that actually improve their processes, improve their effectiveness and get work done in less time, and with this in mind, we switched to cloud. We are a small company with a small client base and it was easier to switch. Most of us have IT background. I believe cost is the main reason for changes which happens in any business.

Less hardware and equipment was also indicative of cost reduction.

> PK: The major factor is the cost of owning hardware infrastructure, setting it up and someone maintaining it. All those cost are taken out and it's handled by the cloud. That was the major decision to move towards the cloud...reduction in total cost of ownership.

PK further added:

> PK: Budget is tight and we need to do more with less. And cloud definitely enables you to do more. Our bookkeeper can communicate with people globally, and do company payroll all using her smartphone. It really is a revolution, not only in terms of technology but how we do things over here.

Furthermore, the concept of "pay to continue or discontinue consuming the service" (PH) was found to be cost effective.

4.6.5 Data Centers

Another factor in the move to adopt cloud technologies was data storage. PB specified that they were running out of storage and did not want to spend the money refreshing it or adding more storage servers.

> PB: Mainly because of data centres. We decided to adopt cloud because our systems were running out of storage and we didn't want to spend the money refreshing it because upgrades are costly and so we lease storage from our provider. So now we don't have to deal with things like daily backups and database maintenance. Because the service provider does it all for us.

Furthermore, PB elaborated that their SLAs provide for "data storage services with good backup and security features".

4.6.6 Free from Maintaining IT Infrastructure

The cost factor has a direct bearing on reduction of the physical resources in the company. According to PK, by "reducing [the] company's physical resources and allocating its maintenance to the cloud provider, the company is saving a lot of money"

PF's response that "the company by choice decided to reduce the IT infrastructure because it was looking at ways to save cost" mirrored the views of PK below.

> PK: First of all it is expensive to have your own hardware infrastructure to host all these things. Cloud based solutions obviously make it easier for companies to host their products. So we had a choice to let go of all our wirings and hardware.

4.6.7 Speed

Speed was a decisive factor during cloud adoption as indicated by two participants.

PB believed that the choice to adopt the cloud was dependent on speed in terms of "high latency connection" due to very long delays in "loading applications on our website" and that "data storage was found to be the basis of the speed factor." PB elaborated further that application downtime has a significant impact on the company and "troubleshooting became difficult sometimes".

But PF's perception emphasised a different aspect of speed: "faster network and quicker access to shared documents is the main factor and it all depends on the bandwidth and how fast the Internet speeds are, because to be successful in cloud you need to have very good speed. There is a lot of improvement in terms of the speed at which we share resources. It is faster."

4.6.8 Suitability

Suitability of an application to run in a cloud environment was an important factor that organisations had to consider before the adoption process.

PF offered a valuable insight as his organisation was "open to the possibility" and "looked at convenience and suitability, mainly suitability, like do we need it and what can we do with it, will our business still function...that sort of thing."

Promoting "business values" (PE) through suitability of application on the cloud environment was seen as a strategic "innovation" (PE, PJ).

> PE: For cloud implementation, it was of foremost importance to consider which of our applications are actually suitable for cloud computing and can support company values and promote business values.

> PJ: We firstly started off with the decision of what to keep, what to put up on cloud and what was suitable for our business needs and will it be efficient.

4.7 Conclusion

This chapter has presented the data analysis and findings from all three coding phases using NVivo Software as the main tool. It presented the factors that affected the organisations' decisions to migrate to the cloud. The eight factors grounded in the empirical data emerged as: business continuity, convenience, cost effectiveness, data centres, and CSP reputation, free from maintaining IT infrastructure, speed and suitability. Furthermore, the two analytical frameworks, CRG and RCM, were applied to explain the dynamic relationships between the core categories and their processes and dimensions.

The subsequent chapter provides a discussion of the findings which focuses on the second research question.

Chapter 5 Findings: Research Question Two

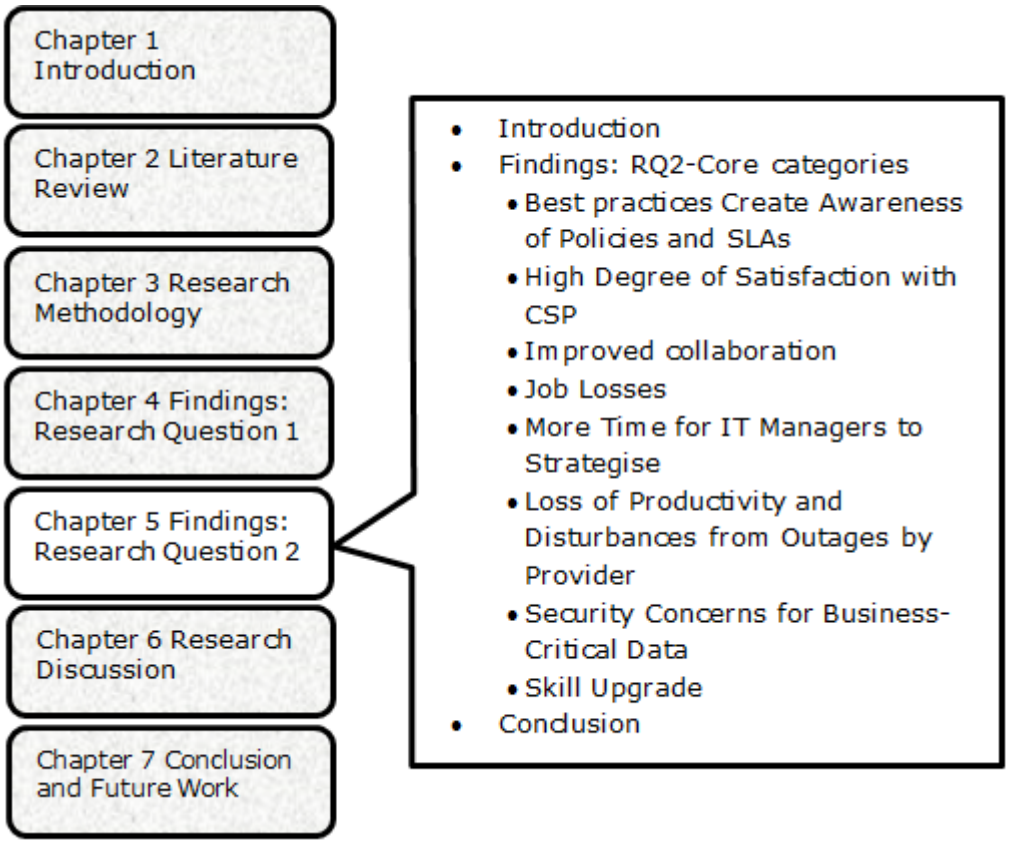

Figure 5.1 Chapter 5 Roadmap

5.1 Introduction

This chapter reports the findings of the second research question in this study**:** What effect on work practices have been noted when cloud technologies are adopted by these organisations? How core categories emerge through the coding processes has already been explained in Chapter Four. The core categories are further divided into two main themes: Factors and Impact. Factors as a theme, was explained in the previous chapter. The focus in this chapter is on the core theme 'Impact'. The categories under theme impact were dependent on the factors and showed a marked effect or influence in the work practices. This chapter answers the second research question by again using the two analytical matrices: CRG and RCM. The findings reported in this chapter are merged with the findings of the previous chapter and discussed in detail in Chapter 6.

5.2 Findings: Research Question Two – Core Categories

Eight core categories emerged from selective coding which focussed on the impact of cloud adoption by NZ companies (see Table 5.1). These eight core categories were developed during the coding phases. Table 4.5 in Chapter 4 shows the sub categories, core categories and themes that emerged.

Table 5.1 Core Categories of Theme Impact

Nodes at Selective Coding Stage
• Best practices create awareness of policies and SLAs • High degree of satisfaction with CSP • Improved collaboration • Job losses • More time for IT Managers to strategise • Loss of productivity and disturbances due to outages • Security concerns for business-critical data • Skill upgrade

The CRG (see Table 5.2) further explains the dynamics of the core categories.

After the relationships were developed among the categories with the use of the CRG, it was time to look closely at those relationships for patterns that supported a central phenomenon. The next stage was to create an RCM (see Table 5.3). The concepts identified during the coding were organised into eight categories that connected to the crucial elements of cloud implementation and its impact in the workplace. The core category, ‘impact of cloud adoption on work practices’, emerged along with its theoretical constructs.

The explanation that follows is interlaced with all twelve of the participants' interviews. As stated previously, pseudonyms were assigned to the participants to protect their anonymity. The interweaving of the eight categories to the dimensions was connected via the RCM moving left to right and beginning with properties. Moving across the matrix, the properties are connected to the consequences of Table 5.2 and hence the connections become more strongly interwoven with the final theme ‘impact’. Each process of the story is displayed below as a subsection.

