ORGANISATIONAL RESILIENCE IN NEW ZEALAND

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ABSTRACT

Organisations maintain our economy; they provide jobs, goods, services and a sense of community. The increasingly globalised nature of the modern world has lead to organisations facing threats that often are not recognise until the threat becomes a crisis. It is impossible for organisations, regardless of size, location or financial strength, to identify all possible hazards and their consequences; let alone plan for them. Therefore, the concept of increasing organisational resilience is gaining momentum.

However, the term resilience has been used with abandon across a wide range of academic disciplines and in a great many situations. There is little consensus regarding what resilience is, what it means for organisations and, more importantly, how they may achieve greater resilience in the face of increasing threats.

This study investigates 10 organisations from a range of industry sectors, sizes, localities and types within the New Zealand context to discover what are the common issues that foster or create barriers to increased resilience. Organisational resilience is defined in this study as a function of the overall situation awareness, keystone vulnerabilities and adaptive capacity of an organisation in a complex, dynamic and interrelated environment. A multiple case-study method has been used, and a facilitated 5-Step process for assessing and increasing resilience has been developed in conjunction with these organisations. Data was collected in the form of interviews, survey and participant observations in workshop environments. A set of 15 resilience indicators have been identified, and the organisations have been ranked according to their overall resilience relative to the other organisations in this study.

Future work is likely to include further quantification of the methodology and the resilience indicators, resilience maturity models and work on understanding resilient leadership, communication of resilience concepts and international case studies to further determine the range of resilience for organisations.

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I would also like to humbly thank my mother. She has spent many many hours looking after my son so that I can chase, and catch this endeavour. Without her, none of this would have been possible.

Finally, I would like to dedicate this work to my son, Toby. Thank you Toby for your laughter, tantrums and love that kept me grounded, and made me see the bigger picture in all of this. I hope that you learn that no matter what life throws at you, you can achieve your hearts desire if you really want to.

Life is either a daring adventure or nothing. (Helen Keller)

TABLE OF CONTENTS

Abstract i
Acknowledgements iii
Table of Contents v
Table of Figures ix
Table of Tables xi

1 INTRODUCTION 1
1.1 Overview 1
1.2 Context of this Research 1
1.3 Ethical Considerations 2
1.4 Thesis Layout 2

2 LITERATURE REVIEW 5
2.1 Introduction 5
2.2 The Organisational System 5
2.3 Organisational Learning in Complex Systems 9
2.3.1 Adaptivity 9
2.3.2 Situation Awareness 13
2.4 The Vulnerable Organisation 16
2.5 Organisations and Risk 18
2.6 The New Zealand Context 21

3 THESIS METHODOLOGY 23
3.1 Introduction 23
3.1.1 Definitions 23
3.1.2 Aims and Objectives 23
3.1.3 Case Study Methodology 23
3.2 Justification of the Case-Study Methodology 24
3.2.1 Research Questions and Propositions 24
3.3 Execution of the Case-Study Methodology 28
3.3.1 Selection of Case-Study Organisations 28
3.3.2 Data Collection 30
3.3.2.1 Interview Phase 31
3.3.2.2 Workshop Phase 35
3.3.3 Data Analysis using Grounded Theory Methods 35
3.3.3.1 Grounded Theory: a critical review 35
3.3.3.2 Grounded Theory in this study 37
3.4 Modification of the Case-Study Methodology 38
3.4.1 Feedback Loop 1: Case-Study Selection Issues 39
3.4.1.1 Organisation Selection and Access 39
3.4.1.2 Organisation Size 40
3.4.2 Feedback Loop 2: Data Collection Issues 40
3.4.2.1 Order of Interviewees 40
3.4.2.2 Recording of Interviews 41
3.4.2.3 Multiple Participant Interviews 41
3.4.2.4 External Interviewees and Organisational Interconnectedness 41
3.4.2.5 Observers 42
3.4.2.6 Technology and Presentation of Data 42
3.4.2.7 Size of the Workshops 42
3.4.2.8 Timing of the Workshops 43
3.4.2.9 Contextual Issues and the Order of the Workshop 43
3.4.3 Feedback Loop 3: Linking Data with Propositions 44
3.5 Amalgamation of the Case-Study Methodology 45
3.6 The Reduction of Bias in the Study 45
3.6.1 Organisation Selection 45
3.6.2 Data Collection 46
3.6.3 Data Analysis 46
3.7 Qualitative versus Quantitative Data 46

3.8 Summary 47

4 METHODOLOGY FOR ASSESSING AND IMPROVING ORGANISATIONAL RESILIENCE 51
4.1 Introduction 51
4.2 Objectives of the 5-Step Process 52
4.3 Theoretical Basis of the 5-Step Process 53
4.3.1 The Grounded Theory Methodology 53
4.3.2 Organisational Learning 54
4.3.3 The Risk Management and Business Continuity Approach 54
4.4 The 5-Step Process 55
4.4.1 Step 1: Building an Awareness of Resilience Issues 55
4.4.1.1 Interviews, Surveys and Reporting 55
4.4.1.2 Consequence Scenarios 56
4.4.2 Step 2: Determination of Essential Organisational Components 57
4.4.2.1 Component Mapping 57
4.4.3 Step 3: Self Assessment of Vulnerability 59
4.4.3.1 Selecting the Scale of Assessment 59
4.4.3.2 Criticality 60
4.4.3.3 Preparedness 60
4.4.3.4 Susceptibility 60
4.4.4 Step 4: Identification and Prioritisation of Keystone Vulnerabilities 61
4.4.4.1 The Vulnerability Matrix 61
4.4.4.2 Keystone Vulnerability Prioritisation 62
4.4.5 Step 5: Increasing Adaptive Capacity 64
4.4.5.1 Readiness Exercises and Disaster Simulations 64
4.5 Synthesis 66
4.6 The Resilience Profile 67
4.7 Summary 70

5 RESILIENCE INDICATORS FOR ORGANISATIONS 71
5.1 Introduction 71
5.1.1 Maintaining Case-Study Integrity 71
5.1.2 Reports and Confidentiality 71
5.1.3 Keystone Vulnerability Analysis 71
5.1.4 Composite Awareness of Resilience Indicators 72
5.2 Principal Resilience Issues 72
5.2.1 Situation Awareness 72
5.2.1.1 Roles and responsibilities (SA_1) 72
5.2.1.2 Hazard and Consequence Awareness (SA_2) 75
5.2.1.3 Connectivity Awareness (SA_3) 76
5.2.1.4 Insurance Awareness (SA_4) 76
5.2.1.5 Recovery Priorities (SA_5) 77
5.2.2 Keystone Vulnerabilities: Identification and Management 78
5.2.2.1 Planning Strategies (KV_1) 78
5.2.2.2 Exercises (KV_2) 79
5.2.2.3 Capability and Capacity of Internal Resources (KV_3) 80
5.2.2.4 Capability and Capacity of External Resources (KV_4) 84
5.2.2.5 Organisational Connectivity (KV_5) 86
5.2.3 Adaptive Capacity 87
5.2.3.1 Silo Mentality (AC_1) 87
5.2.3.2 Communications and Relationships (AC_2) 89
5.2.3.3 Strategic Vision and Outcome Expectancy (AC_3) 92
5.2.3.4 Information and Knowledge (AC_4) 93
5.2.3.5 Leadership, Management and Governance Structures (AC_5) 95
5.3 Synthesis 97
5.4 Summary and Conclusions 98

6 THE CASE-STUDY ORGANISATIONS 101
6.1 Introduction 101
6.2 CS1 – Private Manufacturer 101
6.3 CS2 – Local Authority 103
6.4 CS3 – Private Contractor 104
6.5 CS4 – Public Utility Provider 107
6.6 CS5 – Education Provider 108
6.7 CS6 – Private Wholesale Distributor 109
6.8 CS7 – Private Utility Provider 110
6.9 CS8 – Private Retailer 112
6.10 CS9 – Private Primary Producer 113
6.11 CS10 – Private Technology Provider 115
6.12 Results of the Case-Study Organisations 116
6.13 Summary and Conclusions 117

7 IMPLEMENTATION STRATEGIES AND FUTURE WORK 119
7.1 Introduction 119
7.2 Strategies for Improving the Management of Organisational Resilience 120
7.2.1 Communications Strategy 120
7.2.1.1 What Do Others Here Do? 120
7.2.1.2 Leadership and Governance 120
7.2.1.3 Keep in Mind the Bigger Picture 121
7.2.1.4 Stakeholder Welfare 121
7.2.2 Business Resources Strategy 121
7.2.2.1 What could hit us and how bad could it be? 122
7.2.2.2 What are we all about? 122
7.2.2.3 What do we have at our disposal? 122
7.2.3 Emergency Planning Strategy 123
7.2.3.1 Response to Crises 123
7.2.3.2 Recovery from Crises 123
7.2.3.3 Exercises 123
7.3 The 5-Step Process as an Implementation Tool 124
7.3.1 Consequence Scenarios 124
7.3.2 Keystone Vulnerabilities and Matrices 124
7.3.3 Readiness Exercises and Disaster Simulations (REDS) 125
7.4 Future Work 125
7.4.1 Quantification of Resilience Measures 125
7.4.1.1 Benchmarking of Resilience Indicators 125
7.4.1.2 Quantification of Keystone Vulnerabilities 126
7.4.2 Resilience Maturity Models 126
7.4.3 Communication of Resilience 126
7.4.4 Resilient Sectors 126
7.4.5 Resilient Leadership 127
7.5 Summary and Conclusions 127

8 SUMMARY AND CONCLUSIONS 129
8.1 Overview 129
8.2 Definitions 129
8.3 Methodology 130
8.4 Resilience Indicators 133
8.5 The Case-Study Organisations 135
8.6 Strategies for Resilience Management 135
8.6.1 Resilient Communications Strategy 135
8.6.2 Business Resources Strategy 136
8.6.3 Emergency Planning Strategy 136
8.7 Implementation Issues 136
8.8 Future Work 137
8.9 Synthesis 137

9 REFERENCES **139**

APPENDIX A A1
APPENDIX B B1
APPENDIX C C1
APPENDIX D D1
APPENDIX E E1
APPENDIX F F1
APPENDIX G G1

Table of Figures

Figure 1: *Illustration of a random and scale free network (adapted from Dalziell and McManus, 2004). a) A random network is one where the nodes have a relatively even distribution of links to each other. b) scale-free network is characterised by 'hubs' where a small number of nodes attract the majority of links* 8

Figure 2: *The Bell Curve versus the Power Law (after Buchanan, 2004)* 19

Figure 3: *Risk Transference (after Etkin, 1999).* 20

Figure 4: *Diagrammatic representation of the case study methodology followed in this research (modified from Yin, 2003, Figure 2.2). The methodology is divided into four phases of investigation; justification, execution, modification and amalgamation. Feedback loops are also illustrated which represent the iterative nature of the methodology and the changes in approach where new data emerged or where existing strategies were inconsistent with the current situation. This diagram also shows how each case study was conducted and then data was integrated to generate theory.* 25

Figure 5: *The Grounded Theory approach to data management and the generation of theory from qualitative analysis of information (after Pidgeon and Harwood, 1996)* 38

Figure 6: *A schematic flow diagram illustrating the iterative nature of the 5-Step process and the connectivity between steps to achieve improved resilience for organisations.* 56

Figure 7: *Sample vulnerability matrices showing (a) an all-hazards approach and (b) a context specific approach to determine keystone vulnerabilities for organisational resilience.* 63

Figure 8: *The Resilience Profile. For an organisation with very high resilience (a) the resilience envelope (black and white hashed area on the diagram) will plot close to the apex of each axis of the triangle, in the very high zone. For an organisation with very low resilience (b) the resilience envelope will plot much closer to the centre of the diagram for each axis.* 69

Figure 9: *The resilience profile for CS1, the Private Manufacturer.* 102

Figure 10: *The resilience profile for CS2, the Local Authority.* 103

Figure 11: *The resilience profile for CS3, the private contractor.* 105

Figure 12: *The resilience profile for CS4, the Public Utility.* 106

Figure 13: *The resilience profile for CS5, Educational Organisation* 108

Figure 14: *The resilience profile for CS6 - Private Wholesale Distributor.* 110

Figure 15: *The resilience profile for CS7, Private Utility Provider* 111

Figure 16: *The resilience profile for CS8, Private Retailer* 113

Figure 17: *The resilience profile for CS9, the Primary Producer.* 114

Figure 18: *The resilience profile for CS10, the Private Technology Provider.* 116

Figure 19: *Resilience profiles highlighting the difference between an organisation that is very highly resilient overall (a) and one which displays a very low overall resilience (b).* 132

Table of Tables

Table 1: *New organisational learning tools.* 9

Table 2: *A matrix that shows the criteria for selecting the organisations to take part in this study.* 32

Table 3: *Scoring system for both individual resilience indicators and for collated resilience scores.* 48

Table 4: *Summary table showing the individual and collated resilience scores for each case-study organisation. For key to scoring system, refer to Table 3* 49

Table 5: *A table showing the connectivity of the steps in the 5-Step process and how the steps relate to the attributes of resilience.* 52

Table 6: *Details of the consequence scenarios used to improve an organisation's situation awareness.* 58

Table 7: *An example of the types of internal and external organisational components mapped for organisations in this study.* 59

Table 8: *The relative ratings of case study organisation for each resilience indicator identified.* 99

Table 9: *A summary table showing the relative rankings and associated scores for each organisation in this study, together with a composite ranking of total resilience.* 117

Table 10: *A matrix showing the relationships between each of the resilience indicators.* 119

Table 11: *A table showing which of the resilience indicators are targeted by the proposed resilience management strategies.* 121

Table 12: *Details of the 5-Step process and the attributes of resilience that are addressed by each step.* 131

Table 13: *Overview of the case-study organisations and the relative degrees of resilience determined for each.* 133

Table 14: *A summary of the resilience indicators representing key issues for all organisations in this study.* 134

1 INTRODUCTION

1.1 Overview

New Zealand is a small country in terms of its geographic size, population and economy. However New Zealand's physical environment is highly dynamic and its geographic isolation means that organisations here must maintain a high degree of connection with the global organisational community. Organisations manage, maintain and operate our infrastructure, create our economy and contribute to our society. The ability of organisations to respond and recover effectively following a hazard event has a large influence on the length of time that essential services are unavailable. Therefore, enhancing organisational resilience is a critical step towards creating more resilient communities.

It is important for organisations that resilience becomes an operational construct that has tangible and measurable outcomes and not just a theoretical concept. Additionally resilience is often seen as a crisis or emergency management issue; the link between creating resilient day-to-day operations and having a resilient crisis response/recovery is typically not well understood by organisations. This research attempts to bridge the gap between the concept of resilience and the creation of a more resilient organisation.

The benefits of becoming a more resilient organisation cannot be overstated. Resilience will increase an organisation's awareness of its entire operating environment, both internally and externally, and provide the capacity to recognise and act upon the threats (and opportunities) of any situation. Increased resilience will also allow an organisation to better identify its keystone vulnerabilities and be able to set priorities when implementing business continuity and emergency management planning. Finally, improving resilience also encourages a more adaptive enterprise; one that can make decisions in both a timely and appropriate manner, engage in effective and empathic leadership and ensure the creation of a culture of resilience in an organisation. Ultimately understanding and building resilient organisations will help to improve resilience throughout the community, both in New Zealand and on the global stage.

1.2 Context of this Research

This research project is an intrinsic component of 'Resilient Organisations: Organisational Systems for Readiness, Response and Recovery'; an innovative and ambitious research project investigating how New Zealand organisations may improve their resilience to hazard events. Resilient Organisations is funded by the Foundation for Research Science and Technology. Over a six year period Resilient Organisations is investigating the planning, prioritisation and deployment, and legal issues faced by New Zealand organisations in relation to hazard events. The project has three separate but interconnected objectives. The work contained in this study contributes to the first objective.