Table 5.2 Conditional Relationship Guide – Research Question 2

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Best practices create awareness of policies and SLAs	Practices used for successful migration to cloud SLAs need to be incorporated with current business policies	During migration to cloud	In the organisational context With service provider organisation	Lack of knowledge and awareness of NZ Cloud Computing Code of Practice Intensive experience with current industry practices Lack of awareness on SLAs and its effectiveness	By choice Job requirement Fulfil the rules and regulation regarding the services offered by CSP to the organisation	Experience Perception (use of "I think…" and I suppose…")
High degree of satisfaction with CSP	Level of services fulfilled by cloud provider	During and after cloud migration	In the organisational context With service provider organisation	Establish trust with the cloud provider and services used	By communicating with customer services	Communication Build trust

Table 5.2 (cont.) Conditional Relationship Guide – Research Question 2

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Improved collaboration	Foster innovation through efficiency Less travelling Improved sharing of ideas and resources	After migrating to cloud	In the organisational context With clients and third parties	More economically viable	Easier communication with geographically dispersed organisations Faster access to resources and documents and better communication with distant parties	More productivity
Job loss	Downsize to meet cost of migration Keeping workers with only special skills	Before, during and after cloud migration	In the organisational context	Less hardware, less administration of networks	Focus on cost reduction and needs of migration requirements	Decision-making Developing experts suitable for the job

Table 5.2 (cont.) Conditional Relationship Guide – Research Question 2

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
More time for IT managers to strategise	More time to focus on thinking and performing strategically, instead of overseeing in-house technology maintenance	When physical infrastructure is removed to make way for new cloud technologies	Within the IT department of the organisation	Focus on growing the business Measure and manage performance and effectiveness of the level of expectations for both provider and organisation	Pay more attention to performance and evaluation of new technology and future benefits	Decision-making
Loss of productivity and disturbances due to outages by provider	No access to cloud based services	After cloud migration	In the organisation With clients and third parties	Provider cuts off services due to unforeseen circumstances	No fault of organisation Provider fault	Outside forces

Table 5.2 (cont.) Conditional Relationship Guide – Research Question 2

Category	**What**	**When**	**Where**	**Why**	**How**	**With What Consequence**
Security concerns for business critical data	Facing problems with business data on cloud Lack of organisational planning as to what happens when data is lost	After migrating to cloud	In the organisation With service provider organisation	Data being hacked, lost or tampered with SLAs vague in this area	Security not as effective as initially thought by organisation	Perception Experienced data loss by being hacked
Skill upgrade	Foster learning and upgrade skills for the migration	During and after cloud migration	In the organisation	Dependant on training offered before or after migration	By Choice Training if offered by organisation	Self-motivation Job requirement

Table 5.3 Reflective Coding Matrix – Research Question 2

Reflective Coding Matrix					
Core Category	**Impact of Cloud Adoption on Work Practices**				
Properties	Experience	Build Trust	Productivity	Third Party Problem	Job Requirement
Processes	Apply skills practices through extensive work experiences	Collaborate with colleagues and clients	Cutting cost Reduce physical resources Increase innovation	Maintain a consistent system and provide smooth services	Upgrade skill to finish task
Dimensions	Sharing ideas on practical approaches and implementing them	Communicating while on the move Sharing ideas	Communicating while on the move Sharing ideas Tasks get done faster	Configuration issues Outages Security issues Corrupt data	Training Hands on learning Understanding dynamics
Context	In the organisational context	In the organisational context	In the organisational context	24/7 availability	In the organisational context
Modes for understanding the consequences	Skilled and knowledgeable enough to get the work done	Effective communication necessary for growth and fostering relationship with clients	Effective collaboration and cost cutting necessary for overall organisational growth	Consistent and apt services lead to good relationship between organisation and CSP, otherwise an issue	Increase capability and skills through on job training or taking courses in order to get the job done

5.3 Findings - Impact

5.3.1 Best Practices Create Awareness of Policies and SLAs

One of the key impacts from the findings was that the use of "best practices" (PB, PC, PD, PE, PF & PG) and "current industry practices" (PJ, PL) generated awareness of compliance and other regulatory tools that were needed which was otherwise lacking. Eight of the twelve interview participants identified the use of best practices or current industry practices as an essential element during the implementation process.

Best practices were described as the "skills or techniques that does the job" (PA) and the "more the practices evolve, improvements are made and the better it becomes" (PI).

Furthermore, the following participants' views and opinions on best practices tended to merge with the SLAs. PA stressed that following "best practices through ITIL we define SLAs ourselves as how they fit into customers' requirements and so we negotiate the SLAs."

Participant PK identified "intensively skilled and experienced staff" as a motivation for successful migration. "I don't think that any particular code of compliance has to be followed; we do it our way because we have very experienced people working for us."

The use of best practice is perceived to be useful as "cloud providers do provide consistent adherence and they address concerns regarding integrity as well" (PH).

Interestingly, PK's perception from his experience highlighted another element of best practice when he talked about industry-specific compliance. PK stated "I think compliance requirements tend to muddle all cloud models by creating hurdles to optimal infrastructure operations which should be specific to each company." He further emphasised that "there are no hard and fast rules to follow except for the SLAs".

These views were shared by PH: "there's a cloud computing code of practice but I think it's not really a mandatory code, the processes that we use align with ISO27001".

5.3.2 Improved Collaboration within Company and with Clients

An important impact that was voiced by many participants was an improvement in collaboration within the organisation itself and with their clients.

PK explained that “collaboration with colleagues and clients improved on so many levels and was helpful in building trust”. He further described that having “another company branch and many client companies in various regions meant a lot of travelling” and that “[a] geographically dispersed company like ours need to foster innovation while being efficient.”

PB supported PK’s views by stating that “travelling to meet customers, expand company products and markets and see staff was less economically viable but with cloud solutions things are faster and more productive.”

According to PF speed is an “important factor in promoting collaboration”. This view was supported by PI.

> PI: Before applications forced staff to change the way they work in order to fit the needs of the application but with faster and more improved collaboration nowadays, applications are designed to fit the way people work and facilitate them to be more productive.

5.3.3 Job Losses

One negative impact felt during the cloud implementation stage and after the completion of the adoption process was the loss of jobs. Loss of jobs was normally associated with “cost effectiveness” and “requiring experts for the cloud implementation to happen” (PB). PG stated that “job loss was not a concern at first but uncertainty and insecurity lingers”.

> PA: I would say we have seen job re-shift. We need to hire more people who can maintain the cloud and to understand the security applications, so the skill level of our staff to provide those services needs to go up. But we did let some staff go because they were not up to the standards we required.

> PH: The type of job loss that happened is more on the IT administration side because those basic tasks are now no longer required. We need more experts, people who can accurately assess business developments and look for how they can improve business processes.

Job losses could also be attributed to fewer infrastructures and reduced cost. PA stated that “the cloud enables more mobile and more dispersed organisations” and this means

that “the physical manifestations of the organisation are becoming compact so as to reduce cost.”

5.3.4 More Time for IT Managers to Strategise

A senior IT employee elaborated on the fact that when his organisation transferred its resources to the cloud, it freed up his time to focus more on expanding the business strategically, instead of being burdened with daily overseeing of in-house maintenance.

> PG: One of the hidden benefits for me personally was that less infrastructure meant more time for me. It means I can focus more on decision making, like performance and evaluation of cloud applications and proposing more business solutions, rather than being bothered by company equipment, network and wiring and such. So yeah, for me that’s one of the key benefits, I guess.

Furthermore, PG’s perception was that the implemented cloud “helps us all to focus on what makes the company more operational by simply leaving all the other matters to our service provider.”

5.3.5 Loss of Productivity and Disturbances due to Outages by Provider

Participants felt that outages by providers had a negative impact. Short term outages were seen as a disturbance but got resolved quickly.

PB claimed that an outage was “mainly temporary but we were not prepared for it”, and that it was “resolved pretty quickly and we had no complains with their provider”.

PJ also stated along the same lines: “our service provider can handle things pretty fast, especially outages, so things get on track pretty fast.”

A bigger impact was felt by participants during long-term and frequent outages.

PK shared his experience by stating that “outages are predictable and bound to happen on cloud but it does happen a lot here and it can be for very long hours so we can’t access anything during those hours”.

PD shared the above views as he too felt that it was less productive because no work gets done during outages.

PD: It did not happen at the beginning but in the last few months we have been experiencing long term outages. When it happens we cannot access any of our applications because as you know they reside on the cloud. So it can be a real pain at times when we don't have access to anything. No work [gets] done.

5.3.6 High Degree of Satisfaction with Cloud Provider Service

A key impact felt after the cloud migration was the level of satisfaction or dissatisfaction with the provider services.

The level of dependency on the CSPs was found to be "high". PC emphasised that "dependency is very high because if we didn't have it we'd be stranded."

PA and PE were very satisfied with the services provided by their respective CSPs.

PA: We are extremely happy with the cloud provider. Cloud is much faster and the service is really good.

PE: We are pretty happy with the service because any time when we ring, it's more like 24/7, so they will always have a quite knowledgeable person to answer the question fully.

While the general consensus was that that the CSP is a "reputable company" and so they "do a good job" at providing "effective customer service", some participants' relayed their frustration with the services.

For example, PF stated that the services were not worth the price paid: "Our provider is very expensive and yet it takes them 3 days to answer our queries. We hardly call them for anything. Pretty useless, I would say."

PI indicated that smaller queries were answered immediately while the more difficult or complex technical queries took longer time: "If our queries are too technical the support person will pass down to the cloud provider support team so it's taking time for them to get answers back and forth. [It] takes at least a week or two."

Outages had a direct bearing on the satisfaction level of services as described by participants in Section 5.3.5. PD viewed cloud solutions as "flawed" because when a third party controls our stuff we are bound to leave everything in their hands and not

plan ahead for things like this to happen". He further stated that "applications should be made keeping failures like outages in mind for lesser impact".

Having the CSP in a different time zone also had a negative impact on the speed of delivery as stated by PB: "… the only issue is most of them are based in a different time zone with us so the support and the contact normally takes more than one day to have the feedback come back."

5.3.7 Security Concerns for Business Critical Data

None of the participants mentioned security as a factor for embracing cloud technologies but its impact was felt after adoption.

Findings revealed that none of the participants had a plan for when data is lost or how to seek remedies for lost data from the provider.

PE indicated that their organisation was "still holding on from any big future move to cloud because data privacy is the biggest concern" while PA stated that he chose "not to go with cloud for certain data which is business-critical. It increases security risks."

PB indicated that trust in CSP was crucial when it came to data security.

> PB: We have to trust them [CSP] that they will never get our data lost. If data is lost, then the only thing we can do probably is just blame them and sue them. Basically, we are totally reliant on the data centers for backup.

5.3.8 Skill Upgrade

The participants stated that there were no opportunities for training. Staff had to foster learning and maintain a 'can do' attitude. There were no certifications or courses provided to upskill in the first place. Skills and training were mostly acquired during the process which is quite rigorous and time consuming. Because the migration process had a time limitation, the expectations of employees were high by managers at all times; this led to pressure.

Having the right kind of skill for the implementation process had three impacts.

Firstly according to PJ "there were many configuration issues during implementation [and] integration did not run smooth due to lack of skills. I was the only one handling cloud…did have training but mostly online for free." But according to most of the

participants, the process of integration was “smooth” (PA, PB, PC, PE and PK) with “no problems” (PD, PF, PH) during adoption stages. This was attributed to having “specialised skilled people who know how to get the job done (PK).”

Secondly, skill upgrades had a direct bearing on job role as explained by PG: “[the] general feeling is that jobs will go but people will have to up skill because jobs will change. Networking and infrastructure knowledge will lessen and cloud will take over.”

Lastly, the rate of development after the adoption process was slow. Skill acquisition became an ongoing process even after adoption. The maintenance of the systems required people to be knowledgeable in cloud-based technologies because a lot of synchronisation was happening

5.4 Conclusion

This chapter presented the findings of the second research question which revealed the effect of cloud migration on organisations in NZ and its impact on employees and on the organisation as a whole. The eight categories related to the impact theme, which were grounded in the empirical data, and emerged as: best practices create awareness of policies and SLAs, improved collaboration within company and with clients, job losses, more time for IT managers to strategise, outages by provider, high degree of satisfaction with CSP, security concerns for business-critical data and skill upgrade.

Furthermore, the two analytical frameworks, CRG and RCM, were applied to explain the dynamic relationships between the core categories and their processes and dimensions.

Chapter 6 provides a discussion of the findings obtained from the three coding stages and the CRG and CRM. This chapter will focus on the two research questions and highlight a number of parallels that can be drawn between the interpretation of the empirical data and the relevant literature. Furthermore, Leavitt’s model is used in order to identify the socio-technical elements from the findings and present a conceptual socio-technical cloud framework.

Chapter 6 Research Discussion

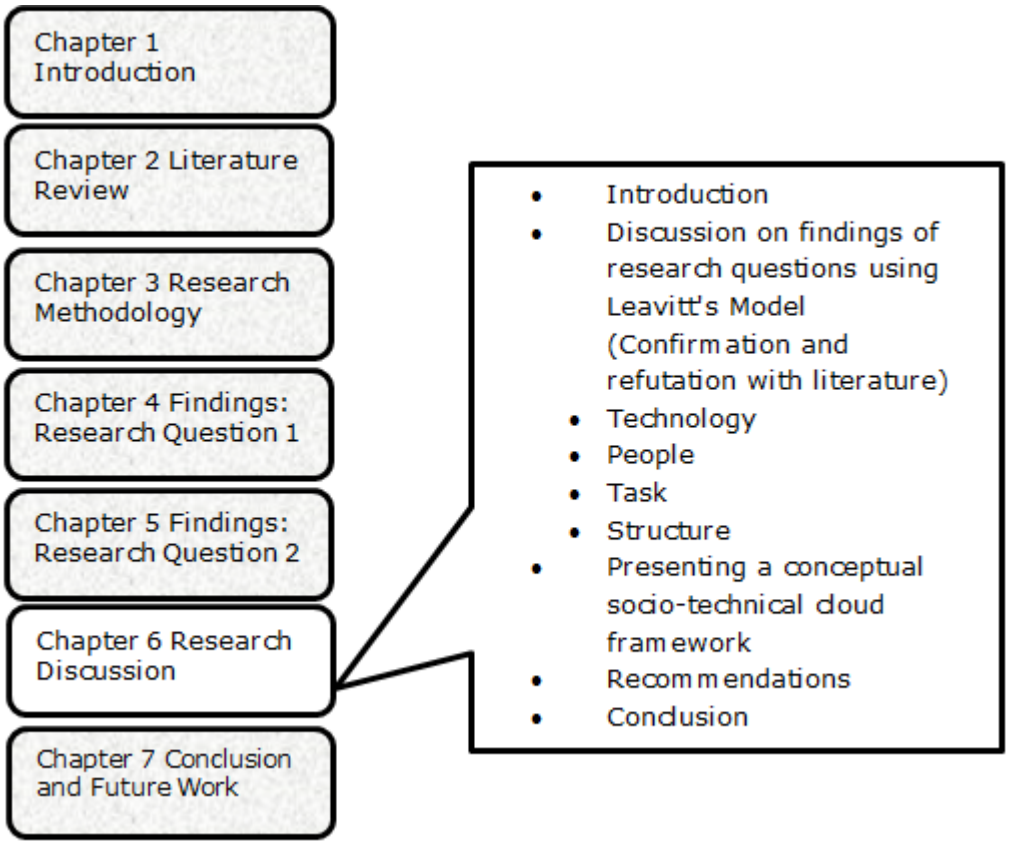

Figure 6.1 Chapter 6 Roadmap

6.1 Introduction

This chapter explicitly discusses the relationships and connections between the grounded theory categories, which were presented in the Chapters 4 and 5, using Leavitt's model and presents a 'conceptual socio-technical cloud framework'. The categories and their relationships are the basis of the grounded theory that offers an explanation about the factors associated with cloud migration and its impact on work practices. The findings from the data analysis in Chapters 4 and 5 relate to each GT category and comparisons with the relevant literature were made to substantiate and strengthen the theory. Leavitt's model (see Section 2.4.4) is used to explain the findings. Finally, discussion on discrepancies or gaps between the participants' views and those commonly presented in the literature are also presented.

The research participants expressed different reasons for cloud adoption which were grounded in the interview data and have also presented issues that have been identified in the findings (Chapter 4). The key factors identified by the participants were business

continuity, convenience, cost effectiveness, data centres, and free from maintaining IT infrastructure, cloud service provider (CSP) reputation, speed, and suitability.

Participants also described the impacts felt by their organisations during and after cloud implementation. The impacts were listed in Chapter 5 as: best practices create awareness of policies and service-level agreements (SLAs), improved collaboration, job losses, more time for IT managers to strategise, loss of productivity and disturbances due to outages by provider, high degree of satisfaction with CSP, security concerns for business-critical data and skill upgrade.

The subsequent sections discuss the findings of the core categories derived from the views and perceptions of the twelve research participants.

6.2 Discussion on Findings of Research Questions using Leavitt's Model

Cloud implementation is a collaborative process and the intervention created by the technology produces changes in the social elements of the organisation. Lee (2004) emphasised that, just as there are information requirements that the social system presents to the technical system, so there are organisation requirements that the technical system presents to the social system.