Objective One explores how and why organisations plan for hazard events, and examines how investment is prioritised, both within organisations and from a wider perspective, by identifying critical industries. Additionally, Objective One also explores ways to improve internal strategies for organisational planning and link resilience for crises with day-to-day operations. Finally, Objective One looks at ways to provide a platform for inter-organisational hazard planning both within and across industry boundaries.

Objective Two looks at the prioritisation and deployment of physical and human resources for recovery after a hazard event. This objective looks at clusters of organisations that will have to work together following a crisis to meet their individual and collective objectives.

Objective Three investigates the legal and contractual environment in New Zealand with a view to establishing a comprehensive procurement framework and programme management plan for reconstruction in the event of a national disaster.

1.3 Ethical Considerations

This study follows the guidelines provided by the University of Canterbury Human Ethics Committee (August 2001). Because this study is an investigation of a business organisation or institution, the researchers are not required to gain approval from the Human Ethics Committee. However, in accordance with the Committee's principles and guidelines, this study adhered to the following primary principles:

1. Informed and voluntary consent. All participants were either telephoned or emailed by the researcher to ask for their participation in the study. The selection of participants was facilitated initially by the primary contact in the organisation after initial discussions with the researcher about the nature of the study, and consideration of which staff members would be most suitable to interview.
2. Respect for rights of privacy and confidentiality. All participants were asked if they were comfortable with their interview being recorded and were all assured that their privacy, confidentiality and anonymity would be strictly respected. No participants were directly identified by their comments in any reports to the organisation, or in this thesis.
3. Limitation of deception. Each organisation was presented with a 'draft discussion' report which was designed as a way for the organisation to review the results of the interviews. The participants were invited to comment on this report in each organisation and given the opportunity for discussion during a workshop session. All transcriptions of interviews were available to respective participants for review if required.
4. Minimisation of risk. Two-way confidentiality agreements were signed by both the organisation and the University of Canterbury. This was designed to minimise risk to both parties.
5. Obligations under the Treaty of Waitangi. This study did not investigate cultural issues specifically.

1.4 Thesis Layout

This thesis is divided into the following chapters:

Chapter 2 - Review of Related Literature. In order to begin to address resilience issues for organisations it is crucial to gain a detailed understanding of what existing research and knowledge is available in this area. This chapter outlines the key concepts in modern thinking about resilience, vulnerability, adaptive capacity, situation awareness, complexity and organisations.

Chapter 3 - Thesis Methodology. The approach used in this research follows that of a multiple case study approach and is entirely qualitative in nature. The case study methodology is complimented during the information gathering and analysis phases by adopting the Grounded Theory method. This chapter details both the case study and the

Grounded Theory methodologies and their application to the research questions for this study including presentation of the research questions and supporting propositions. Also included in Chapter 3 is the presentation of essential definitions of organisational resilience, situation awareness, keystone vulnerabilities and adaptive capacity.

Chapter 4 - Methodology for Assessing and Improving Resilience. Chapter 4 details the 5-Step process; a methodology developed with the case-study organisations and used primarily to gather information but also to assess and manage organisational resilience. The 5-Step process has formed the backbone of this research and each of the five steps are detailed in Chapter 4. Additionally, the resilience profile is introduced and the methodology for creating profiles and interpreting them is explored.

Chapter 5 - Resilience Indicators for Organisations. Collation of the information from each of the case study organisation is presented in Chapter 5 as a set of generic resilience indicators. There are 15 indicators in total; five each representing situation awareness, keystone vulnerability and adaptive capacity. These indicators are explored and the discussion considers the original research questions and propositions. The discussion also investigated as well as the inter-relationships between them and assessed for each organisation relative to the others in the study; composite scores are presented. These scores are the data from which the resilience profiles in Chapter 6 were generated.

Chapter 6 - The Case-Study Organisations. A total of 10 organisations were investigated in this study and a summary of the resilience issues that are pertinent to each is presented in Chapter 6. The discussion for each organisation is subdivided into situation awareness, the management and identification of keystone vulnerabilities and adaptive capacity. A resilience profile is also presented for each organisation. These are composite profiles and represent the overall resilience of the organisation compared to the other organisations in this study. The information used to generate these profiles is presented in Chapter 5.

Chapter 7 - Resilience Management Strategies, Implementation and Future Work. As a result of the identification of the generic resilience indicators for organisations in Chapter 6, three resilience management strategies are proposed. These strategies address each of the indicators at least once, and some indicators are addressed multiple times. The inter-relationships between resilience indicators are highlighted. The 5-Step process is introduced as an implementation tool for organisations seeking to improve their resilience. Chapter 7 also looks at the questions and issues raised by this research but which are outside of the scope of this current study. There are comments on the reasons why these are important to gain a more complete understanding of organisational resilience.

Chapter 8 - Summary and Conclusions. This chapter integrates the information presented in this thesis into a short summary of relevant methodologies, key findings and possible ways forward.

2 LITERATURE REVIEW

2.1 Introduction

This chapter presents a broad overview of the current literature related to the development of resilience from an organisational perspective. The chapter forms the basis of the working definition of organisational resilience used in this study; where…

Resilience is a function of an organisation's situation awareness, identification and management of keystone vulnerabilities and adaptive capacity in a complex, dynamic and interconnected environment.

Traditionally, resilience is viewed as those qualities that enable an individual, community or organisation to cope with, adapt to and recover from a disaster event (Buckle et al, 2000; Horne, 1997; Mallak, 1998; Pelling and Uitto, 2001; Riolli and Savicki, 2003). It is the capacity of a system to absorb change (generally conceptualised in the form of sudden shocks) and still retain its essential functionality (Walker et al, 2006). The concept of resilience has evolved through its application to numerous scientific disciplines. Resilience has been discussed in relation to; climate change and linked to vulnerability (Timmerman, 1981); in terms of proactive and reactive resilience of society as a whole (Dovers and Handmer, 1992); as it relates to both ecological and social systems (Adger, 2000); and natural hazards (Blaikie et al, 1994) to name but a few. Resilience is not a static condition of an organisation and may vary over time and depending on the nature and consequences of a particular crisis. Therefore, organisational resilience is thought by some authors to have different, but related meanings; resilience is the ability to prevent the negative consequences of an event occurring; resilience is the ability to prevent something with negative consequences worsening over time, and; resilience is the ability to engage in recovery following the negative consequences of an event (Westrum, 2006).

Several excellent reviews of the literature are available by Folke, (2006), Hollnagel et al (2006) and Klein et al (2003), and the reader is directed towards these for a detailed discussion. However, as pointed out by Klein et al (2003), resilience remains a theoretical concept and methods for achieving improved resilience at an operational level still challenge both the academic and the practitioner.

2.2 The organisational system

A general systems approach to looking at organisations has been suggested by a number of authors as a way to assess and measure resilience at an organisational scale (Dalziell and McManus, 2004; Horne, 1997; Marais et al, 2004; Riolli and Saviki, 2003; Starr et al, 2004). A general theory of systems has been applied to many disciplines including ecology, physics, sociology to name only a few. Systems theory has also been applied in an organisational sense and often used as a bridge for interdisciplinary research. Generally speaking, systems thinking is marked by its focus on a holistic viewpoint; a viewpoint where the relationships between the agents in a system are more important than the agents themselves. As the number of agents in the system increases and the behaviour of the system becomes non linear (namely, system behaviour cannot be predicted by the behaviour of individual agents), then the system becomes complex. When the agents in a complex system exhibit learning-type behaviours, then it becomes a complex adaptive system. Leading researchers in complex adaptive systems (CAS) include Gell-

Mann (1994) and Holland (1995). Dooley (1996, 1997) provides guidance regarding the essential components of CAS whereby:

- A CAS is composed of agents each acting semi-autonomously and which evolve over time.
- Agents scan their environments and develop mental models, or schema, of that environment.
- Agents can increase their fitness by acting to change the schema to fit the observation, or act to change the observation to fit the schema.
- The schema define how agents interact with other agents in the environment around them.

Further, CAS typically exhibit the following characteristics (after Vogelsang, 2002):

- individual agents interacting and re/constructing their relationships at the local level
- development of global patterns and the emergence of self-organisation
- constant creation of variety; the ability to develop new methods for action that build on the successes of the past. Knowledge that the system can only be influenced, not directed.

It could be argued that all organisations are complex because of the complexity of their most common agent, humans (Schein, 1980). However, it is more typically the internal or external environment which contributes the most to complexity in organisations (Dooley, 2002). The internal environment reflects the organisational processes and supportive technologies within the organisation while the external environment consists of suppliers, competitors, markets and so on.

The complexity that arises in internal environments for organisations is often attributed to increases in technology. Charles Perrow (1984) introduced the concept that some technological systems have what are termed as 'normal' or unavoidable accidents and incidents based on two inter-related dimensions; interactive complexity and loose/tight coupling. Interactive complexity is the phenomenon of a unforeseen and unplanned sequences of events that are not visible in a system. Loose and tight coupling refers to the degree to which parts of a system are tied to one another. In a tightly coupled system, the composite parts are linked very closely so that any changes in one part of the system have immediate implications and effects on all others. This can lead to disastrous results. Loosely coupled systems, on the other hand, have links, but the performance of one element of the system is not dependent on another. Typically these loosely coupled systems are able to absorb disruptions and perturbations without destabilisation of the entire system (Marias et al, 2004). The premise of Perrow's approach is that these tightly coupled systems, which also exhibit interactive complexity, are likely to experience 'system accidents' that are entirely unpredictable and also potentially cascading in nature. Many examples of these types of system failures have been documented. Examples include the chemical disaster at Bhopal (Shrivastava, 1992), Chernobyl nuclear power plant (Kennedy and Kirwan, 1998; Pidgeon, 1998; Pidgeon and O'Leary, 2000), the Exxon Valdez oil spill (Grabowski and Roberts, 1996) and the Mann Gulch disaster (Weick, 1993) to name but a few.

Additionally, researchers have noted that some types of organisations which exhibit the interactive complexity and tightly coupled systems identified by Perrow seem to experience remarkably few 'system accidents'. These organisations have been labelled as High Reliability Organisations (HRO's) (see La porte, 1996; La porte and Consolini, 1991; Roberts and G, 1989; Roberts, Stout and Halpern, 1994; Rochlin, La Porte and Roberts, 1987 and Weick, 1989). One of the principal elements of HRO's is the concept of mindfulness (Roberts, Stout and Halpern,

1994; Vogus and Welborne, 2003; Weick and Sutcliffe, 2001; Weick et al, 1999; Wildavsky, 1988). This mindfulness includes:

- a preoccupation with failure: recognition that the identification of near misses and any failures are an indicator of the entire system reliability and health; recognition and reward for the reporting of errors.
- a reluctance to simplify interpretations: a commitment to finding and maintaining divergent viewpoints about a situation in order to ensure that key variables of the system and environment are not overlooked.
- a sensitivity to operations: looking at the big picture on a constant basis from the viewpoint of real-time information.
- a commitment to resilience: a belief that the existing body of information is not complete and faith that the organisation has the ability to bounce back from failures, and handle any surprises that either the system or the environment momentarily produce.
- an under-specification of structures: the deferment of decision making to individuals with the greatest experience and expertise in the organisation regardless of the structured hierarchy, and recognition of more 'fluid' decision making processes.

Several examples are available in the literature, which detail case studies of HRO's. These include nuclear submarines and nuclear powered aircraft (Bierly and Spender, 1995; Roberts, Rousseau and La Porte, 1994; Rochlin, La Porte and Roberts, 1987), nuclear power plants (Bourrier, 1996; La Porte, 1982; La Porte and Thomas, 1995; Schulman, 1993), the Challenger Space Shuttle disaster (Heimann, 1993), military systems (Roberts, Stout and Halpern, 1994; Zohar and Luria, 2003) and air traffic control towers (La Porte and Consolini, 1991).

A criticism of both NRT and HRO theory is that few organisations have the extremely complex technology that is evident in these organisations; therefore the lessons to be learned from NRT and HRO's are limited and not necessarily applicable to mainstream organisations (Luo Carlo et al, 2004; van den Eede and van den Walle, 2005). Another criticism is that both theories oversimplify the causes of accidents by underestimating the problems of dealing with uncertainty (HRO research) or underestimate and oversimplify the ways in which to cope with uncertainty (Marais et al, 2004). However, some researchers have tried to integrate these theories to uncover techniques that are more relevant for those organisations that exhibit a complex relationship between technological and social elements; socio-technical systems. The study of socio-techincial systems theory is traditionally attributed to Eric Trist and Ken Bamforth (1951). In a case study of long-wall coal mining as a 'production system' they observed that in spite of improved technology the organisation's productivity was decreasing. Similarly, despite improvements in pay and conditions, the workforce was still dogged with increasing absenteeism. Therefore, it was theorised that greater emphasis needed to be placed on group dynamics rather than that of just the individual. The theory of socio-technical systems is based on the concept of joint optimisation. That is, the link between the social networks in any organisation and the interaction with the technical networks; there is an almost symbiotic relationship that develops. Development and optimisation of the social network without development and optimisation of the technical system can lead to potentially disastrous relationships and, in come instances, considerable damage to the organisation as a whole. In Barry Turner's study into man made disasters (Turner, 1978) he hypothesised that instead of disasters in technological systems being defined by the impacts on the technology, they should be defined by the impacts on the social and cultural aspects of the organisation (Pidgeon and O'Leary, 2000; Turner, 1978; Turner and Pidgeon, 1997).

'The man-made disasters model proposes that the build-up of latent errors and events, at odds with the culturally taken for granted, is accompanied by a collective failure of organizational cognition and 'intelligence', as the developing system vulnerability to failure remains concealed by social processes which attenuate evaluations of risk.' (Pidgeon and O'Leary, 2000)

Therefore, from a systems perspective, individual organisations may be viewed as systems themselves, and also as agents within a larger system. The interdependencies can be remarkably complex. Further to the concept of organisations themselves existing as components in complex networks, Barabasi (2003) has identified two types of network, which may have significant implications for developing resilience strategies for organisations (Figure 1). Firstly is the 'random network'; defined by the ability of nodes to be connected by a number of independent links, much like a road network in a city. While initially the random network is resistant to random failure of the links or nodes, rapid collapse of the network can occur once a critical threshold is reached and exceeded. Secondly is the scale-free network, which is defined by hubs; nodes within the network that have a majority of the links. The Internet typifies the scale-free network, where hubs may be represented by websites such as Google and Amazon. Similarly to the random network, the scale-free network is remarkably resistant to the failure of random links and nodes. However, targeted removal of hubs can quickly break down the network and disable the service.

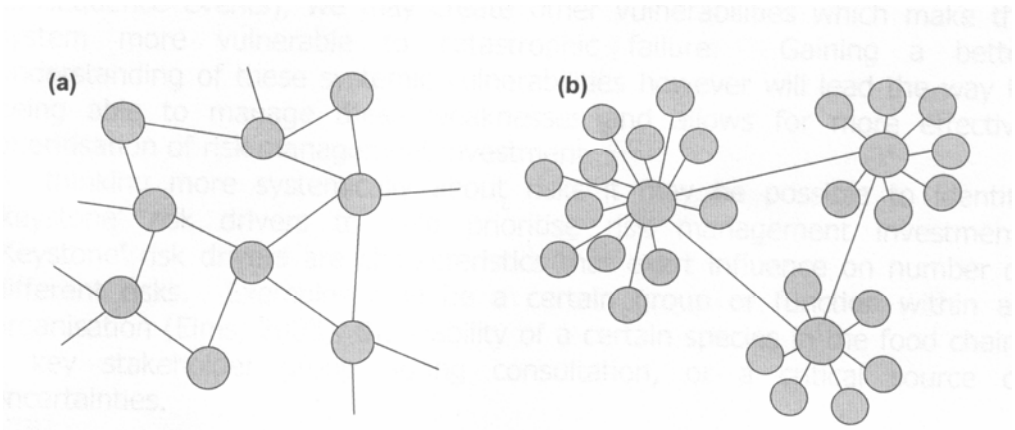

Figure 1: Illustration of a random and scale free network (adapted from Dalziell and McManus, 2004). a) A random network is one where the nodes have a relatively even distribution of links to each other. b) scale-free network is characterised by 'hubs' where a small number of nodes attract the majority of links.

As highlighted by Dalziell and McManus (2004), the failure vulnerabilities of these two types of networks have significant implications for designing resilient organisational systems. While random events, typically defined by natural hazards, will always be held in high regard by risk managers, it is the emerging hazards of the information technology age, terrorism and pandemic for example that may have the greatest implications for developing resilient organisational networks. Given the global economic imperative of recent years and the development of key organisations as hubs within the widespread organisational network, systematic removal of key hubs could potentially lead to a global economic catastrophe.

2.3 Organisational learning in complex systems

Organisations as complex adaptive systems display, to varying degree, a capacity to learn. Schein (1996) describes four factors that are intrinsic in an organisation's learning ability and its overall systemic health. These include:

- A sense of identity, purpose or mission
- A capacity on the part of the system to adapt and maintain itself in the face of internal and external changes.
- A capacity to perceive and test reality; and
- Some degree of internal integration or alignment of the sub-systems that make up the total system (after Schein, 1996).

There are several elements that contribute to an organisation's learning ability. These include the recognition of an essential interconnectedness (the systems view of the world), the ability to change how the world is viewed (generative learning) and the ability to adapt to changed environments (adaptive learning) (Murray, 2002; Schein, 1996; Senge, 1990). It is the ability of the organisational culture to ensure that learning is not entirely based on adaptive learning but becomes accommodating of both adaptive and generative learning types. New learning tools are also required to achieve this, however as this is unlikely to be achieved through cognitive changes alone (Murray, 2002). Examples of these tools may be found in Table 1 below (in Murray, 2002 and modified from Senge, 1990). The following discussion introduces the theories and concepts behind adaptive and generative learning in terms of adaptivity and situation awareness for organisations.

Table 1. New organisational learning tools.

Building shared vision	Surfacing and testing mental models	Systems thinking
• Encouraging personal vision. • Communicating and asking for support. • Visioning as an ongoing process. • Blending extrinsic and intrinsic visions. • Distinguishing positive from negative visions.	• Seeing leaps of abstraction. • Balancing enquiry and advocacy. • Distinguishing espoused theory from theory in use. • Recognising and defusing defensive routines.	• Seeing interrelationships, not things and processes, not snapshots. • Moving beyond blame. • Distinguishing detail complexity from dynamic complexity. • Focusing on areas of high leverage. • Avoiding symptomatic solutions.

2.3.1 Adaptivity

Adaptive learning centres on the ability of an organisation to cope; to learn and change simultaneously and align itself with its environment (Daft and Weick, 1984; Murray, 2002). Organisations that are successful in adaptive learning are proficient in:

- Sensing the change in the environment, both internally and externally,
- Acquiring information and make sure it is disseminated to where is can be processed and acted upon.
- Interpreting the information and formulate correct or appropriate conclusions
- Making internal transformation to address the changes in the environment without drawing adverse side effects.
- Development of new actions based on the information at hand; and
- Obtaining feedback on the appropriateness of the new actions (the Adaptive Coping Cycle, after Schein, 1980)

The literature in relation to adaptivity is divided into two rather distinct categories; socio-environmental systems and organisational systems. There is a huge body of research on adaptive capacity as it relates to socio-environmental

systems, particularly in relation to climate change research. This field is matched by a plethora of research into organisational adaptive capacity and learning. Although the discussion here focuses on the organisational research domain, a short introduction on the socio-environmental system approach is warranted. However, this discussion of the socio-environmental system approach doesn't aim to provide the reader with any great depth in this regard; rather the reader is referred to some of the excellent summaries of this work for more detail (Brooks, 2003; Gallopin, 2006; Klein et al, 2003; Smit and Wandel, 2006).

Typically researchers in socio-environmental adaption consider that these systems are investigated at the scale of a community; a 'definable aggregation of households, interconnected in some way and with a limited spatial extent' (Coombs et al, 1988; Smit and Wandel, 2006). Adaption may be synonymous with survival and success of the system and those that are successful at adapting have a high adaptive capacity; they are able to cope with change and respond to it quickly and effectively (Denevan, 1983). From the perspective of political ecology the focus of adaptive capacity changes to investigating the forces that impact on an individual's adaptive capacity when their community is faced with change (Kasperson and Kasperson, 2005; Smit and Wandel, 2006). Within this research into socio-environmental systems and climate change, the link between vulnerability and adaptive capacity is considered intrinsic. In some schools of thought adaptive capacity is one of the components of vulnerability, or even that they are opposite ends of the same spectrum (Smit and Wandel, 2006). These studies seek to identify and evaluate the criteria that determine the vulnerability of a system (typically countries, regions or communities) and that from these vulnerabilities can be reduced by increasing adaptive capacities or reducing exposure (Adger et al 2004; Brooks et al, 2005; Kelly and Adger, 2000). Luers and Lobell (2003), for example, incorporate the concept of adaptive capacity into their vulnerability assessment of agricultural systems in Mexico. Adaptive capacity, the author's argue, is a significant factor in characterising vulnerability and may be defined as *'the extent to which a system can modify its circumstances to move to a less vulnerable condition'* (p 259).

It is important to realise that adaptive capacity is not a static feature of any system. There are a number of studies (Folke et al, 2002; deVries, 1985) that look at how these components change over time and in response to environmental changes (economic, social, political and institutional) (Smit and Wandel, 2006). Furthermore, researchers have considered the inter-relationships between determinants of adaptive capacity, recognizing that strengths or weaknesses in one aspect, for example managerial ability, may influence other determinants such as the reduction of psychological stress among workers (Smit and Wandel, 2006).

The concept of adaptive capacity is at the core of current organisational resilience methodology. Adaptive capacity is defined as the ability of an enterprise to alter its 'strategy, operations, management systems, governance structure and decision-support capabilities' to withstand perturbations and disruptions (Starr et al, 2004). Organisations that focus on their resilience in the face of disruption generally adopt adaptive qualities and proactive responses. Furthermore, they emphasise positive behaviour within the enterprise and within employees and look at disruptions as being opportunities for advancement (Folke et al, 2002; Mallak, 1998).

The study of adaptive capacity in relation to organisational systems has resulted in considerable advances in recent years particularly regarding the cultural capital of an organisation and the effects this may have on its ability to withstand crises. The idea is not new and may be linked to Perrow's work on normal accidents (1979) and various studies into High Reliability Organisations (HRO's). Several different organisational cultures have been identified in terms of both adaptivity and learning abilty (see in particular the work by Schein, 1996). Some examples of

organisations have been shown to exhibit favourable workplace cultures that help them to adapt to changes in their operating environment, even when these changes are unforeseen and unexpected. Examples include Nokia, Toyota (Sheffi, 2006a), Dell (Sheffi, 2005), UPS (Coutu, 2002) and Coca-Cola (Seaman and Williams, 2005). While terminology differs regarding what attributes actually make up such effective organisational cultures, there are some widely accepted qualities that organisations can encourage (these attributes are discussed below).

Additionally, employees that are conditioned to expect the unexpected contribute significantly to an organisation with a high adaptive capacity. The ability for an organisation to combine the development and testing of a plan with enhancing the capacity of its staff to cope with the unexpected is a critical balance. No organisation can plan for every possible circumstance and therefore the organisational culture becomes vital (Sheffi, 2005). This is very apparent in high reliability and reliability seeking organisations where the culture of safety becomes more important to operational efficiency than controlling or mitigating unforeseen and unexpected events (Rochlin, 1999). Schein (1996) has identified three specific 'cultures' that are relevant to understanding the learning organisation and how adapitivity develops. These organisational cultures include:

- The operator culture: various 'sub-systems' of the organisation whose role it is to deliver the products and services that are derived from the organisation's primary objective or task. Subcultures often develop and these are typically the parts of the organisational system that are targeted for wholesale changes when the organisation experiences transformations. This culture is extremely people oriented.
- The engineering culture: the people who inhabit this organisational culture are those who are responsible for designing the systems and processes upon which the organisation 'delivers its products and services and by which it maintains itself". These people believe in the simplicity and efficiency of technical solutions and that humans are the source of all errors.
- The CEO culture: the individuals in the CEO culture are dominated by a financial focus and view of the organisation. They are typically distrustful of information from a bottom-up direction, and see people in an organisation as a cost, not an asset.

The ability of both leaders and general staff to view crises from a positive and opportunistic perspective is important in the adaptive organisation (for example Borneman, 2005; Hagevik, 1998; Norman et al., 2005; Pearson and Mitroff, 1993; Penrose, 2000; Sheffi, 2005; Starr et al., 2004). Additionally, the quality of leadership and the degree of empowerment through to lower levels in an organisation is increasingly seen as a critical facet of an adaptive organisation's culture (for example Coutu, 2002; Hagevik, 1998; Kerfoot, 2005; Norman et al, 2005; Sheffi, 2006a; 2006b; 2005). Empowerment, for instance, has been identified as a key part of the successful response by the US Coast Guard during Hurricane Katrina and the saving of over 24,000 lives (Sheffi, 2006b). Leadership during times of crisis and non-crisis is vital to developing an enhanced adaptive capacity in an organisation. This may be achieved by the development and communication of mutual value systems between the leadership and workforce in an organisation (Sheffi, 2005; Senge, 2006).

The interest in creating an increased adaptive capacity during and immediately following a disaster has lead some researchers to propose a set of adaptive features to enhance organisational and societal resilience (Kendra and Wachtendorf, 2003; Mallak, 1998; Weick, 1993).

- Bricolage: This is the capacity to adapt known information and apply it to the current situation in a creative manner. People and organisations that engage in bricolage on a regular basis are adept at using limited resources in a chaotic situation to create order and solve problems.
- Virtual Role Systems: This is the ability of sub-sets of an organisation to take on the role and responsibility of absent members. Additionally, Virtual Role Systems require that all elements of the system have a common vision of the risk they face, the goals that they are aiming for, and the possible actions that they may engage in to achieve their collective goals. This is true for individuals within an organisation and for groups of organisations serving a community or society. Comfort (1999) points out the importance of information technology for development of Virtual Role Systems. She supports the critical appearance of linkages between and within organisations/communities and the subsequent creation of a 'sociotechnical system in which the ability to exchange timely, accurate information among multiple participant facilitates a more open, responsive, creative approach to solving shared problems.' (Comfort, 1999; 5).
- Wisdom: The capacity to know the limits of the information at hand, and the ability to seek out additional information is termed by Weick (1993) as wisdom. This may be also viewed as the ability of a system to self-organise (Kendra and Wachtendorf, 2003). Mallak (1998) further subdivides 'wisdom' into:
  - *Ensure Adequate External Resources:* access to further resources over and above those required for everyday decisions will enable a positive adaptive response for situations that are outside the ordinary.
  - *Expand Decision-Making Boundaries:* this is the ability of employees within an organisation to make decisions within their experience and knowledge base without having to continually refer to upper management levels. Expansion of decision-making boundaries can significantly enhance the adaptive capacity of an organisation in times of crisis.
- Respectful Interaction. The respectful interaction of all levels within an organisation, and between organisations is closely related to Mallak's 'Expand Decision-Making Boundaries' above. Respect for the reports and decisions of others, the respect for ones own perceptions and decisions, and the ability to act upon these decisions honestly and openly is a key feature in the adaptive capacity of organisations during and following disaster events.
- Positive Adaptive Behaviour. Together with the ability to perceive experiences in a constructive manner, developing positive adaptive behaviour is critical if change is to be viewed as opportunities, not just negatively. The development of these strategies is important in allowing decisions and actions based on the situations at hand, rather than a pre-programmed response to a crisis.
- Develop tolerance for uncertainty. No individual or organisation can accurately map out all the risks that could be faced now or in the future. Therefore it is vital that a tolerance for uncertainty is created as part of an organisational (and perhaps societal and global) culture. This is related to bricolage in that the ability to cope with a crisis will require using the information that is at hand, and accepting that one will never have all the required information about a situation.

Dalziell and McManus (2004) introduce the concept that systems (specifically organisational systems) can adapt to changes in different ways. Firstly they may use existing responses and apply them to the problems at hand, which may involve up-scaling this response. Secondly, existing responses may be utilised in a new context for a crisis situation. Thirdly, an organisation may develop novel responses and apply them to a problem. The problems may be new and unforeseen or those that the organisation has been able to see coming. Typically organisations enlist

either a command and control type structure to deal with crisis or a more organic and innovative approach (Dalziell and McManus, 2004).

2.3.2 Situation Awareness

Generative learning for organisations is distinct from adaptive learning which is more focused on coping. Generative learning is, in essence, the process of creation and expands on, and moves beyond adaptive learning; it allows organisations to be less reactive in their approach. A key aspect in developing generative learning is an organisations ability to generate creative tension.

Creative tension comes from seeing clearly where we want to be, our 'vision', and telling the truth about where we are, our 'current reality'.(Senge, 1994).

The ability of the organisation to continually be aware of itself and its environment is known as its situation awareness. Originally coined in relation to military pilots the modern concept of situation awareness is traditionally attributed to Endsley (1995) and originally described the situation awareness of an individual or agent within system; situation awareness is:

'the perception of the elements within a volume of time and space, the comprehension of their meaning, and the projection of their status into the near future'.

However, as recognition of teamwork increased, so did the necessity to look at situation awareness from a different, more complex perspective. Even those decisions ultimately made by one individual are often based on information from a much wider team. Furthermore, the sum of individual knowledge or awareness does not represent the overall situation awareness of the system (Salas et al, 1995). While team or shared situation awareness is rapidly becoming a significant field of research there is no common definition agreed upon (Salmon et al, 2006). The terminology is diverse (Roth et al, 2006) and includes 'shared contextual knowledge' (Rognin, 2000), 'shared mental models' (Cannon-Bowers et al, 1993), 'team cognition' (Espinosa et al, 2004) and 'shared workspace awareness' (Gutwin and Greenberg, 2004) among numerous others. Oomes (2004) suggests the concept of organisational awareness, particularly in relation to the effective management of crisis situations as:

'an understanding of the multiple parties that make up the organisation and how they relate to each other'.

Events such as the 9/11 terrorist attacks in the USA, Hurricane Katrina in 2005 and the Boxing Day Tsunami in 2005 have highlighted how poor communications, limited situation awareness and a lack of multi-agency/organisation interoperability has contributed to major deficiencies in the emergency response (Bahora et al, 2003; Ntuen, 2006; Runyan, 2006; Titan Systems Corporation, 2002). Researchers and practitioners are therefore becoming increasingly concerned with developing improved situation awareness among teams. Specifically this is in relation to the response and recovery for individual organisations as well as from a multi-organisational approach, particularly in terms of inherently dynamic and complex situations.

The temporal aspect of situation awareness is also an important consideration. Endsley et al (2003) describe three time-related impacts on situation awareness.