Leavitt's model was adopted for this research in order to identify the socio-technical components of an organisation and assess the changes that the four components undergo should one of them change. Based on the findings, the following sections depict changes which happen in an organisation when a new technology (cloud) is adopted, and identify the variables which coincide with the four constructs of Leavitt's model.

For the purpose of this study, the technology component is defined as 'implementing cloud-based technologies'. Because technology is the component under study, its impacts on the other components are described.

The following sections are centred on the nine relationships of Leavitt's model.

- Technology - Structure How does change in technology affect structure?
- Technology - Task How does change in technology affect task?
- Technology - People How does change in technology affect people?

- Structure - Task — How does change in structure affect task?
- Structure - People — How does change in structure affect people?
- Task - Structure — How does change in task affect structure?
- Task - People — How does change in task affect people?
- People - Task — How does change in people affect task?
- People - Structure — How does change in people affect structure?

6.3 Technology

The findings revealed the following changes to the technological environment of the organisation during cloud implementation: removal of physical resources to allow for adoption of a cloud model, use of cloud-based services and data storage; partial removal of business and IT legacy systems to allow adoption of newer technology; and testing and debugging of software applications on the adopted cloud model for a smooth transition. The apparent change in the technology component had an impact on the other three components of Leavitt's model as described in Table 6.1.

Table 6.1 indicates that cloud-based technologies transformed the organisational structures in areas of IT administration, decentralised tasks so it could be shared by the organisation and CSPs, and improved collaboration amongst employees and with third parties.

Research findings indicate that a change in technology directed the transformation in the organisations. Faster access to and availability of company applications and services indicate that the technology change had a positive impact. The consequences of social impact included a change in attitude and beliefs towards new goals for this technological change which led to changes in communication between different hierarchies within the organisation. It was perceived by the participants that communication was mainly from "top-down" (PE) or from "the main boss" (PG, PK). Alshamaila, Papagiannidis and Li (2013) state that top management commitment, support and attitude towards change are absolutely crucial for significant transformation to occur in an organisation.

Table 6.1 Modification of Component Technology

Technology - Structure	**Technology - Tasks**	**Technology - People**
Loss of jobs evident in IT department. New and specialised employees got hired. More coordination required with CSPs, less interdepartmental coordination.	Infrastructure tasks changed because dealing with physical servers and machines lessened. Manual work less but many tasks like configuration and testing on cloud got allocated to fewer and more specialised people. Faster access to company applications and documents	Employees are trained (only one case) to handle new technology. Mostly employees train themselves as part of job requirement. There is improved collaboration between team members, third parties and the entire organisation Skilled people getting more cloud-related responsibilities

The findings of the study confirm that one of the benefits of cloud adoption is accessibility to IT resources such as software applications and storage (Trigueros-Preciado et al., 2013). Furthermore, cloud technologies allow management of organisations' entire IT resources by way of ubiquitous access with any kind of web-based interface, device or equipment (Marston, Zhi, Bandyopadhyay & Ghalsasi, 2011). This is supported by the comments of PA, who stated, "Cloud is much faster. We use software for our professional services for our systems, and services are faster." Speed was the driving force attributed to faster access.

It was also evident from the findings that cost savings transpired through CSPs absorbing the overheads associated with software and hardware upgrades and the replacement of physical resources such as obsolete network and security devices (see Section 2.5.2). The cost factor was attributed to three things: increase in productivity, size of the company and the internal IT infrastructure. Walterbusch, Martens and Teuteberg (2013) have highlighted that pricing schemes and attractive cost models for range of services attract organisations to opt for cloud. Compared to bigger enterprises, SMEs tend to have strength in smaller staff numbers and low staff turnover (Tan, 2010) and, due to their smaller structure, they have the ability to venture out into changing trends (Ensari & Karabay, 2014).

But while the technology change had a positive impact, a few conflicts arose. For example PE indicated that “no one would listen to his suggestions before [switching to] cloud and no one bothered after” and that he was “unhappy with the way things get done around here.” Furthermore PB resented the way that the “boss made everybody redundant and kept only me to do all the jobs on the cloud”. According to El-Gazzar (2014), as jobs are merged, the role of IT staff changes and they are required to acquire new skill sets. This role change may create conflicts due to unexpected tasks (Nograšek, & Vintar, 2011)

Another negative impact was loss of productivity due to outages, as access to resources got cut off. But findings revealed that in spite of frustration over outages, organisations continued to depend on their CSPs. According to Srinivasan (2014), cloud users believed that with good communication and real time updates from the CSPs they would be able to plan for actions during outages.

6.4 People

The findings revealed the following people were involved in the overall adoption process in an organisation: top management, IT manager, IT administrator, and CSP support staff. They were required to work in a unified way to carry out the required implementation process.

Table 6.2 shows how modification in the people component changed the organisational structure and task components.

The employees were found to be the key drivers during the cloud implementation as they were encouraged to perform challenging tasks and take on more responsibility as part of the job requirement.

The findings showed that organisations do not appear to provide appropriate training for the management and use of cloud services as organisations expect staff to learn on the job because they are skilled technicians. Only one of the twelve organisations opted for courses to acquire skills. Participants believed through experience that team members are normally aware of the features and functions of the applications and services provided by CSPs in the in-house training.

Table 6.2 Modification of Component People

People - Structure	**People - Tasks**
Hiring more skilled and experienced employees meant less supervision. And more time to strategise for IT managers.	Hiring new employees led to modifying the tasks such as configuring and testing to make best use of their skills and knowledge.
Having skilled staff showed that there were minimal integration issues during cloud implementation.	Evidence of skilled employees being burdened with responsibilities as job role changed.
	Employees upgrading skills or specialised in cloud-related areas could handle tasks well due to their skills and knowledge of best practices.

The main focus before adoption was mainly on people issues such as perception, beliefs and attitudes along with practices, tools and techniques for cloud use. This helped improve organisational capabilities, perceptions and attitude towards cloud adoption, thereby improving the usefulness of the implementation.

Employee skill level had an impact on the adoption processes and it was found that the more specialised employees could handle the jobs well and with minimal issues during the adoption stage. Having technical competence (Low et al., 2011) therefore increases the success of the adoption process.

Job losses were also evident as the less skilled employees needed to be replaced. This led to the employees who were involved in the cloud adoption being burdened with many cloud-related tasks such as administration, testing and configuring. This shift in the job role created a minor workplace conflict. El-Gazzar (2014) stresses that job relevance is crucial in enhancing an organisation's status and day-to-day operations and that employees should have control over their work and complete their tasks successfully. In order to motivate people for successful cloud adoption, a formal recognition and reward system can be put in place. Efforts and results obtained by the team can be acknowledged and appreciated. Results and progress of the users using cloud, their input as well as suggestions could be monitored closely.

6.5 Task

With the change in the technology this study identified some key tasks which also changed: they were business process remodelling for better productivity and better collaboration through use of mobile devices and applications.

Table 6.3 Modification of Component Task

Task - Structure	**Task - People**
Remodelling business processes led to amendments in the organisation objectives: job losses, hiring of skilled employees and removing physical infrastructure to pave the way for new cloud-based technologies. Structure changed in terms of job losses in the IT department because specific tasks could only be handled by specialised employees.	Change in carrying out tasks required organisations to up skill and train the employees to make them familiar with the new cloud-based technologies. Organisational tasks were carried out faster and more efficiently through improved collaboration amongst employees. Employees used mobile devices in carrying out organisation tasks. This was attributed to faster network and better accessibility to organisational resources.

Research findings indicated intersection of social behaviour and technology through collaboration. Phaphoom, Wang and Abrahamsson (2013) suggest that one of the main reasons cloud-based technologies are adopted is to improve collaboration and communication between stakeholders for dependable and efficient information delivery to third parties. Breeding (2014), also suggested that while some types of data or information must be confined within the organisation, there exist capacities for information- and resources-sharing to great mutual benefit.

As evident from this study, mobile devices such as smartphones, iPads, laptops and all other kinds of tablets were increasingly used by employees and were described as “on the go technology” (PJ) and equally “important for communication and business dealings” (PK). Mobile devices are crucial for accessing and extracting company data on the move and so speed also plays a crucial part.

From this study, it was apparent that mobile devices do more than just add social features; they bring with them the ability to create effective new business solutions that use the unique capabilities of mobility combined with social attributes by taking advantage of the location and presence of employees and their third party counterparts.

Research findings indicate that it was possible to add social layers through services provided by CSPs. Business information embedded in organisational documents, spreadsheets and presentations were normally given a social layer that can alert the entire company when certain changes have been made. Employees use this for any software application that has access to the social platform and creates much needed situational awareness and vital event notifications in a single, manageable way. But as explained by PE, the results of the social platform may be unreliable.