- Firstly is the understanding of the available time until a specific action or event occurs.
- Secondly is an understanding of the time until actions and events have specific consequences.
- Thirdly, situation awareness requires an understanding of the rate of information change in dynamic real-world situations.

These temporal aspects of situation awareness apply to individuals within an organisation engaging in decision making activities. But they also apply to the organisation as a whole; operating within a network of other organisations and within its community of stakeholders. Essentially, situation awareness is 'the engine that drives the decision making and performance in complex, dynamic systems' (Endsley et al, 2003). Some of the barriers to effective situation awareness are particularly relevant for organisations dealing with large scale crisis situations; namely workload-anxiety-fatigue-other stressors (WAFOS), data overload and complexity creep (Endsley et al, 2003), workload (Gregoriades and Sutcliffe, 2006) or taskload (Grootjen et al, 2006), macro versus micro scale of situation awareness (Stanton et al, 2006) and decentralized control that creates 'roadblocks (Gorman et al, 2006).

Recent research is pointing to the increased ability of organisations to respond effectively using a more creative and flexible decision making structure. This appears to be because automation and rigour (more associated with command and control decision making) may actually hinder adaptive capacity by reducing situation awareness (Endsley et al, 2003) and ultimately performance; systems must be more flexible or they risk becoming redundant (Stanton and Baber, 2006). An excellent case study is presented by Paraskevas (2006) that identifies the need for a flexible decision making structure resulting from high adaptive capacity for a major food poisoning outbreak in a hotel chain. This case study is an excellent example of the importance of complex adaptive systems in developing resilient organisations.

A fundamental approach to increasing an organisation's situation awareness is by encouraging some experience of pseudo-crisis situations through the use of scenario exercises. Coates (2006) suggests that organisations have a 'severely limited psychological capacity' to look at incidents in other corporations and apply the lessons learned to themselves. Therefore, scenario exercises offer significant value for the networked organisation, specifically if they involve participants from across a number of internal divisions and/or external interconnected organisations. The benefits include: increased awareness of value systems and the development of shared mental models (Starr et al, 2004); appreciation of a team environment and integration of diverse information (Coutu, 2002; Flin, 1996; Paton, 1996; Paton and Jackson, 2002; Quanjel et al, 1998, Salas et al 1999); the identification of solutions that may not have been overtly apparent (Starr et al, 2004); the opportunity to learn from emergency experiences and apply that knowledge in novel situations (Paton and Jackson, 2002); the fostering and encouragement of self efficacy (Jex and Bliese, 1999), and; improving the persistence of individuals and groups to achieve predefined goals in an emergency situation (Klimoski and Brickner, 1987; Paton and Jackson, 2002).

Improving organisational awareness about crises also involves learning about the types of emergency situations that may occur. Many organisations have engaged in some sort of risk identification process but few take this process one step further and combine risks of similar nature or expected response. In an emergency often the same types of issues will be faced and actions will be common across crisis types (Pearson and Mitroff, 1993). Furthermore, while there is debate on the validity and usefulness of emergency plans (Seaman and Williams, 2005), for those organisations that do create emergency plans, these must be tested, practiced and exercised to be useful in a real

emergency (Coates, 2006; Coutu, 2002). It is also vital that organisations do not just focus on those events that they can foresee or those that they have already experienced.

Recent research into the interconnectedness of organisations has allowed researchers to identify the critical links and hubs of their relationships with other organisations and their participating communities. This recognition has lead to a greatly increased understanding and appreciation of their vulnerabilities; economically, politically, socially and environmentally. The advent of the information age, and the increasing reliance on computerised networks and communications has reduced the size of the world for organisations while at the same time dramatically increasing the potential for abuse of the systems. Much of the risk that organisations face is tied up in their intrinsic interconnectedness; the organisational network. Barabasi (2003) suggests that traditional organisational networks are trees and originate from the CEO upwards in a bifurcated branching fashion. These organisations are dominated by vertically integrated management structures (Buchanan, 2003). One principal weaknesses of this style of organisation in relation to hazards, is over-organisation, which may create a completely inflexible enterprise that cannot respond dynamically to changing environments. Marais et al (2004) also discuss this concept in looking critically at normal accident theory and HRO theory; that complex systems are defined by 'indirect, non-linear and feedback relationship' rather than traditional chain of events models. These simply do not account for the complexity in organisational systems and that the focus needs to change to a more holistic and integrated approach recognising both socio and technical aspects. Weick (2006) talks about the loss of imagination and the potential implications on decision making processes in crises and some authors even go so far as to define resilience in organisations as the ability to 'self-renew over time' through the process of innovation (Reinmoeller and van Baardwijk, 2005).

The key, therefore, to successful adaptation in this new, changing environment, according to Barabasi (2003) is to move from a tree-based organisational structure, to a web or network organisation that effectively utilises many inter- and intra-organisational links. It is critical that organisations understand that they do not work alone if they are to successfully navigate a crisis. They must recognize themselves as parts of a wider network, and indeed as networks themselves. As a result there is an increasing need for decision makers, and organisations generally, to have common and shared cognition. As described by Schein (1996):

'…complex organizations (that) are systems composed of many sub-systems, each of which is composed of many individuals, one can see that the total organization's capacity to maintain itself and grow, to continue to act effectively in the face of changing circumstances, depends upon the creation of a set of shared assumptions that cut across the subsystems and survive in spite of changes in the individual membership of the subsystems, i.e. the culture' (p 4).

The ability to increase the resilience of self organising systems in a context whereby they are not at the mercy of random events is supported by an increasing focus on organisational strategic planning. In conjunction with organisational learning, strategic planning is being used as a methodology for increasing an organisations capacity to cope with crisis. (Stacey, 1996, Vogelsang, 2002). In a case study completed by Paraskevas (2006) the difficulties of creating crisis responses in complex adaptive systems was clearly highlighted. A hotel chain suffered a large scale food poisoning incident throughout its individual hotels; however the effects of the crisis were not felt equally at each location. While the organisation had invested a considerable amount of resources in developing a crisis

management plan, it had failed to allow the individual hotel operators flexibility in using this planning to address the situation they were facing. The organisation had not developed a 'crisis culture'. As Paraskevas notes:

'...the behaviour of the system is determined by its agent's interaction at a local level and this is the reason why the control of the crisis response system has to be distributed among its agents' (p 900).

2.4 The Vulnerable Organisation

The term vulnerability is one which has many different definitions and applications depending on the objectives of the researchers/practitioners and the situation within which it is applied. As such there is considerable confusion over the use of vulnerability and assessing and modelling vulnerability in the real world. The concept of vulnerability originated in natural hazard research but has since expanded considerably into other disciplines. There are many authors who have sought to summarise the thinking about vulnerability, however this is an extremely difficult task as the literature on the topic is large. For this research, vulnerability is considered specifically as it relates to organisations. Therefore, the following discussion focuses on this aspect of vulnerability and makes no attempt to provide a detailed account of vulnerability in other areas of enquiry. Good summaries are given by Klein et al (2003), Füssel (2005) and Villagrán De León (2006) and highlight some of the difficulties associated with determining what vulnerability is as well as how to measure and assess vulnerability to provide meaningful results. The reader is directed to these summaries for a detailed account of how vulnerability has evolved as a term since the 1970's.

A number of studies of organisational vulnerability have highlighted some of the strongest influences on post crisis survival, particularly for small businesses. The degree of structural damage to the physical location of an organisation and its degree of disaster preparedness has been shown to have some influence on survival rates (Alesch and Holly, 1998; Alesch et al, 2001; Chang and Falit-Baiamonte, 2002; Tierney, 1997; Webb et al, 2000). However, much stronger indicators of organisational failure following a crisis include: interruptions to infrastructure, experiencing financial difficulties prior to an event; operational difficulties, problems with interdependencies and problems with the supply chain (Alesch and Holly, 1998; Alesch et al, 2001; Chang, 2001a; Chang, 2001b; Chang and Falit-Baiamonte, 2002; Durkin, 1984; Tierney, 1997; Webb et al, 2000). Additionally, Paton (1996) identified that, in an organisational context, the vulnerability of key groups that contribute to an organisation must be considered from a business continuity perspective. Another aspect of organisational vulnerability is the concept of latent pathogens (Reason, 1990) or failure preconditions (Turner, 1978; 1994). These failure preconditions may be linked to different organisational cultures ranging along a spectrum from pathological to bureaucratic to generative (Bier et al, 2004; Westrum, 2004). They are also influenced by what is known as a disaster incubation period; the timeframe over which the build up of failure preconditions occurs and disaster is 'triggered' (Turner, 1994). One of the most important outcomes of this networked economy is the potential for small changes at one scale to become significant, even devastating, at another. While broken links generally affect only the immediate organisations involved, the failure of some links will lead to a ripple effect throughout the entire system (Barabasi, 2003; Comfort, 1999; WBCSD, 2004) and this has spawned a new kind of risk – interdependence risk (Buchanan, 2003). Examples are numerous and include, among others, the 1997 East Asia economic crisis and the 1996 Power blackout in the USA and Canada. Watts (2003) quotes Perrow (1984) with regard to systemic failures or 'accidents' as the result of standard or regular errors that compound in unanticipated ways and result in

consequences that unexpected. Furthermore, Watts (2003) goes on to discuss the weak points of a complex system; the components that, if struck in the right way at the right time, have the potential to bring down the entire system.

The advantages of a vulnerability based risk assessment over a traditional crisis or recovery based risk assessment are being increasingly adopted by the computing world. Keanini (2003) identifies that for network security to be effective in the future, a significant philosophical shift is required away from what he terms 'attack management' towards a vulnerability management approach. Many of the vulnerability management issues already identified in the computing world can be readily applied to disaster management in other fields, including organisational vulnerability, such as qualitative loss assessments (Buckle et al. 2000; Keanini, 2003; McEntire 2001; Weichselgartner, 2001).

The scale at which vulnerability is assessed is critical and the global and interconnected nature of organisations highlights this fact. Wisner (2005; After Villagrán De León, 2006) considers vulnerability to be fractal in nature, lending itself more to chaos theory than a more traditional world view. He makes the observation that vulnerability manifests itself very differently at a household level compared to a national level even for the same event. Adger et al (2004) similarly state that vulnerability should not be assessed across scales because processes causing the vulnerability are different at each scale. This is also true of organisations where what is highly vulnerable to a small firm of 1-2 employees may be vastly different to what is vulnerable to a multi-national organisation. Hence, the assessment of vulnerability should be conducted separately at different scales (Villagrán De León, 2006). Also important to any vulnerability research is awareness of the spatial-temporal element (Watts and Bolhe, 1993). The inclusion of a special-temporal element allows different aspects of vulnerability to be important at different times and in different places. Watts and Bolhe suggest, therefore, that vulnerability is not a static entity, but rather it is a dynamic and complex condition that cannot and should not be reduced to simplistic terms. From this perspective a more holistic and systemic approach to vulnerability may be more suitable for organisations. Turner et al (2003) propose that vulnerability relates to the degree of harm or negative exposure experienced by a system, sub-system or even a component of the system following an event. Villagrán De León (2006) introduces the notion that a community or society be viewed as a set of interconnecting systems and networks. The individual components of these systems must be assessed for their vulnerability together with the vulnerability of the relationships and interactions between these components; their interdependence.

Interdependence between organisations in New Zealand was highlighted by a landmark study in 1991 looking at the performance of lifeline utility organisations in a large scale hypothetical earthquake scenario in Wellington, the nation's capital (CAE, 1991). The interface with co-ordinating organisations such as Civil Defence and Emergency Management was highlighted in this study as a critical facet to the successful response and recovery of lifeline utilities and the wider community that they serve. Furthermore, this study identified that individual organisations must create their own emergency planning strategies and be involved with the strategies of those on whom they will depend in a crisis. The Wellington Lifelines study and the others in New Zealand that followed this model clearly showed that interdependence of utilities is made more vulnerable by our increasingly sophisticated world and our reliance on advanced technology. The vulnerability associated with interdependency is further enhanced by expectations of the general public for both private and public organisations to display more accountability in a crisis situation (WELG, 1994). Therefore, the intrinsic connectedness of organisations, together with the interdependencies that arise as a result, have a significant impact on organisational vulnerability.

Further to the concept of interdependencies in a system and the assessment of their vulnerabilities is the notion of keystone vulnerabilities. The term 'keystone' can be used to denote the presence of integral species in an ecosystem. Typically, a keystone species is one which has an influence on its environment or ecosystem that is disproportionate to its size or abundance (Paine, 1995). The loss of this species can cause a significant shift in the ecosystem; sometimes causing its eventual destruction. Keystone can also have an architectural meaning and is described as either 'the wedge-shaped piece at the highest point of an arch that locks the other pieces in place' or 'something on which associated things depend for support' (The New Penguin English Dictionary, 2000). From an organisational perspective, keystone vulnerabilities represent both the architectural and the environmental meanings. These keystone vulnerabilities are components in the organisational system, which by their loss or impairment have the potential to cause exceptional effects throughout the system; associated components of the system depend on them for support. This is most often observed in the supply chain of organisations. Numerous examples exist of cascade type failures resulting from the loss of one supplier whose criticality to the entire system was not recognized until it was lost. For example, the Toyota-Aisin crisis (Watts, 2003) that involved the loss of a single factory in Japan that was solely responsible for the production of a critical valve needed for all Toyota vehicles. Keystone vulnerabilities may be either catastrophic (the immediate failure of a system due to the sudden loss of a critical component) or insidious (the failure of a system over time due to ongoing systematic or coincident loss of moderately critical components).

An organisation may have a high level of resilience, and hence a lowered vulnerability, but its post-disaster condition may lead to a very different organisational structure than before the disaster event. This is synonymous with the concept of ecological resilience outlined in the 1970's work of Holling (1973). Holling used the term resilience to describe how two different types of systems responded to stress; a stable system that exists in a perpetual state of equilibrium and seeks to return to that state following disturbance, and a dynamic system that is in a constant state of flux and how it moves in response to disturbance. From an organisational perspective this shows that organisations are complex self-organising systems with multiple equilibrium states. Many organisations that focus solely on their post disaster recovery, rather than focus on becoming more resilient, will often try to return to their pre-disaster condition (Tobin 1999). However, recovery rarely addresses the causal problems leading to the disaster situation in the first place, and may in-fact increase the risk of the next disaster occurring (Comfort et al, 1999; Tobin, 1999).

The relationship between vulnerability and resilience is often debated in the literature. As Villagrán De León (2006) observes, some believe that resilience is the ability of a system to resist the impact of a given event. Others believe that resilience is a systems ability to absorb and cope with an event. For many definitions of vulnerability, it becomes the reciprocal of resilience. Therefore if a given system is highly resilient then it has a low vulnerability. Folke et al (2002) describe resilience as the 'flip side' of vulnerability, but also that resilience (together with sensitivity and exposure) is a determinant of vulnerability. There is another emerging school of thought whereby vulnerability is a measure of the criticality, preparedness and susceptibility of the components of an organisational system and that vulnerability is but one of the components of resilience (Resilient Organisations, 2007).

2.5 Organisations and Risk

Risk and risk management have become essential concepts in organisational management and development. However, what actually constitutes effective risk identification and risk management is still a contentious issue.

Risk is commonly viewed as the intersection between two dimensions; the consequences/expected outcomes/impacts of an event and the likelihood of that event occurring with the given outcomes (El Sawah et al, 2006). Smallman (1996) identifies two types of risk management approach; the reactive (or homeostatic) and the proactive (or collibrational).