> PE: I don't find it particularly effective, and there are often complaints by my fellow workers when we have our sales meetings…sometimes they get reminders when they have changed the ad and the change has been implemented, and sometimes they don't. So it's a cloud solution with inconsistent results.

This research confirmed, on theoretical grounds that cloud computing offers the potential for significant advantages that include reduction in costs, operational agility, fostering innovation, and increasing benefits and advantages through the introduction of the latest architecture and technology. Further proof of a social impact arises from the fact that the organisations start with the deployment of SaaS which is a delivery model of popular social networking services.

As a result, as organisations move to the cloud they find that they incline to newer application models that have social computing capabilities. While it is theoretically correct that cloud computing adoption fosters social computing adoption through the use of the SaaS, the research findings indicate that actual adoption and use of these social strategies is lagging significantly behind as organisations take the time to assess a range of issues with enterprise social computing capabilities, including appropriateness, convenience and suitability, data security and control, and policy management strategies. Both PK and PE have indicated the importance of having social capabilities through their company applications.

PK: We have been using SharePoint for a long time and it has social interactive features such as tagging which enables all of us to add tags to entries to help identify and categorise it for later search and that sort of thing. It has dynamic news feed and audio and video streaming for our company wikis as well.

PE: In future we want to use Salesforce for our CRM systems and Salesforce provides a service called Chatter which I have heard is pretty good, so that might take care of the social aspect of things. Meanwhile SharePoint does it all.

6.6 Structure

This research describes the changes to organisational structure arising from changes in technology. The following structural attributes were affected: teamwork and employee composition, top management support, effective communication.

Table 6.4 Modification of Component Structure

Structure - People	**Structure - Tasks**
Modification in organisational structure necessitated changing employee job roles. In some cases, one or two employees were assigned all the tasks for the cloud adoption, as well as the cloud administration processes. Acquiring new skills or trainings were based on their new job responsibilities. Change in structure allowed IT manager (one case only) to gain more time to strategise due to fewer employees and less physical resources.	The change in structure involved job losses. This necessitated a change in goal in terms of the tasks handled by employees with specialised skills for successful implementation and administration of cloud applications. Dealing with problematic tasks such as outages and configuring cloud-based applications with CSPs builds trust and creates good rapport.

The findings indicate that the adoption of cloud technologies is an incremental process because the participants stated that their organisations are unlikely to outsource all their ICT requirements and legacy systems to the cloud anytime sooner. Almost all of the participants mentioned adopting a hybrid-cloud approach as they learn to traverse data-integration processes, security and data privacy and challenges with dealing with CSPs

and SLAs. As stated by Ross and Blumenstein (2013) organisations need to train and develop the skills of their existing ICT employees rather than find new and more specialised staff in the external market because there is a shortage of ICT professionals with the required skills to manage and revolutionise the cloud environment.

It can be seen from the findings that if the organisation places high importance on the adopted technology, it is well received by the users. So the organisational level importance gives rise to significant improvement in the effectiveness of cloud technologies. For example, the findings revealed that collaboration was highly improved and was a key factor for the adoption.

Trust in CSPs was a critical aspect of this study. Findings showed a high level of trust between organisations and CSPs. There were two reasons for high trust: CSP reputation and effective communication between organisation and customer service when resolving problems. Srinivasan (2014) says that even though CSPs take extraordinary precautions to provide uninterrupted service they still encounter service outages for extended periods of time that violate service agreements as evident in this research. Developing transparent and well defined policies that follow known standard and providing cost credit to the customer helps build trust but the focus should still be in having uninterrupted service.

An organisation can perceive cloud adoption as an activity which has to have long-term payoff. Strategic managers believe it is important to use cloud-based services, not only for cost-saving but also for the continuous learning of the users, especially employees dealing with CSPs and handling the integration and implementation of the cloud.

The interest in cloud adoption in terms of research for suitability and CSPs which could be trusted were shared by the managers with the IT department, and users as in employees of the organisation. This shows that clear communication regarding the organisational perception of the importance of cloud adoption and its practices were conveyed across the different levels of hierarchy in the organisations. This sets the expectations correctly and aligns the employees with the organisational values and way of thinking on the adoption perspective.

In order to generate high levels of satisfaction with cloud technologies, the results and benefits derived from it should be highlighted across varying levels of the organisation.

A high level of satisfaction will lead to more interest being shown in the newer technology in future in the organisation.

6.7 Presenting a Conceptual Socio-Technical Cloud Framework

The development of a framework at a conceptual level is shaped from the following three phases (see Figure 6.2).

Phase I: Involves the theory produced from this study
Phase II: Shows what is affected through Leavitt's model
Phase III: Includes identification of strategies

The conceptual structure is based on a framework to organise thinking about decision-makers' concerns and match it to the elements that address these concerns, where each tool enables decision-makers to focus on and model different characteristics of their organisations or IT systems. This conceptual structure can then be used to reason about and investigate cloud adoption decisions.

For example, by exhibiting organisation-specific hardware infrastructure and software applications, it becomes possible to estimate the costs of running that system in the cloud, and hence decide whether deploying that system infrastructure in the cloud would be cost effective, what type of cloud deployment model to use and what services and platform to select. Furthermore, by identifying the impacts of a proposed system to employees' work activities, its practical and socio-technical feasibility can be determined. For example, implementing a new technology may be cost effective yet not feasible socio-technically if it actually decreases job satisfaction and undermines existing hierarchical power and organisational values.

6.8 Recommendations and Best Practices

The findings revealed that several essential elements which are considered crucial during implementation of a new technology were absent during the adoption process. These are discussed in the subsequent subsections.

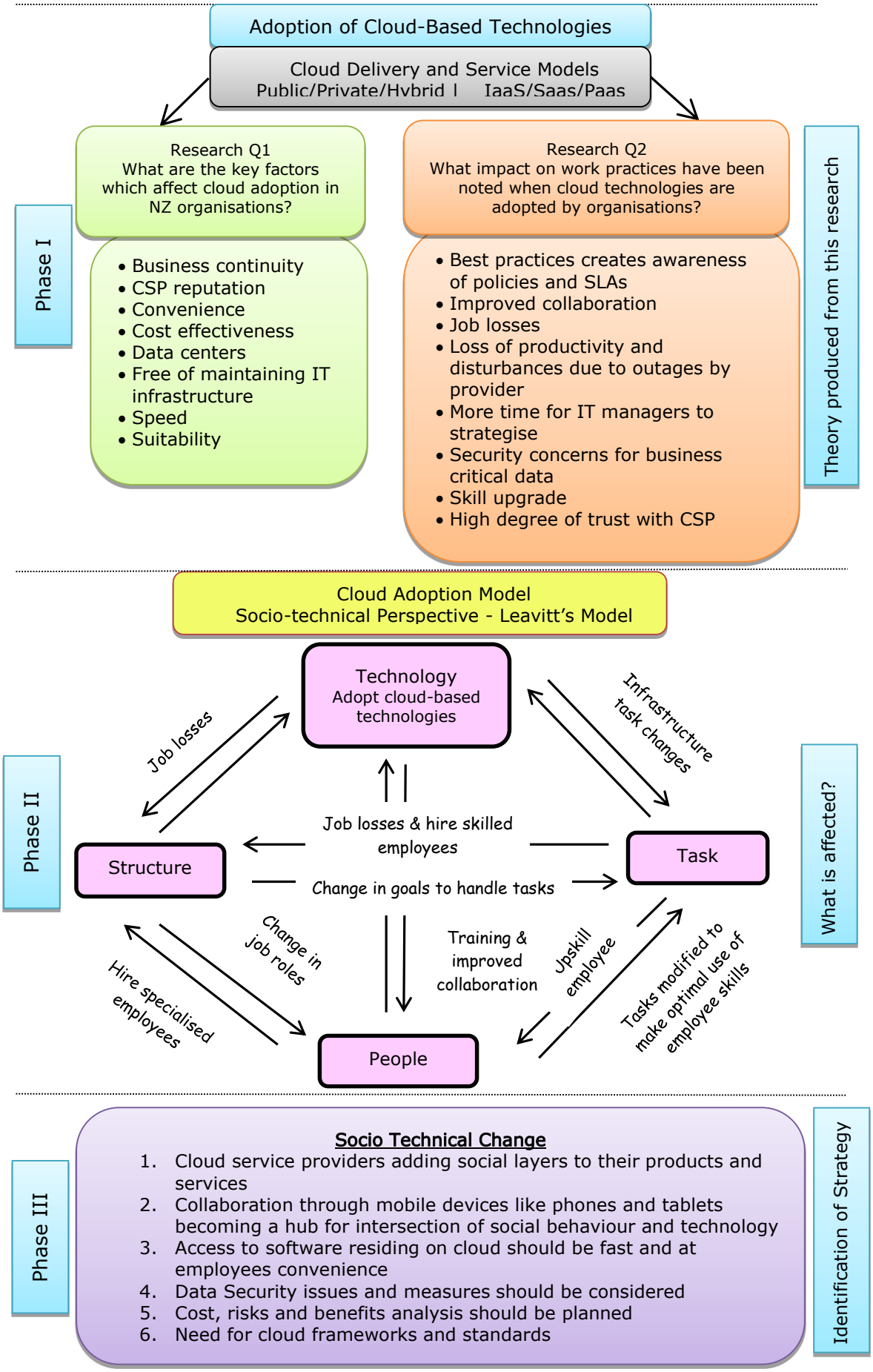

Figure 6.2 Conceptual Socio-Technical Cloud Framework

6.8.1 Lack of Technology Acceptance Models during Adoption

One element that was clearly missing was the lack of frameworks or models adopted for the migration.

Only two participants stated that a framework for the adoption process was used. The frameworks were the Information Technology Infrastructure Library (ITIL) framework and the International Organisation for Standardisation (ISO).

One approach discussed that could benefit cloud adoption decision-making is to develop a cloud-modelling framework that can be used to model relevant elements of the existing IT systems with the adoption processes. Another approach could be to use an already existing framework for cloud adoption.

According to the literature, there are many widespread cloud computing architectures, models and frameworks in existence (see Section 2.4). These frameworks consist of a range of models such as a range of applications, data and cost models. Use of these models can be effective in terms of examining the cost of implementation, performing feasibility analysis, making risk assessment plan, and measuring organisational values.

6.8.2 Systematic Management of SLAs

From the findings, there is an indication that SLAs were not clearly understood between the organisation and the CSPs. Initial findings indicated that "no one ever read SLAs fully" (PF) and there was "no clear understanding if something went wrong" (PL). Furthermore the SLAs were not incorporated with the organisational policies as indicated by PF.

> PF: It is only an agreement just for our provider to protect themselves…just shows how the services are delivered and what they [CSP] provide. We just keep it as a safeguard. It is not part of our policy and has got nothing to do with strategies as such.

What was more interesting was the fact that organisations did not bother to verify the services in terms of security and data loss.

Comments such as "don't know what to do if it happens…provider is to blame in case of data loss" (PC) as well as "we'll see when it happens, nothing has happened yet" are

indicative of the fact that there was hardly any awareness in terms of the grounds which are covered in SLAs regarding data protection.

Organisational policies could be changed to include stakeholders and how they might be involved in the adoption process. The importance of involving the stakeholders is to reduce disruptions after the adoption process.

Findings revealed that organisations opt for CSPs with established, available and reliable services as this leads to higher levels of trust. However, the study also showed that outages had a negative impact as employees cannot access any company documents stored on the cloud if the service goes down. Srinivasan (2014) suggests that services and operations of CSPs should be transparent to the customer and causalities such as service unavailability and outages should be identified and addressed, for example, having power supply backup in case of outages.

The lack of documentation around policies for an existing problem or to having proper backup procedures often leads to the "blame game' question, that is, who is in charge of dealing with strategies and policies? PK states that "managers hate to write documentation unless absolutely necessary and no one bothers to look at it or read it." It is always crucial to have a systematic approach towards managing SLAs especially in terms of evaluating services, reporting faults and resolving disputes (Rimal, Choi & Lumb 2010).

6.8.3 Data Security Issues and Measures

From the findings it is evident that data security measures were not considered crucial before cloud migration but data security and privacy created a huge impact on work practices after implementation. For example, both PA and PK commented on data loss and privacy breach.

> PA: We use Dropbox extensively and it resides on cloud. But it was hacked a few years ago and we lost everything. Not only that, but a huge part of our client data was lost and we could not retrieve that successfully, there's a huge challenge in terms of security. So we have to be careful of security SLAs.

> PK: Yes just last week, Yahoo got attacked and all of a sudden many of our clients got nasty spam email from one of the providers Xtra. Half of the clients are with Xtra because they are the biggest providers so we had to block the emails

but could not do so because then the legitimate emails would be blocked as well.

Findings also indicated that a few participants felt that data loss and security and privacy issues on the cloud were the main reasons preventing their organisation from moving their resources entirely on the cloud in the future. PB, PC, PD, PF, PG and PK indicated that future development would be slow due to this reason.

But PD's view was entirely different from all the other participants. PD stated the following:

PD: I think that my data is not that precious, it's not that sensitive and it's not that valuable. If I lost it, it would be painful but not irreplaceable, so I'm not prepared to spend my money on backup systems.

He further added:

PD: There's no procedure because my company is not a high-risk company, so the cost of achieving fail-safe-ness is more than the cost of the risk. So I'm not prepared to invest resources and time and effort into downloading and saving it to an external hard drive when I think the chance of Google going bankrupt in my lifetime is very, very slim.

The above findings indicate differing points of view. Many studies claim that data loss, security and privacy are crucial issues of cloud adoption (see Section 2.6.1). Organisations should recognise that it's their responsibility to secure their data before sending it to the cloud, as CSPs guarantee of the security of data stored in their cloud is not full proof (Freedman, 2009; Srinivasan, 2014).

6.9 Conclusion

This chapter presented a Conceptual Framework as a model for the adoption and delivery of IT services on the cloud for an organisation and presented changes in the four constructs of Leavitt's model as a measure of the socio-technical aspects of the adoption process.

Depending on an organisation's objectives for utilising the cloud, the emphasis on the four components (structure, people, process, technology) vary.

Organisational capabilities must be restructured to provide the knowledge of how to build, design and consume services from the cloud. Employees who work for the organisation must be able to execute the tasks required of them for adopting cloud-based services.

The following chapter presents the conclusion of this research. A summary of the research conducted and the significant answers to the research questions are outlined. Furthermore, the limitations of this research and the areas for future work are explained.

Chapter 7 Conclusion and Future Work

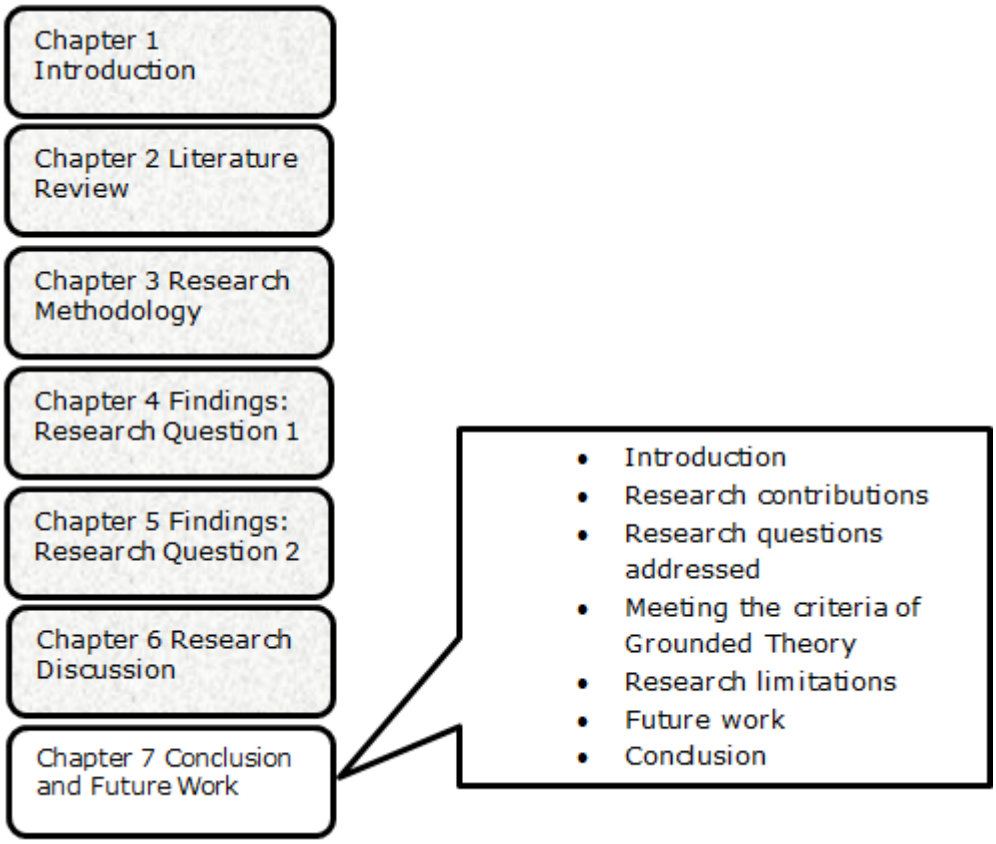

Figure 7.1 Chapter 7 Roadmap

7.1 Introduction

To this point, Chapter 1 identified the aim of this study and discussed the significant contributions that this research intended to produce in the cloud adoption research relating to NZ organisations. The research focussed on finding the socio-technical factors and impacts of the cloud adoption by applying Leavitt's model.