- The reactive risk management approach may be defined by preset and predetermined risk tolerances applied as guidelines for organisational action. The insurance industry is a good example of an organisational type that uses the reactive risk management approach. Despite indications to the contrary, organisations successfully following this pathway towards effective risk management engage in practices that enhance risk avoidance, prevention and reduction.
- The proactive approach to risk management recognises the inherent errors in predictive science and human behaviour and seeks to reduce, avoid and prevent risk. This approach comes at risk management from a more holistic perspective, looking not just at the events that cause risks, but also the potential for risks.

For organisations one of the key points to come out of complexity science and systems thinking, and its implications for risk management, is that while complexity and unpredictability is unavoidable, it does not have to spell disaster. The development of adaptable, flexible and innovative organisations can lead to greatly expanded opportunities.

'The result is an approach to risk which moves well beyond the mere use of controls to limit risk exposure. Instead it creates risk optimisation and even risk leadership – the process by which an organisation is able to seize opportunities within defined risk parameters and capitalise on the rewards that follow.' (WBCSD, 2004).

Buchanan (2004) suggests that the importance of considering the application of power laws to data for risk analysis particularly highlighting the inadequacy of using the Bell Curve to estimate the occurrence of extreme events. The difference between the two is relatively benign at the outset (Figure 2) but when the tail areas of the two curves are taken into consideration, the real differences become apparent. But what do power laws mean for organisational structure and how to manage crisis events? Power laws indicate that organisations are in-fact complex, self-organising systems, which do not follow a random series of events. Rather they follow a predictable and ultimately manageable path, albeit a difficult one to understand.

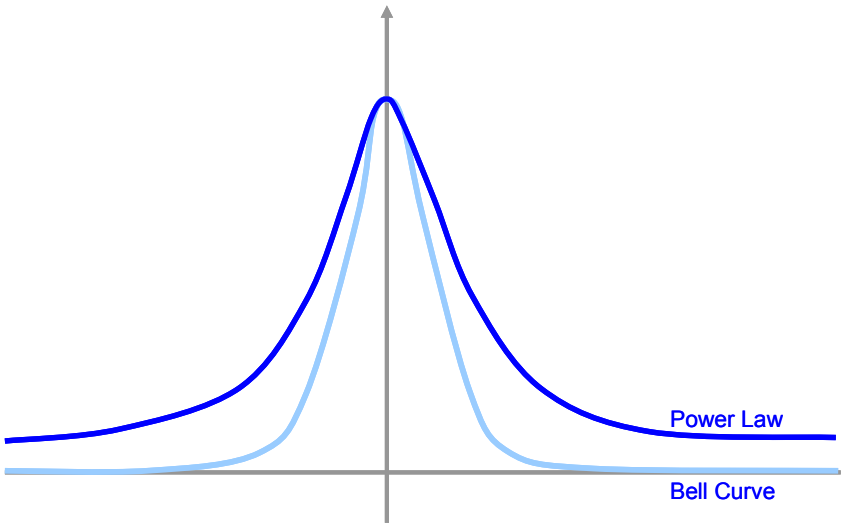

Figure 2. The Bell Curve versus the Power Law (after Buchanan, 2004)

As researchers begin to understand the laws that drive complex and dynamic systems, it becomes increasingly apparent that a paradigm shift in approach is required if risk management is to remain an effective tool for organisations. Events that traditionally were considered well outside the lifetime of the average organisation, are realistically much more likely to occur, and are much more unpredictable in their nature. One of the challenges for organisations is not to over prioritise those events they can foresee at the expense of building the capacity to cope with those they cannot. The phenomenon of risk homeostasis is prevalent whereby people actively and subconsciously adapt their behaviour to adjust to a perceived acceptable level of risk (Etkin, 1999; Wilde, 1994). For example, as highlighted by Slovic (1986), people tend to disregard those events that they have not experiences as a potential risk. In many instances, the issue of 'risk transference' significantly alters the perception of risk away from the high consequence, low probability events (Figure 3), (Etkin, 1999; Mileti, 1999; Tobin and Montz, 1997). Similarly, those events that have not been experienced in living memory, or even historically, are much less likely to be considered as worthwhile for realistic risk assessments (Etkin, 1999; Slovic, 1986).

When development or mitigation strategies fail to correctly access the risk of rare high-consequence events, risk is transferred from the more common hazards to extreme events that exceed design criteria. Long-term vulnerability can thereby be increased. Risk transference, therefore, may be a significant obstacle to successful management of extreme events for organisations. The consequences of smaller scale events are reduced to such a successful degree that organisations can no longer cope with the larger scale events that come along. Potentially this could lead to large scale catastrophe (Holling et al, 1998). This phenomenon also has implications on resilience according to Etkin (1999);

'A more resilient society cannot be achieved without some consideration of how risk is transferred from the more commonplace to the rare events'.

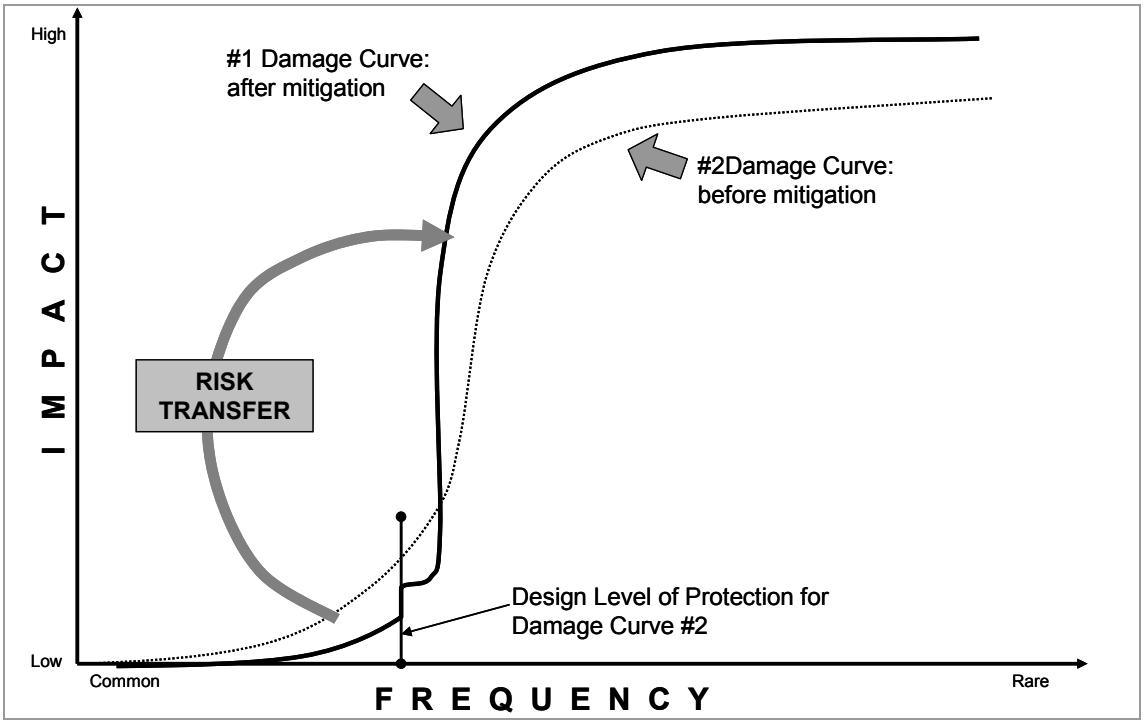

Figure 3. Risk Transference (after Etkin, 1999).

2.6 The New Zealand Context

In New Zealand there is an increasing emphasis on creating more resilient communities. The changed focus from post-crisis response to pre-crisis planning originated in the early-mid 1990's in New Zealand and reflects a global trend (Britton and Clark, 2000; Buckle et al, 2000; Keanini, 2003; Luers et al, 2003; McEntire, 2001; Pelling and Uitto, 2001; Weichselgartner, 2001). Significant and widespread economic restructuring in the 1980's in New Zealand highlighted the need to alter the way emergency management was addressed. This resulted in legislative changes and the establishment of the Ministry of Emergency Management in 1999 (subsequently renamed Ministry of Civil Defence & Emergency Management). The purpose of these changes was to ensure that broad risk management techniques become embedded in government, business and the community, thereby increasing overall resilience and continuity (Britton and Clark, 2000). The current legislation in New Zealand for Civil Defence and Emergency Management (CDEM Act, 2002) reflects a need for greater levels of responsibility from organisations with a front-line response during and following a crisis (for example lifeline utility providers, emergency services such as police, fire and health organisations, and emergency co-ordination agencies). However, it is becoming more apparent that a wide range of organisations also need to increase their resilience because of the vital role that they play in community resilience and recovery (Dalziell, 2005). In addition, the move to more comprehensive emergency management in New Zealand has resulted in an 'all-hazards' approach. While the traditional focus of emergency management has been on natural hazards, the current legislation requires the adoption of a risk management approach which addresses all hazards including emerging hazards such as pandemic and terrorism. A new National Civil Defence Emergency Management Plan and Guide were released in July 2006 (MCDEM, 2006).

As New Zealand entered the 1980's, economically it was facing huge national debt and a change of government in 1984 saw the introduction of an extensive program of restructuring the economy. This restructuring, operating over two decades, lead to the corporatisation of organisations in New Zealand and has had both positive and negative impacts. As highlighted by Brundsdon and Dalziell (2005) the restructuring focused on both private and public sectors, demanding 'economic accountability and independence' and has produced smaller and more independent enterprises and business units resulting in greater economic efficiency in the short term. However, this has reduced the capacity of organisations to engage in longer term management strategies that improve resilience (Brunsdon and Dalziell, 2005).

3 THESIS METHODOLOGY

3.1 Introduction

This chapter details the research methodology used in this study. Initially the discussion centres on the justification of using the case study methodology in this study. The discussion then moves on to describe the execution of the methodology in this study and talks about case study selection, data collection and analysis. The next part of this chapter examines how the methodology was modified during the study as difficulties in execution arose and as key issues emerged from the data. This is followed by an examination of the final stages of the case-study methodology; amalgamation of information into theory.

3.1.1 Definitions

As explained in Chapter 2 previously, definitions of resilience are many and varied. Typically definitions are generated that are scale and time specific, and suited to the particular research discipline that they originate from. From an extensive review of relevant literature and in conjunction with the case-study organisations, the following definition of organisational resilience is that developed and used in this study:

Organisational resilience is a function of an organisations overall situation awareness, keystone vulnerability and adaptive capacity in a complex, dynamic and interdependent system.

3.1.2 Aims and Objectives

In this study, the research question posed was:

'What are the components of resilience that are common to all organisations in the New Zealand context'?

The principal objective of this study, therefore, was to identify aspects of organisational resilience that may be generic; that is, aspects of the organisational system that contributes to resilience irrespective of the organisation's size, nature, industry type or location. As such, the case study organisations have been selected specifically to simulate as much variation in the organisational community as possible.

3.1.3 Case Study Methodology

The research methodology in this study is qualitative in nature and uses a multiple case-study approach. To support the case-study methodology the Grounded Theory approach was used to analyse data. The case study methodology followed in this research reflects that proposed by Yin (2003) for multiple case studies. ***Figure***, modified from Yin (Figure 2.2, 2003), shows, diagrammatically, this multiple case study methodology and subdivides the process up into four stages; justification, execution, modification and amalgamation. Each of these stages is described in the following sections and reflects the methodology for case study research suggested by Yin (2003).

3.2 Justification of the Case-Study Methodology

The following discussion explores why the case study methodology was used in this research. Overall this research is an exploratory study of organisations, asking the question 'what are the components of resilience common to all organisations'? In order to answer this question, the case study strategy was suitable for a number of reasons and supported the methodology suggested by Yin (2003). Firstly the research has a contemporary focus and is looking at the present state of organisations in a current context, and how their past experiences contribute to this present reality. Secondly, the researcher had no degree of behavioural control over the subjects. As consistent with the ethical guidelines in Chapter 1, this research was designed to be an observation of the selected organisations and not involve experimentation of employees etc. Finally, the research questions posed at the beginning of this research project all lent themselves to either 'how' or 'why' questions. These research questions and the propositions supporting them are presented in Section 3.2.1.

A multiple-case study has been favoured over a single-case study as the study integrates data from 10 individual organisations, each of which was studied in its own right. The information from each organisation was then collated to explore the hypothesis that there are fundamental and underlying components of resilience that are common to all organisations. This collation of information and correlation across organisations was an emergent feature of the research and will be discussed in detail in Chapter 5. Details of the individual case study organisations are presented in Chapter 6 and the criteria for selecting appropriate case-study organisations are outlined in Section 3.3.1. However, broadly speaking organisations were selected to represent the greatest variability in organisation size, type, industry and locality. The reason for this diversity was to explore the proposition that there would be common components of resilience observable across all organisations. From this exploration of common resilience issues for organisations, the researcher proposed that a more systemic and holistic approach to resilience would provide added value for all organisations in their approach to crisis management and planning.

3.2.1 Research Questions and Propositions

The development of a question or hypothesis, and questions that build on that field of enquiry do not necessarily point the researcher to how to answer these questions (Yin, 2003). Therefore, it is important in the case study methodology to develop a set of propositions, supporting the research questions and assisting the research in the direction of enquiry. The questions and propositions presented below detail the manner in which the primary research theory was examined. These questions provide the basic outline of the research for the case studies and the propositions used help to maintain the direction of the enquiry.

1. How does the organisation identify, assess and manage its vulnerability to hazards that have both a direct impact (physical, economic or otherwise) and an indirect impact (typically through linked organisations or the community within which it operates)?

Once the organisation has identified vulnerabilities in its operations, what process does it employ to manage those vulnerabilities? The notion is that constant review and updating of vulnerabilities in relation to internal and external changes is a key feature in reducing the vulnerability of an organisation to disaster (Buckle et al. 2000; McEntire 2001; Weichselgartner 2001).

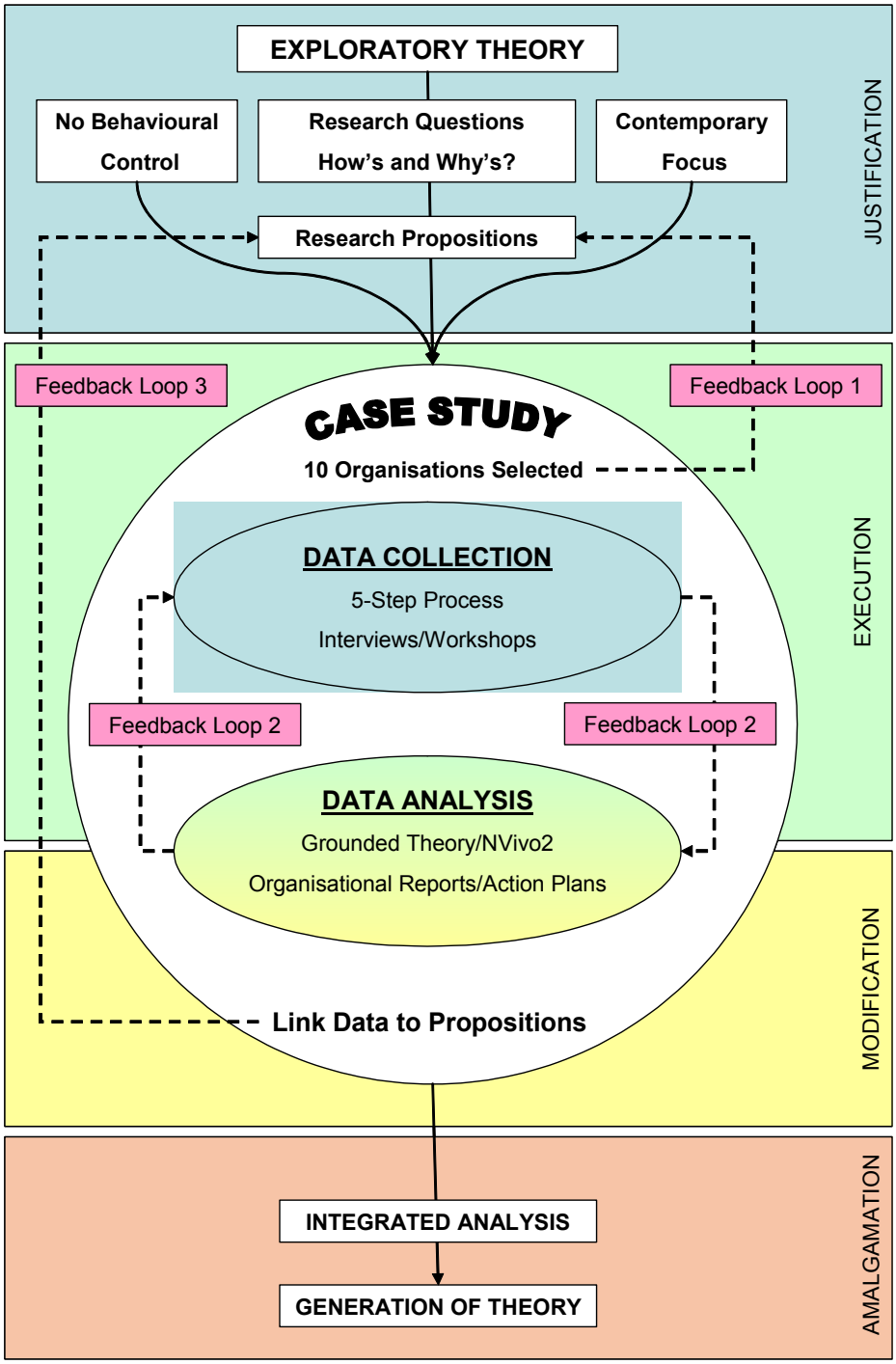

Figure 4. Diagrammatic representation of the case study methodology followed in this research (modified from Yin, 2003, Figure 2.2). The methodology is divided into four phases of investigation; justification, execution, modification and amalgamation. Feedback loops are also illustrated which represent the iterative nature of the methodology and the changes in approach where new data emerged or where existing strategies were inconsistent with the current situation. This diagram also shows how each case study was conducted and then data was integrated to generate theory.

Crisis mitigation techniques using vulnerability assessments within organisations are beginning to challenge traditional post-disaster risk management techniques. This investigation seeks to ascertain how organisations identify and consequently manage their vulnerability to a variety of hazard types. One of the

principal strategies for assessing vulnerability is to look at the processes that may lead to a vulnerable organisation rather than the individual vulnerabilities themselves (Pelling 1999). The premise here is that by decreasing the vulnerability of the process, you will in turn reduce the individual vulnerabilities associated with those processes. This approach may help the researcher identify those vulnerabilities, systemic in nature, that are consistent across organisational boundaries.

2. How does the organisation manage its vulnerability to high consequence/low probability events compared to low-moderate consequence/high probability events? What can we learn from the organisational culture that contributes to the organisations approach to extreme events?

For many organisations higher consequence events are not planned for. The reasons are either the consequences are considered to be beyond the capacity of the organisation to cope with, or their low probability of occurrence makes them seem less important and other more pressing issues. The global nature of the organisational network now means that emerging threats such as terrorism, biological hazards and 'mega' hazards associated with the failure of interconnected enterprises are becoming more critical. Investigation of this question will provide information about the organisational awareness of both hazard events that are relevant, as well as the interconnectedness of the organisation. Further it is hoped that this question will lead the researcher to a better understanding of the organisational culture towards crises. This question also forms the basis of investigating what are the principal keystone vulnerabilities for organisations and if these are common to all organisations.

3. How adaptive does the organisation believe it is in the face of a potential crisis situation? How does it achieve high adaptive capacity?

Resilience is partially the ability of an organisation to approach crisis situations as a potentially positive experience, and to utilise an enhanced ability to change as the economic, physical, political and social situation demands. A key concept in increasing organisational resilience, therefore, is thought to be building an organisation that focuses on positive strategies for coping with change. Organisations that are more resilient have a positive, opportunistic workforce that is encouraged to utilise information from all sources, and to think outside the square. This question focuses the research on these expected components of adaptive capacity, and allows the discovery of other aspects that may be relevant to all organisations.

4. How strategic is the organisation in terms of crisis management? How does the organisation view its ability to control its business environment following a crisis? Is this a conscious decision or does the organisation assume that the post-crisis phase will be out of its control?

The ability of an organisation to maintain a strategic viewpoint is important in both crisis and non-crisis times. In the period following a crisis those enterprises that focus on recovery often will not address the issues that made them susceptible to the disaster in the first place (Tobin 1999). Hence the experience of the disaster, and implementation and success of the recovery strategy may lead to increased vulnerability and promote a cycle of vulnerability-disaster-damage-recovery-vulnerability. Often recovery is entirely concerned with how the organisation returns to a state from which it can operate at a level similar to that

before the event. However, it is becoming increasingly apparent that this approach, as the sole focus of crisis management, is limited.

In times of crisis, an organisations ability to be strategic will depend on its overall awareness of the immediate situation and potential impacts in the future. This is likely to be impacted by the degree of preparedness for crises that the organisation has engaged in. Therefore, how organisations prepare for disaster events is at least as important as how they recover from them. A change in focus from an entirely reactive, post-disaster recovery approach towards the integration of a pro-active, pre-disaster strategy for organisations is the basis of this question. Foreseeably the success of such an approach to organisational resilience will depend on how much control the enterprise perceives it has over the crisis situation and its ability to respond effectively.

5. How does the organisation identify, assess and manage any vulnerability associated with inter-organisational relationships? Is this an ongoing iterative process or a one-off exercise? How aware is the organisation of its business environment and how this might change during and following a crisis?

In the modern organisational world crises do not have to influence an organisation directly or physically to have a significant impact. Many businesses do not adequately acknowledge the vulnerability of relationships between their organisation and the other organisations that they are linked to, nor do they fully appreciate the extent to which these relationships may impact them after a disaster event. Organisations may focus on some links, but others are left to chance, and a wider appreciation of just how important the management of inter-organisational links can be is often lacking. Current thinking suggests that an iterative communication process is required within and between organisations for management of these vulnerabilities to be successful. Further, the nature of the relationships between organisations is likely to change during a crisis, and organisations may find themselves dealing with business, agencies and individuals that they wouldn't during business as normal conditions. This research question seeks to investigate the organisational awareness of these links, what impact the organisational culture has on these relationships and the perceptions regarding inter-organisational planning strategies.

6. How does the organisation see its role in the wider community both pre-disaster and during the post disaster phase? What are the driving factors that influence the organisations perceptions of its social responsibility and how are these perceptions exercised in practice?

It is impossible for any organisation to exist without some element of community interaction, whether it is in relation to staff members, customers, other organisations or shareholders. The relationship that an organisation develops with its community of stakeholders may enhance overall resilience, and this process may be reciprocal. Many organisations have mission statements and make bold claims about their relationship with the community; however what are the factors that influence the actual practical application of those commitments?

7. Does the organisation have a contingency plan for ongoing operations with linked organisations if traditional links are broken for any reason? If so, how does the organisation implement and manage this plan and what practices are in place to assess the quality of this information?

A critical component of this research is to investigate the levels of dependency on different types of organisations in a variety of crisis situations. While the impact of poor resilience in some types of organisations is well known, for example electricity providers, others are much less obvious. This question focuses the research on looking at these other 'hubs', which may be keystone vulnerabilities for the entire network. Investigation into the degree and nature of planning for linked organisations is an important aspect of this research, together with the driving forces behind planning are equally important.

Additionally, the intra-organisational links are related to how an enterprise adapts to a crisis situation. It is widely accepted that intra-organisational communication is critical in the successful management of and recovery from disaster. How organisations foster these internal links and how the continue to update and modify them is equally critical to the survival of an organisation as links between businesses.

3.3 Execution of the Case-Study Methodology

3.3.1 Selection of Case Study Organisations

The basic proposition for this study is that there are likely to be resilience issues that are common to all organisations in the New Zealand context. The selection of organisations in this study deliberately targeted a variety of organisations. Therefore, the researcher approached public, private and co-operative organisations, a wide range of industries, small, medium and large sized organisations (relevant to the New Zealand context, not from an international perspective) and included lifeline organisations. A matrix of key components was developed early on in the planning stage of the research to assist the researcher in deciding which organisations to approach to take part in this study so as to ensure the best variety of case study organisations possible. Table 1 shows this matrix and the case studies that participated in this study. The selection criteria in order of relative importance are also described below. It should be noted, however, that in some instances the organisations that best fitted the selection criteria were unavailable, unable or unwilling to participate in the study.

Criterion 1: Organisation Size. This category referred to the total number of full time staff that an organisation has at its disposal. Small organisations are those with less than 40 full time employees, medium organisations have between 40 and 150 employees while large organisations have greater than 150 full time staff. The size categories were developed specifically for the New Zealand context. The use of organisational size as one of the main selection criterion was based in the perception that resilience issues may be different for large organisations compared to smaller organisations, due to differences in financial situation, availability of resources, geographic distribution, number of staff to manage, communications issues among others.

Criterion 2: Organisation Type. At the outset of this study it was determined that there would be a minimum of 10 case study organisations including public and private business (www.resorgs.org.nz). As with Criterion 1, it was assumed that resilience issues might be different for different types of organisations, therefore it was important to ensure that a variety of organisation types were represented in the study to uncover any resilience issues common across this criterion. As a result, representatives of four different types of organisations were included in this study; private organisations, publicly listed

organisations, organisations providing lifeline services and government organisations (divided into local or central government organisations). As the study progressed it became apparent that there were other types of organisations that might also provide important insight for the research, for example co-operative type organisations. Some of these were able to be incorporated into the study, but others were not.

Criterion 3: Sector. An additional criterion was based on the industry sector that the organisations represented. The division was based on whether the organisation was in the primary (the process of changing natural resources into primary products), secondary (the manufacture of primary sector goods into finished products) tertiary (the provision of services the businesses) or quaternary sector (the provision of intellectual services) (Rosenberg, 1998). As with Criteria 1 and 2, the principle reason for including this criterion was to see if different sectors would have similar resilience issues. For example, there may be a perception that organisations in the primary sector would have a different set of resilience problems because they serviced a different part of the economy. This perception may be prevalent in the organisations themselves (and within a particular sector) as well as within the research community. Further, the assistance that organisations within a sector may require to cope with adverse situations may be different if there are different resilience issues across sector types. Because this study was not dependent on specific types of crises (where a particular crisis type may affect organisations in each sector differently), it was important to gather information on resilience from a different perspective. Additionally, as the study progressed it became apparent that lifeline organisations may have been more appropriately represented under this criterion than under Criterion 2 above. However, this was a retrospective observation and did not change the selection criteria in this study.

Criterion 4: Location. Although from a logistics point of view, finding organisations close to the geographic location of the research program was desirable, it was important to select organisations on the basis of a wide geographic distribution. The reason for this was twofold. Firstly, the researcher wanted to study the effects of organisations that were exposed to different physical hazard regimes in an attempt to reduce the bias resulting from any focus on natural hazards in the study. Secondly, the researcher wanted to uncover any common resilience issues that arose for organisations with a small geographic distribution (one or two localised offices/sites) and compare these to organisations that had a wider geographic distribution. The selection of organisations, therefore, included those with local, national and international distributions of staff, sites and offices. Table 1 shows the location of offices as local, national, international where local represents organisations with offices/sites based in a limited, localised geographic area (for example, within a single city or town and no additional offices/sites elsewhere). National distribution refers to organisations that have offices/sites in localities in two or more places around New Zealand. The 'international' category represents those organisations that have offices/sites outside of New Zealand.

Criterion 5: Supply Distribution. Another important consideration in the identification of organisations for participation in this study is the location of market/s for the distribution of goods and/or services. This was initially only considered from one perspective which was the viewpoint of the organisation's own distribution network; where it distributes it own products and services to. Another perspective is potentially important; where the organisation purchases products and services for it's own operations. However, selecting organisations on the basis of this second perspective required an in-depth knowledge of the organisations operations which the researcher was not privy to prior to interaction with the organisation.

Therefore, the focus of this criterion is solely on whether the organisation distributes its products and services locally, nationally and/or internationally. In Table 1 the organisation's primary market is identified by a double asterisk and additional markets by a single asterisk. Again, local refers to localised market in a specific New Zealand centre, national represents New Zealand wide markets and international refers to markets outside of New Zealand.

Criterion 6: Dependence. During the planning stage of the study, there was an expectation that some organisations were likely to have a primary dependence on human resources (staff, government, community etc) rather than physical, material resources (inventory, technology, agriculture etc), and vice versa. It was thought to be important to select organisation to represent these two different dependencies to determine if there were common resilience issues. It was impossible to select the organisations for participation in this study based solely on this criterion because this involved an in-depth prior knowledge of the organisation. However, because this criterion was considered to be important to the study direction, an initial decision was made regarding the type of dependency each organisation may have. As most organisations will have some dependence on both aspects, each organisation was rated as having high, moderate or low dependency for either human or physical resources.

As previously mentioned, the organisations that eventually participated in this study were not always the ideal choices due to issues outside of the researchers control (for example, time limitations, organisational commitment, lack of key contacts etc) the researcher actively selected the widest possible variety of organisations.

The selection of organisations occurred in a staggered fashion throughout the study. Groups of organisations were approached in four phases to ensure that no one organisation would have to wait more than two months before they could participate in the study. This staggered approach also allowed the researcher to refine the types of organisations that should be targeted by the study to maintain the required variability.

3.3.2 Data Collection

As part of this research, a methodology for improving organisational resilience was developed; the 5-step process for resilience management. For all case study organisations data collection was split up into two distinct phases of investigation utilising the tools developed in the 5-Step process. Data was collected via the interview phase and both collected and validated during the workshop phase. From the perspective of this research, the primary objective of developing the 5-Step process was to gather information about organisational resilience in a structured manner that could be accurately repeated for all organisations and which reduced the chances of bias. However, the 5-Step process had the dual role of also providing practical tools for organisations to actually improve their resilience. Each the five steps focuses on one or more attributes of resilience; situation awareness, keystone vulnerability and adaptive capacity. The five steps are:

- Step 1. Improving awareness of resilience issues using a combination of interviews with key stakeholders, surveying of stakeholders about resilience issues and the introduction of consequence scenarios.
- Step 2. Increasing awareness of resilience issues by developing a program of organisational component mapping; identifying those aspects of the organisation both internally and externally that are likely to have the greatest impact on the organisation from a resilience perspective.
- Step 3. Investigating organisational vulnerability by engaging key stakeholders in a program of self assessment of the organisational components from Step 2; this involves assessing component criticality, preparedness and susceptibility in the face of different crisis contexts.
- Step 4. Analysing and identifying keystone vulnerabilities in an organisation using vulnerability assessment information from Step 3 and creating a powerful visualisation tool called a vulnerability matrix.
- Step 5. Enhancing adaptive capacity using Readiness Exercises and Disaster Simulations (REDS); effectively a disaster scenario based on events identified from the consequence scenarios (Step 1).

The 5-step process as it relates to improving resilience for organisations is described in detail in Chapter 4. From the perspective of the data collection protocol in the case-study methodology the interview and workshop phases are examined below.