The literature relevant to cloud adoption in organisations was reviewed in Chapter 2, including the socio-technical aspect, the cloud delivery and service models, Leavitt's model as a suitable framework, motivational factors of cloud adoption in organisations and the challenges of cloud adoption in organisations.

In Chapter 3, the research questions were identified and a credible research methodology specified. Prospective research participants are sent an invitation containing information on this research (see Appendix D) and a consent form is signed upon acceptance (see Appendix C). Then interviews were conducted, recorded and

transcribed. Nvivo10 software was used mainly for coding and deriving categories and themes from the interview data.

Chapters 4 and 5 presented the analysis and findings of the research. Chapter 4 described the eight categories of the theme of factors as: business continuity, convenience, cost effectiveness, data centres, and free from maintaining IT Infrastructure, Cloud Service Provider (CSP) reputation, speed, and suitability.

Chapter 5 described the eight categories the second theme of impact as: best practices create awareness of policies and service-level agreements (SLAs), improved collaboration, job losses, more time for IT managers to strategise, loss of productivity and disturbances due to outages by provider, high degree of satisfaction with CSP, security concerns for business-critical data and skill upgrade.

Chapter 6 discussed the findings of this study in detail and proposed a *'Conceptual Socio-Technical Cloud Strategy Framework'* (see Section 6.7). A meta-analysis of the relationship between the four components of Leavitt's model was done to find the impacts the technology component had on other components.

This final chapter highlights the contributions of this research to the field of study and draws conclusions from the overall study. It also considers the limitations of the research and provides recommendations for further research. The aims and objectives, as introduced in Chapter 1, are revisited and addressed, as well as the criteria and validity for grounded theory research (see Section 3.11).

7.2 Research Contribution

This study explored the cloud adoption environment in SMEs and developed a conceptual cloud computing adoption model that was theoretically grounded in Leavitt's socio-technical framework. By adopting the Leavitt's model, this study has shown that the four contexts of this framework: technology, tasks, organisational, and structure, are connected to each other.

The research findings have important implications for academia in terms of identifying and applying rigorous processes used by the GTM, use of NVivo10 software for data analysis and use of Leavitt's model to measure socio-technical impacts.

The findings of this study also have great value to the decision makers in an organisation, in terms of outlining better strategies for cloud computing adoption. For organisations and CSPs, the conceptual model that was derived in this study may enhance their understanding of why organisations choose to adopt cloud-based technologies and what effects are felt in the workplace. Furthermore, CSPs may need to improve their dealings with organisations in terms of understanding and meeting SLAs.

7.3 Research Questions Addressed

This study is an exploratory one to understand and gain knowledge about the factors and the impact of cloud computing adoption by NZ organisations. The research questions were addressed by conducting interviews and exploring the mindset of experts. The study accurately reflects the views, opinions and perceptions of participants who work in SMEs and had been involved in the cloud adoption processes. The significant contributions of the research are achieved through the identification and conduct of the correct procedures for achieving exploratory criteria through GTM processes (see Figure 3.2) and finding indicative themes and categories through CRG and RCM.

7.4 Meeting the Criteria of Grounded Theory

The findings of this study are specific in its current context, that is, when the awareness of cloud computing is gaining prominence in NZ organisations. Charmaz (2006) has suggested that employing a grounded theory in its particular social context strengthens the study, and comparisons can be drawn between similar studies which can assist in developing more theories at either a general or an abstract level. This research has developed a substantive grounded theory in which the subject area in a specific setting are interpreted and explained, that is to describe individuals' views about factors and impacts in relation to cloud adoption in their respective organisations.

Hence, the findings have led to the development of a practical grounded theory, which is specific for a particular area in the cloud computing field of study. The following section revisits the criteria for grounded theory studies as described by Charmaz (2006).

7.4.1 Credibility

The criterion of 'credibility' measures whether the data was sufficient to merit claims, did the categories cover a wide range of empirical observations and whether any logical links formed between the empirical data and theory. Data saturation was reached after

twelve interviews, therefore the study shows credibility. Logical links between the empirical data, the two research questions of the study and the analysis were formed successfully. A properly guided grounded theory approach was devised for coding processes, and further use of matrices such as CRG and RCM strengthened the development of theories. The study has provided enough evidence in the form of explanations of links between categories which formed the basis for the grounded theory. Furthermore, comparing the theory to the literature has helped to develop an independent assessment of the two research questions.

7.4.2 Originality

The criterion of 'originality' measures whether the theories and categories developed in the study offered new insights into the area of research. This study claims to be original in the sense that it assesses theoretical significance because socio-technical factors using Leavitt's model have not previously been researched in relation to cloud computing using the grounded theory methodology. The key factors and the associated impacts shed new light on the other important variables connected to the literature review.

7.4.3 Resonance

The criterion of 'resonance' aims at assessing whether the research analysis offered the participants deeper insights about their lives and worlds. In other words, did the categories developed from the grounded data relate to the experience and knowledge of participants and did the categories make sense to them?

The grounded theory developed for this study reveals individuals' experiences with the factors and impact in relation to their perception of cloud adoption. There are two ways resonance was achieved in this study. Firstly, data collection and analysis were sporadically conducted and, through the initial coding process, early findings were verified to shape further data collections. And then some of the tentative categories were presented to some of the participants (PC, PF, PG and PK) in order to assess how participants interpreted them. These processes were beneficial to this study in terms of gaining clarity on the interview data, and to the research participants on providing them with an understanding of the dynamics of what they said and how it was being interpreted. The processes evaluated whether participants accepted the categories as valid interpretations of their views.

7.4.4 Usefulness

The criterion of ‘usefulness’ evaluates whether the study contributed to knowledge and if it could spark further research in other essential areas. Empirical data collections for this study were aimed at capturing participants’ feelings and opinions about the cloud adoption subject area and it was important to allow participants to express what was important to them in this context. Analysis revealed which factors were most spoken about and how this contrasted with literature. This research provides opportunities for additional research. Further research would be necessary to develop a grounded theory more capable of generalisation and which would be transferable to other subject areas (see Section 7.6).

7.5 Research Limitations

The findings revealed that cloud adoption impacts directly on the provision of IT related services as well as indirectly through the contextual elements of organisational structure, communication, processes and knowledge. However, this research does have limitations which are discussed in the next section.

7.5.1 Exploratory and Interpretive

This study is exploratory which means that conclusions drawn from this research were limited to the empirical data examined. Grounded theory research is highly descriptive and contains a wealth of meanings; hence no statistical analysis was employed. And being descriptive in nature meant that data could be interpreted in different ways.

In addition, the study is highly dependent on the theoretical sensitivity of the researcher and so the findings are dependent on individual interpretation. This research also suffers from limitations of intellectual discipline; physical commitment; and a time structure that was unavailable to the researcher, as per demands of any grounded theory study.

7.5.2 Theoretical Sampling

One of the processes closely associated to GTM is theoretical sampling. This study did not employ this sampling process due to time limitations. Theoretical sampling is controlled by emerging theory and therefore could not be planned in a detailed manner before the interview process.

7.5.3 Privacy and Security

Findings revealed that implementing cloud-based technologies had impacted the privacy and security of organisational data and applications. Security threats were evident after cloud implementation. Also, threats such as hacking into vulnerable cloud infrastructure and loss of data emerged. A lack of awareness by organisations on how SLAs provided for security and data protection opens room for more research in areas of privacy and security.

7.5.4 Performance Management

This study also did not deal with performance management. Issues of poor performance are common with the introduction of new technologies. This could be due to load factor or sharing internal and external servers. Problems may arise because of the time required for data transfer to external systems. This line of research must be conducted in future.

7.6 Future Work

The findings of this study and the limitations described in Section 7.5 present opportunities for future research as described in the following subsections.

7.6.1 Exploratory

Although the theory that emerged has relevance to a wider field and even though the research participants represented a cross section of managerial and IT professions, it is possible that another selection of interview participants could produce different viewpoints.

Furthermore, interpretations of GTM can be strengthened by applying statistical analysis through surveys.

7.6.2 Theoretical Sampling

Theoretical sampling is a highly systematic process and applying it while attempting to generate a theory in a GTM related study may strengthen the rigour of the study and provide a firmer structure to data collection and data analysis processes.

7.6.3 Privacy and Security

Further research is required to investigate data protection mechanisms over the cloud, to secure data and protect privacy. Cloud services should preserve data integrity and

organisational privacy. At the same time, they should enhance interoperability across multiple cloud service providers.

7.6.4 Minimal Integration Issues

This study refutes the literature with participants claiming that "everything went smoothly" and "there were no integration problems". Studies in the literature indicated that adoption of new technologies face integration problems, this study claims otherwise.

The literature, however, took a different view of the integration aspect of cloud adoption compared to that of the participants in this study. Two different views of integration can be identified: Complexity and Compatibility.

Complexity and lack of compatibility of cloud solutions with existing IT infrastructure are mainly seen as barriers to cloud computing adoption (Low, Chen & Wu, 2011).

Compatibility is considered as a key determinant of cloud adoption (see Section 2.5.3). Compatibility with in-house systems focuses on accomplishing a high level of integration for the new technologies. Therefore, it is crucial for organisations that the adopted technology be consistent with their existing standards and requirements. El-Gazzar (2014) stated that IT governance plays a crucial role in ensuring the successful integration of cloud-based technologies. IT governance was not considered in this study.

Having minimal integration issues has opened up possibilities for further research in areas of IT governance in handling cloud integration. A question which arises is whether SMEs tend to have minimal integration issues compared to larger organisations.

7.6.5 Challenging to Quantify Genuine Benefits

A determinant not identified in the literature but one that the participants pointed out as an important hindrance to the use of the adopted technology was the inability of the participant to quantify the genuine benefits that the cloud can produce in their organisation.

> PJ: It is not possible to quantify the genuine benefits of cloud computing. You like it you keep it. You don't like it, ditch it. It is the same as all other technologies that are in the market. Cloud has same benefits and

> problems as what we used to have with our physical resources, no different. The only thing is that there are provider companies involved. Cost benefit docs are useless because the cost of implementation and usage balance out and there are no profits.

From PJ's point of view, moulding an organisation's hardware infrastructure and applications may make it possible to estimate the costs of running parts of that system in the cloud. Nonetheless, costs alone are not sufficient to support an adoption decision. The risks and benefits of migration must also be equally considered. By including all the stakeholders in the cost analysis model it becomes easier to recognise the effects of migration on their work. The above statement by PJ opens up the possibility to conduct further research on ways to quantify benefits of cloud adoption at an organisational level.

7.7 Conclusion

The main objective of this study was achieved. This involved a thorough and accurate analysis of interview data using GTM processes. The discipline involved with GTM, its rigour, the intense coding phases, the constant comparative analysis and writing memos, allowed valuable insights to emerge and assisted in producing original theory with relevance for the research participants. The research involved the process of change in a socio-technical context with limited theory available to explain the particular research topic using GTM as a method. Furthermore, the research findings are firmly grounded in data.

The research clearly indicates the impact organisations experience with the adoption and accomplishments of cloud-based technologies in their operations. Decision-makers must formulate strategies to deploy advanced cloud-based technologies to ensure optimum use of IT services in their organisation which can lead to increased profits and easier application and service management.

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Appendix A: Ethics Approval

AUTEC
SECRETARIAT

1 May 2013

Alan Litchfield
Faculty of Design and Creative Technologies

Dear Alan

Re Ethics Application: **13/46 Assessing the Socio-Technical impacts of cloud computing in New Zealand organisations: An exploratory study.**

Thank you for providing evidence as requested, which satisfies the points raised by the AUT University Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 1 May 2016.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online throughhttp://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 1 May 2016;
- A brief report on the status of the project using form EA3, which is available online throughhttp://www.aut.ac.nz/researchethics. This report is to be submitted either when the approval expires on 1 May 2016 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Madeline Banda
Acting Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Rohini Dutt rohinidutt@ihug.co.nz

Appendix B: Interview Questions

Interview Questions

Name of Participant: _____

Name of Company: _____

1. What is your role in the company?
   -How long have you been working for the company?

2. Has the company been using cloud based solution for long?

3. How did the adoption process go?
   -What kind of solution is it? Are there any technical details I should know?

4. Why did the company adopt Cloud? What were main factors to move to/adopt Cloud?

5. How did you see it as an opportunity for organisational growth?

6. Have you any third parties involved? How are they involved?

7. What is the nature of the relationship with the third parties?

8. How has the adoption of cloud changed what you do?

9. How has cloud adoption affected or impacted staff?

10. What uncertainty did you experience in the adoption of cloud?

11. What future opportunities has the adoption opened up?

12. In what way do you feel it improved the status of the organisation as a whole?

Appendix C: Consent Form

Consent Form

Project title: ***Assessing the Socio-Technical Impacts of Cloud Computing in New Zealand Organisations: An Exploratory Study***

Project Supervisor: ***Dr. Alan Litchfield***

Researcher: ***Rohini Dutt***[1]

- ○ I have read and understood the information provided about this research project in the Information Sheet dated dd mmmm yyyy.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ○ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.
- ○ I agree to take part in this research.
- ○ I wish to receive a summary of the research findings (please tick one): Yes○ No○

Participant's signature: .....

Participant's name: .....

Participant's Contact Details (if appropriate):

.....

.....

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 01/05/2013 AUTEC Reference number 13/46

Note: The Participant should retain a copy of this form.

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[1] Subsequent to the information collection phase, name changed to Gaur through marriage.

Appendix D: Participation Information Sheet

Participant Information Sheet

Date Information Sheet Produced:

31/03/2013

Project Title

Assessing the Socio-Technical Impacts of Cloud Computing in New Zealand Organisations: An Exploratory Study

An Invitation

My name is Rohini Dutt and I am currently undertaking postgraduate research towards a Master of Computing and Information Sciences at AUT. I would like to invite you to participate in this research study that will help me gather valuable information towards my thesis.

Currently I am preparing to write my thesis in which I want to ***investigate the current industry perceptions of cloud implementation and deployment***. I need one hour of your valuable time to conduct an interview on the impact of cloud implementations.

If you are interested please contact me at rohinidutt@ihug.co.nz or 021 472 341. It will be greatly appreciated. Participation is entirely voluntary and you have the right to withdraw from this study without having to provide a reason. You will not be disadvantaged in any way should you choose to withdraw.

What is the purpose of this research?

This research proposes to study the impact of cloud migration in NZ organisations and its effects on the organisational culture, work performance and system affordances. I would like to know the answer to questions such as: ***What are the key factors which affect cloud adoption in NZ organisations and what are their effects on work practices?***

Through your answers I will be able to create a 'Socio-Technical Cloud Strategy Framework' which will be beneficial in identifying and minimising socio-technical issues and constraints.

How were you identified and why are you being invited to participate in this research?

You have been chosen for this study because your organisation may have implemented cloud technologies and can help provide valuable information as to why and how this implementation is affecting your organisation.

What will happen in this research?

If you are selected to participate in the interview for this study, you will be given the opportunity to discuss your experiences and your overall viewpoint on the factors which have affected the decision to adopt cloud technologies, how the migration process went and its effect on the overall organisation. This interview will take ~60 minutes and is intended to be conducted at a public venue, like a nearby coffee shop. Participation is voluntary. This interview will be audio-taped and you may have your responses withdrawn any time before the completion of data collection. The findings may also be used in journal publications or conference presentations, as part of my research output.

Are there any discomforts and risks? If there are any discomforts and risks how will they be alleviated?

The interview questions are structured as to not cause any discomfort. Your voice will be recorded.

If you feel any discomfort during the interview you may refuse to answer questions. You will also be able to have responses withdrawn whenever you like prior to the end of the interview.

How will your privacy be protected?

All information you provide in the interview will be completely confidential, and your name or your company's identity will not be disclosed. Privacy and confidentiality will be respected. Your company name and your individual details will only be referred to by unique codes and pseudonyms. You will be given the opportunity to check the transcript of the interview for any commercially sensitive information.

What are the costs of participating in this research?

There is no cost to you for participating in this study, other than your time. Interviews will take approximately ~60 minutes of your time.

What opportunity do you have to consider this invitation?

Interviews will not commence until July 2013. I will contact you to get your answer or you can contact me by email, rohinidutt@ihug.co.nz or phone 021 4723 41. All terms of agreement, including any doubts or concerns, will be thoroughly explained should you choose to participate before the actual interview.

How do you agree to participate in this research?

I will contact you to get your answer or you can contact me by email, rohinidutt@ihug.co.nz or phone 021 4723 41. Prior to being interviewed, you will be required to complete a Consent Form. This will be provided before the interview.

Will you receive feedback on the results of this research?

The results of this research will be made available to you after analysis has been conducted and the research findings will be included in the results of my Master's thesis. You can have access to the anonymised transcripts and also have access to a digital version of the Master's thesis.

What do you do if you have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr. Alan Litchfield, *alan.litchfield@aut.ac.nz*, 921 9999 ext 5217.

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEC, Dr Rosemary Godbold, *rosemary.godbold@aut.ac.nz* , 921 9999 ext 6902.

Whom do I contact for further information about this research?

You can contact me (the researcher) at rohinidutt@ihug.co.nz, mobile 021472341

Approved by the Auckland University of Technology Ethics Committee on *01/05/2013*, AUTEC Reference number *13/46*.