3.3.2.1 Interview Phase

The first phase of collecting information in the case studies was by interviewing staff in each organisation. Interviews were conducted in a semi structured and open manner. The first interviewee was often the primary contact for the organisation and was often the most senior person interviewed. Other interviewees were suggested by this person and subsequently approached by the research to gain their approval for participation. All interviewees had access to a summary document about the aims and objectives of the research prior to the interview, and these were further explained at the beginning of the interviews. Interviews typically lasted 45-60 minutes in total. In some instances, due principally to time and resource constraints, up to 3 individual were interviewed in the same session. At one organisation a representative from that

Table 1. A matrix that shows the criteria for selecting the organisations to take part in this study.

		Criteria 1			**Criteria 2**				**Criteria 3**				**Criteria 4**			**Criteria 5**			**Criteria 6**	
		Size			Type				Sector				Location			Supply Dist^{n}			Dependence	
		S	M	L	Priv	Pub	Life-Line	Govt (L/N)	P	S	T	Q	Loc	Nat	Int	Loc	Nat	Int	People	Resources
1	Manufacturer/exporter			*	*					*			*		*		*	*	H	H
2	Local Authority	*				*	*	L			*		*			*			H	M
3	Private Contractor			*	*				*	*				*	*	*	*		H	H
4	Public Utility		*			*	*					*		*			*		H	L
5	Education		*			*						*	*			*	*	*	H	L
6	Wholesale Distribution			*	*						*			*		*	*		H	M
7	Private Utility Lifeline			*		*	*				*			*	*	*	*	*	M	H
8	Retailer		*		*					*	*		*	*		*			H	H
9	Primary Producer			*		*			*	*				*	*	*	*	*	H	H
10	Technology Supplier	*				*					*	*	*			*	*		M	H

* = location of offices/sites	* = location of markets	S=<40 full time staff	H = Highly dependent	Priv = private organisation	P=primary
		M=40-150 full time staff	M = Mod. dependent	Pub = public organisation	S=secondary
Loc = single centre		L=150+ full time staff	L = Not dependent	L/Line=lifeline organisation	T=tertiary
Nat = New Zealand wide				Govt=Local or Central	Q=quaternary
Int = International					

organisation's risk management team sat in on a portion of the interviews; this was primarily as an opportunity to learn more about the research methodology in practice. One difficulty in the collection of data from the interview process is the issue of asking directed or loaded questions and leading the respondent in a direction that the researcher determines. In all interviews the researcher sought to avoid asking loaded questions as much as reasonably possible; letting the interviewee lead the discussion in most instances. However, this issue is a difficult one to address; loaded questions should not always be considered to be detrimental to the study. Often this type of questioning can be useful when applied in a logical sequence, and when the researcher can identify that the interviewee is already heading down a particular line of questioning (Charmaz, 1990). Also, as the researchers gain a more detailed understanding of the topic and the key issues emerge, it is possible to partially direct interviews to discover the validity of these observations.

Generally speaking, the interviews followed the outline of the research questions posed in Section 3.2.1. Initially, information was sought on the organisation's experience of disruptive events and the impacts and outcomes of these events. As the study progressed, however, this information was to be found by seeking information about the organisational culture. It became apparent in the first case-study that focusing on perceptions of previous and possible future events yielded more limited information than if interviewing focused on the organisational operation in day-to-day situation. For example, the first interview in CS1, the pilot study, was with the head of the manufacturing department in the organisation. As a result the initial line of questioning (looking at past disruptions) the focus of the interview turned to the physical effects of disruptive events on the organisation. As interviewing progressed within this organisation it became quickly apparent that the physical impacts of risks the organisation faced only told part of the story. While the impact of physical hazards and risks in CS1 were seen by interviewees as significant, they all had differing opinions of which hazards were of most importance. Also, interviewees identified other equally important factors over and above the physical hazard impacts including communications, leadership and strategy, organisational vision, supply chain vulnerabilities and failures in other linked organisations.

During interviewing with CS1, the researcher tried a different approach to the interviewing which involved asking interviewees to comment on day-to-day operations and look at the strengths and weaknesses of these. This line of questioning yielded information on both the physical hazards (uncovered in the initial interview approach) and also the additional issues mentioned above. Looking at day-to-day operations, questions could then be posed inviting interviewees to comment on how they believed these issues would impact on the organisation during times of stress and disruption.

This approach was successful in the case of CS2 which had recently experienced a severely disruptive event and the organisation was having difficulty in seeing past this. Initial interviews in this organisation tended to focus on this event, particularly in an interviewee-led questioning approach. Therefore, it became apparent that interviewing with this organisation, needed to focus less on the actual event, and more on the culture and structure of the organisation itself and how this influenced response and recover in relation to that event. This line of questioning offered more information to the researcher and uncovered some

unexpected topics of discussion which had not been uncovered in previous interviews in the organisation. The researcher was then able to go back some of the key contacts in the organisation and gain their viewpoint on these new topics and issues. This then became the focus of the interviewing technique with the remaining organisations in the study; inviting comment on the day-to-day operations of the organisation and encouraging the interviewee to examine how these would influence operations in a crisis. A range of questions emerged that acted as a prompt for the researcher conducting the interviews. Not all questions were appropriate for all interviewees, and they worked more as a guide for the researcher than as definitive questions in any interview. A complete list of these questions is presented in Appendix A. The basic outline of interviews was as follows:

- All interviews began with the researcher outlining the objectives of the research project (as per the brief that all interviewees were provided with prior to interviewing).
- All interviews outlined the confidentiality of the interviewee, and explained how their comments would be included, anonymously, in a discussion document presented to the organisation at the end of the interview process.
- Each interviewee was asked if they were comfortable with the interview being recorded.
- Each participant was asked their name, position in the organisation, areas of responsibility, and the length of time they had been in that position.
- Each interviewee was asked to discuss briefly their history of employment and involvement with the organisation (particularly if they had worked with linked organisations, or previously had a position of different responsibility).
- The interviewee was then asked to comment on their perceptions of the organisational strengths and in a day-to-day setting. This discussion developed around the question prompts for the researcher as outlined in Appendix A, particularly if interviewees showed hesitation or uncertainty in how to proceed with this discussion.
- The interviewing then went on to look at how the participant believed these strengths and weaknesses would serve the organisation in future crisis situations of varying type and degree, with the discussion again revolving around the questions in Appendix A. This generally prompted the interviewee to talk of their experiences of past situations.
- Where an organisation had experienced a major crisis or disruption, this was used to prompt the discussion of organisational strengths and weaknesses outside of day-to-day operations.
- The close of the interviews involved the researcher introducing the workshop format, and an invitation to the interviewee to participate.
- All interviewees were told that they could look at the transcription of the interview.

During the interview process the data was generally collected using a digital voice recorder and then transcribed. There were a handful of interviewees who were unwilling to be recorded. For these individuals, notes were taken by the researcher during the interview. The number of interviews for each organisation ranged depending on the size of the organisation, the availability of employees and the willingness of employees to take part in the study. The minimum number of interviews was four (for an organisation with only eight full time employees) in one organisation and a maximum of 21 in another. A total of 108 interviews were conducted across the 10 case study organisations. A Draft Discussion report

was generated from the interview data and presented to each of the case study organisations. This report presented the most important information to arise from the interviews and was designed to act as a mirror for the organisation that could be reflected upon later in the study.

All interviews were transcribed for further analysis. At the beginning of the research transcriptions were completed using voice recognition software; the researcher would listen to the interview and 'speak' to the computer creating the transcription. However following hardware problems with the researcher's computer, the original training for the voice recognition software was lost. The researcher chose to transcribe the remaining interviews in a traditional manner, after time constraints made re-creating the training files untenable and the accuracy of the software prior to hardware failure could not be re-generated. All transcriptions were saved in .rtf format in Microsoft Word so that they could be easily incorporated into the coding software, NVivo2, described in Section 3.3.3.

3.3.2.2 Workshop Phase

The second source of data for each of the case study organisations was the resilience workshop. The details of the how the 5-step process was used in the workshop are presented in Chapter 4. With the pilot study (CS1) the workshop began as a way to present the information from the interviews to the case study organisation; this evolved in the remaining case studies as a way to collect and validate information as well as to observe the participants in a simulated crisis situation. In order to validate the data from the interviews and that presented in the draft discussion report, a survey was produced and all workshop participants were asked to complete this prior to the end of the workshop. The data from the survey was later collated and analysed as part of the final case study report. In addition to the survey, the researcher gathered information in the form of a self assessment about the levels of vulnerability in the organisation. The workshop participants were asked to fill in a number of multi-choice forms which were collected from the organisation before the end of the workshop. These forms were later used to assess the organisations preliminary vulnerabilities using a vulnerability matrix. Finally, during the workshop the case study organisation was asked to participated in a simulated crisis scenario; a REDS (Readiness Exercise and Disaster Simulation). This part of the workshop offered the researchers a way of directly observing the participants in a situation that was challenging to their expectations of crises, their assumptions of internal and external support and their leadership and decision making skills. Information from the workshop was integrated with that from the interviews (and draft discussion document) to produce a final report for each organisation. This report outlined the key resilience issues that had become apparent during the study, and offered the organisation a set of action plans; some preliminary strategies to assist the organisation in becoming more resilient.

3.3.3 Data Analysis using Grounded Theory Methods

This study used the Grounded Theory approach to analyse the data from the case study organisations. The Grounded Theory approach supports the use of qualitative and semi-qualitative procedures to study subjects within the social context that they occur (Glasner and Strauss, 1967).

3.3.3.1 Grounded Theory: a critical review

The Grounded Theory Method (GTM) was first proposed by Glasner and Strauss in 1967 as a qualitative research discipline and spread rapidly, particularly in fields such as health (Morse, 1994), education (Urquhart, 2002) and also organisational studies (Smallman, 2004). Since it's inception, the concept, execution and outcomes of GTM have been extensively debated including by its originators; so much so that Glasner and Strauss each developed individual approaches to the methodology (see Smit and Bryant, 2000). Several researchers have postulated over the reasons for this split between Glasner and Strauss, with their respective research backgrounds being the most cited explanation (for example, Bryant, 2002). Glasner's research origins emphasised empirical methods while encouraging original approaches to integrating qualitative information. Strauss on the other hand worked with the Chicago School of Social Research, known for its emphasis on qualitative research methods. The background from which GMT originated has been well described by many authors; refer, for example, to Goulding (2005).

The split between Glasner and Strauss over the issue of how to perform grounded theory has been the source of much academic debate. There are some key points of discussion and discourse about grounded theory. These include the generation of theory from the method (what is theory?), the concept of grounding the theory in the data, the classification of the data itself (the 'all is data' approach, for example) and the 'tabula rasa' concept (restricting the researcher's exposure to relevant literature about the research topic). Each of these arguments, although seemingly not placing a halt on the researchers engaging in GTM, are important to consider and are described briefly below. Detailed arguments may be found in Thomas and James (2006), Haig (1995), Kelle (2005) and Selden (2005).

- The generation of theory. One of the key elements of GTM is that data is analysed as soon as it is collected, and analysis becomes an iterative process of continued interviewing and questioning based on the data already analysed. As such, GTM is sometimes also termed 'the constant comparative method' because of the interplay of data analysis and collection (Strauss and Corbin, 1994). The practicality of GTM is to organise and analyse a large quantity of unstructured qualitative data. Figure shows a flow chart describing in general terms the steps along which generation of a Grounded Theory is developed. This concept of constant comparison and that of grounding theory in the data are sources of academic debate in the literature. Some authors (for example Thomas and James, 2006) advocate that there is little difference between the inductive reasoning generated using GTM and use of deductive reasoning; theory generated from the data versus the generation of a hypothesis and gathering data to prove or disprove that hypothesis. Urquhart (2002) on the other hand claims that the emergence of theory from the data, as Glasner has claimed, is not a magical property, but one which most researchers using GTM will recognise; seeing the data in a completely new light. The argument continues in academia while other researchers propose new ways forward using GTM; a type of middle ground which in itself brings criticism from some academics (Thomas and James, 2006; Charmaz, 2000).
- What is data? There has been academic dispute about what constitutes data for a GTM approach. Haig (1995) and subsequently Bryant (2002) distinguish between phenomena and data which as implications on the generation of theory as described above. Both Glasner and Strauss emphasise that data may be derived from a number of sources and data are not restricted to observations (Strauss, 1987; Urquhart, 2002). In-fact Glasner claims that because GTM is not a qualitative method but a general method all

sources of data are equally relevant (Glasner, 2001). Some, however, consider that GTM focuses on uncovering the data rather than looking at it (Thomas and James, 2006; Robrecht, 1995).

- How much knowledge is appropriate? There has been a lot of misconception over the notion of 'induction' as introduced by Glasner and Strauss. Many researchers have taken their original ideas about entering a research topic from an unbiased perspective to mean the researcher should adopt a 'tabula rasa' approach; that there is no need to consult and review the literature on a topic before the study begins. Taking this approach is claimed to reduce the likelihood that the literature 'might contaminate, stifle or otherwise impede' the researchers progress in generating theory from the data (Glasner, 1992, Urquhart, 2002). Such avoidance of the literature will enhance theoretical sensitivity in the researcher. However, despite commentary by many authors criticising this perspective (Haig, 1995, for example), Glasner himself qualifies this misconception relating to the literature; theoretical sensitivity is in-fact enhanced by the researcher becoming immersed in the relevant literature and associated ideas in order to understand theory (Glasner, 1978).

3.3.3.2 Grounded Theory in this study

For this study, the researcher used NVivo2 software to assist in coding the information from the case study organisations. As identified by Ash and Smallman (2008) although there is some criticism of the use of specialist qualitative data analysis software packages it may be appropriate for studies where there are large volumes of qualitative data as well as additional supporting information (such as information from workshops and written information provided by case-study organisations). In the initial stages of the research the coding system related specifically to the research questions presented in Section 3.2.1. Consistent with both the exploratory case study method and the grounded theory approach some of the most significant information arose from the raw data and not from the initial research questions and propositions. As the study progressed, some resilience issues were apparent in several of the case study organisations, and there was ongoing integration of information across case studies throughout the project. Additionally, with several of the organisations, the interview process extended out over several weeks and therefore the data collection and analysis was coincident. Even for those organisations where interviewing was completed within one week, the ongoing nature of transcription, coding and analysis allowed for emergent issues specific to each organisation to become apparent and be further explored in additional interviewing. This integration was supported by memo generation throughout the course of the study. Memos are generated as a way of describing general trends observed by the researcher, and may be extended to include tentative summaries, theories and suggested directions for the study. Memo writing is often a way of externalising the data analysis and a way of facilitating further theorising (Pidgeon and Harwood, 1996). Because of the extended time frame of the case-study process, memo generation was a critical aspect of ensuring that the researcher did not loose the thread of the investigation for a specific organisation or across all of the case studies. Memos also became a key part of the final stage in the case-study methodology, amalgamation, where information from all of the organisations was integrated to generate theory.

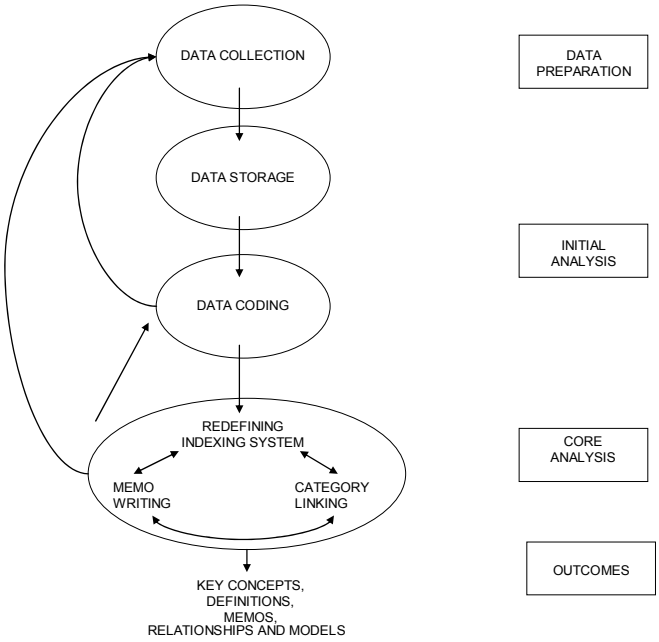

Figure 5. The Grounded Theory approach to data management and the generation of theory from qualitative analysis of information (after Pidgeon and Harwood, 1996)

Typically, Grounded Theory produces a complex analysis of a complex world rather than providing generalisations, and it is intended to be used by the people who are in the observed situations. Additionally Grounded Theory may be derived from a number of different qualitative sources. Turner (1983) illustrates this by showing three organisational analyses by Grounded Theory using observations and interviews for two case study examples, and documentary materials (more specifically public enquiry reports) to study organisational behaviour. Turner (1978) used Grounded Theory to generate theory involving large scale man-made disasters in the United Kingdom between 1965-1975. The study is an example of how Grounded Theory may be used to investigate the "psychological, organisational and inter-organisational elements' that contributed to the pre-conditions of a variety of technological disasters (Turner, 1983). The generation of data sets from the interviews, surveys, vulnerability self-assessments and scenario observations support the Grounded Theory method of multiple data sources to produce a rich data set for analysis (Pidgeon and Harwood, 1996).

The use of NVivo2 software package in this study was limited by its inability to incorporate quantitative or semi-qualitative data. For example, the information from the surveys and the vulnerability matrices was not able to be included in the analysis using NVivo2. The researcher had to address this in a more traditional manner with physical coding of the data, to integrate it with NVivo2.

3.4 Modification of the Case-Study Methodology

During the course of the study, the initial research methodology changed as the result of emergent issues, and as the result of different expectations of and from the case study organisations. This section discusses the most important methodological issues to arise in this study, and what their flow-on effect was on the rest of the research. Also

discussed is how the study changed to accommodate these issues, and the success (or otherwise) of various approaches to the methodology. Figure 4 illustrates three feedback loops identified in the methodology during this study. The first feedback loop pertains to the selection of case-study organisations. As previously discussed, not all of the case study organisations were identified and approached at the beginning of the study; this was a process of discovery for the researchers. Developments of the case-study selection process and the first feedback loop are presented in Section 3.4.1. The second feedback loop identified (Figure 4) developed in relation to the changes required during the data collection phase; in relation to the interviews and workshops for each case-study organisation. The third feedback loop as illustrated in Figure 1 is outlined in Section 3.4.3; however the details of this feedback loop are presented in the following chapters as the results form the basis of the results.

3.4.1 Feedback Loop 1: Case Study Selection Issues

3.4.1.1 Organisation Selection and Access

Following agreement on the types and sizes of organisations that would be appropriate to include in the study, the researcher then approached a number of organisations sequentially to enlist their support and participation in the research. Organisations were selected and approached in a staggered format to ensure that no organisation had to wait more than 2-3 months until their involvement with the study commenced. In several instances organisations that initially expressed a strong desire to take part in the research were later unwilling to commit to the research process. In several instances, after initial communications, face to face meetings proved impossible to organise and due to time constraints on the research, the researcher was forced to abandon following up with these organisations. Therefore, some industries and sectors did not include organisations that were considered ideal for the research. For example, the organisations targeted to represent the primary production sector were smaller wineries. These organisations (for reasons outlined in Section 3.4.1.2 below) were unwilling to take part, and the research eventually secured the support of an organisation in a different industry sector as a primary producer. Typically, access to organisations was most favourable when a member of the research team had a personal acquaintance in that organisation. This provided significant leverage and facilitated access to the key decision makers in the organisation. Furthermore, one organisation was suggested by another of the case-study organisations and these decision makers facilitated access in this instance.

Another issue to arise from the case study selection process was ensuring ongoing support from the organisations in question to participate fully in the research. CS4 was initially very supportive of the process and gaining access to the organisation for interviews was quickly facilitated. Interviewing took place over a matter of weeks and the draft discussion report was issued accordingly. However, after securing a date with this organisation to conduct the workshop (and gather the remaining data for the research), the organisation continually postponed workshop dates. Despite the best efforts of the research team to further engage this organisation and encourage them to participate in the remainder of the study, a workshop was unable to be completed. As a consolation, the researcher was able to observe this organisation in an externally organised disaster simulation, and gather valuable information. A final report was generated for this organisation, however much of the information gathered during the interviews was not able to be validated as per the other organisations. A similar problem arose with CS9. Following agreement with the managing director, and after interviewing and the issuing of the draft discussion report,

the researcher sought to confirm a workshop date. After the first date being postponed, and no additional date forthcoming, the researcher was informed that the executive committee would need to be convinced as to the merits of participating in a workshop. Again, due to time constraints, and ongoing difficulties with the key decision makers in this organisation (including the retirement of a key individual for the research in this organisation shortly after the interviewing was completed) a workshop was not completed in time for the completion of this dissertation. The researcher was allocated a short time slot with the Executive committee to present the merits of participating in a workshop. However, at the time of writing discussions are continuing with this organisation to complete the research program. This organisation had previously invited the researcher to observe an internally organised crisis exercise during the interviewing phase, and this was also incorporated into the analysis for CS9.

In terms of full participation in the research, further complications were encountered with CS7. The organisation was initially very uncomfortable with the confidentiality agreement, and several iterations of this agreement were produced before the researcher was permitted to enter the organisation. During the workshop, and specifically the scenario exercise, there was some significant resistance by key members of this organisation. This experience cemented the importance of selecting an appropriate crisis scenario for an organisation, as well as sub-dividing teams during the workshop to minimise this resistance within a team.

3.4.1.2 Organisation Size

At the beginning of the case-study selection process, the researchers expected that the most difficult organisations to gain support from would be the larger ones. However this proved to be untrue. The most difficult organisations to get representation from in the study were the smaller organisations. The smallest case-study was one of 8 employees (CS10) and the next was 35 employees (CS2). The smaller organisations that were approached to take part in this study cited the unavailability of staff, time constraints (staff could not afford to take time for interviews, let alone commit to a workshop) and expressed a perception that this sort of research was for larger organisations as reasons for not taking part. While the researcher would have liked a better representation of small business in this study, it was very difficult to gain their support.

3.4.2 Feedback Loop 2: Data Collection Issues

3.4.2.1 Order of Interviewees

In all of the organisations the initial interviews were conducted with senior decision makers; in some instances with the CEO or owner. This was typically because this individual was the person who facilitated access into the organisation. From the perspective of data collection and the research this was not the ideal situation. Often the researcher needed background knowledge of the organisation and the central resilience issues before talking with senior decision makers. Also, the availability of these individuals meant that interviews were often shorter than for others in the organisation. Therefore, it would have been useful to either interview senior decision makers at the end of the interview process, or where this was not possible, re-interview at the end to gain a better understanding of the business. This was conducted in CS1, CS2, CS3, CS7 and CS10.

3.4.2.2 Recording of Interviews

The ability to record interviews greatly enhanced the interview process. A small, unobtrusive digital recorder was used in all but two interviews. Permission was sought from all interviewees prior to the start of the interview to record the discussion. While some people expressed initial reservations, they were happy to allow the researcher to record the interview, and soon became unaware of the recorder. Some interviewees asked for the recorder to be turned off during the interview to discuss sensitive information. In these instances the researcher took notes to fill in the gap in the recording. Only once did the recorder fail during the interview due to batteries running out. Again, the research took notes in the place of the recorder. The use of the recorder enables a more accurate record of the interview following transcription, and also allowed the researcher to better engage with the interviewee.

3.4.2.3 Multiple Participant Interviews

As previously mentioned, due in part to time restrictions and the availability of interviewees, some interviews were conducted with more than one individual at a time. Initially the researcher believed that this might compromise the flow of information in the interview due to people being potentially unwilling to disclose as much information as they would if interviewed alone. However, largely this concern was unfounded. In most of the multiple interviews, interviewees actually fed off one another and the ensuing discussion was richer than if they have been interviewed individually. However, the relative position in the organisation of the interviewees was important for a successful multiple participant interview. In one instance the key decision maker and his personal assistant were both interviewed together. In this instance, the personal assistant offered little original comment, and their contribution to the interview was largely directed by the other participant. In this instance, the researcher later met with the personal assistant on a more informal basis (prior to a crisis exercise) for approximately 20 minutes and gained further insight in this environment. Therefore, when conducting multiple participant interviews, the relative position in the company of the participants is important to consider. Super- and subordinate relationships should be avoided as much as possible.

3.4.2.4 External Interviewees and Organisational Interconnectedness

While not directly engineered as part of the case study methodology, for most organisations an external perspective was gained through interviews in other organisations. Some organisations were selected on the basis of their relationships with each other (CS3 and CS4, CS6 and CS8); however the researcher was surprised at the level of interconnection between the organisations. All case study organisations exhibited some degree of connection, either through existing relationships, past relationships or past employees/employers. For CS2, CS4 and CS5 the researcher was able to interview one person who was not directly employed in the organisation but who had a strong knowledge of, and relationship with that organisation.

3.4.2.5 Observers

CS5 was a study of a business unit within a larger organisation. In this case study, two representatives from the parent organisation's risk management division asked to observe some of the interviews. They expressed a wish to learn more about the interview process and about the concept of resilience as presented in this research. The researcher was concerned initially about the potential affect this might have on the willingness of interviewees to disclose sensitive information. However, the level of disclosure in the interviews was very similar to those where multiple participants (of similar decision making levels) were involved (see Section 3.4.2.3). This was surprising in the respect that in most instances, the observer was not personally known to the interviewee, and the observer did not participate in the interview.

3.4.2.6 Technology and Presentation of Data

Initially, with CS1, all presentations were complete on large sheets of paper. Vulnerability matrices and collation of the vulnerability self assessment were all presented on A1 sheets of paper. This was both laborious and time consuming (the workshop for CS1 involved 3 facilitators; the researcher and both supervisors). The evolution of the workshop facilitated the use of electronic media (digital projectors and laptop computers) to present the information collected during the workshop, and also allowed some level of automation in analysis of quantitative data.

Handouts were provided to all workshop participants from the beginning of the research. Handouts included a workshop agenda, a sheet of definitions of resilience and its components, self assessment sheets, survey sheets, and summary crisis scenarios. From CS6, the survey sheets were distributed to workshop participants prior to the day of the workshop and participants were asked to complete them before the session. This was a successful advancement and resulted in participants feeling happier with the conclusion of the workshop, rather than rushing to complete the survey before being able to depart.

3.4.2.7 Size of the Workshops

Generally the workshops were limited to those who participated in the interviews. In some instances, however, due to the large number of interviewees the workshops were also large. The success of a large workshop was partially related to the size of the room where the workshop was being conducted. In CS5, the workshop involved 12 people but the size of the room was large and participants had plenty of room to walk around and organise groups, especially during the scenario exercise. In CS7, however, the total of 16 participants and a small room meant that the workshop was not as successful as it could have been. The size of the room was probably more critical than the number of participants. In CS8, there were only 6 people in the workshop but the room was very small and inadequately resourced and ventilated. Participants therefore had difficulty in engaging with the workshop due to the inadequacy of the location rather than the size of the workshop group. Ideally the workshop groups should number no more than 10-12 participants, and should be split into 2 groups for the scenario exercise. The room used for the workshop should have plenty of ventilation, natural light if possible, and access to tables for group exercises.

It is also important that the workshop structure be flexible and able to be adjusted to suit the organisation in question. While the case-study methodology detailed in this chapter was strictly adhered to during this study, the 5-step process was designed with an inherent scalability so that it could be used with any organisation. Sometimes this caused consternation for the researcher as the workshop structure had to be quickly adjusted as the needs of the organisation changed, however in all instances during this study, the flexibility of the data collection method (the 5-step process) was a significant advantage. In CS10, the smallest organisation in the study, the duration of the workshop was halved at the request of the general manager due to time and staff constraints. The total number of employees attending this workshop was only three, but relatively speaking represented 75% of interviewees and over 1/3 of all employees.

3.4.2.8 Timing of the Workshops

The duration of the workshop changed during the course of the study. Originally the workshops incorporated a lunch break for participants. The rationale for the break was to ensure that the workshop didn't interfere with ongoing operations in the organisation; participants had time to leave the workshop session to check emails, respond to calls and attend to other urgent business. Following the workshop for CS5, the researcher attempted to condense the workshop into a single 3.5hr session with a short coffee/tea break. This was trialled for CS6 and was very successful. Additionally, the time of the day for the workshop was influential. For CS6 the 3.5hr workshop was conducted first thing in the morning. With CS7 the same duration workshop was conducted in the afternoon, finished around 5.30pm. Workshop participants at this session were tired and the researchers had to work hard to maintain the level of engagement that was present at the beginning of the workshop. It was apparent, therefore, that workshops should be conducted, where possible, in a single 3.5hr session in the morning. However, the workshop with CS10 was conducted in only 2 hours; 1.5hrs of which was comprised of the REDS. This proved to be successful and is potentially a valuable way of conducting this research with smaller organisations to minimise disruption in terms of time and human resources while at the same time gaining valuable information.

3.4.2.9 Contextual Issues and the Order of the Workshop

The way that the workshop was structured changed over the course of the study. Additionally, the time available for the workshop varied with each organisation and it became important to remain flexible to maintain organisational engagement.

For the first four workshops the structure included a detailed discussion of the 5-step process, a brainstorming session about crisis events using the consequence scenarios, an assessment of the vulnerability (criticality and preparedness for both response and recovery periods), a simulated crisis exercise and finally, a debriefing session including questions and answers. Initially the workshop was allocated a full half day with a lunch break before the scenario exercise began. During the workshop with CS5 the facilitators were concerned that participants might not return to the workshop after this break. Therefore, a shorter time frame for the workshop was proposed. With CS6 the workshop was conducted within 3.5 hours; a short refreshments break was included and approximately 50% of the workshop focused on the exercise.

At the conclusion of the workshop for CS7, participants commented on a perceived lack of context for the vulnerability assessments. Consequently, this was addressed by changing the structure of the workshop. For CS8 the scenario exercise was conducted before the participants performed the vulnerability self-assessment. There have been various positive and negative aspects to this change. Positive aspects include:

- The changed order of the workshop provides a significantly increased perception of context for participants.
- This has certainly made it easier for participants to conduct the vulnerability assessment.

Negative aspects of this change include:

- The vulnerability assessments tend to become more specific and there is a danger that assessments only consider the 'event' used in the scenario, rather than consider the entire range of events in a particular consequence scenario.
- More vulnerability assessments may be needed to gain a broad understanding of vulnerabilities in the organisation, encompassing the four consequence scenarios

Careful scenario construction can mitigate some of these negative aspects. By selecting an event that brings in elements from two or more consequence scenarios, the organisation can gain both a context specific viewpoint as well as considering the vulnerability from a more broad perspective. However, the most appropriate way to perform the vulnerability assessments was achieved with CS10; conducting the criticality and preparedness assessments from an all-hazards perspective prior to the REDS, and then conducting the susceptibility assessment following the REDS using this as an appropriate context.

Another difficulty was encountered with the workshop for CS10. With the workshop duration being reduced to just two hours, there was not enough time to conduct both the vulnerability assessment and the REDS during the workshop. Therefore, after discussions with the organisation, the vulnerability assessment sheets were sent to CS10 and completed prior to the workshop. The organisation was given detailed instructions about performing these assessments; preparedness and criticality assessments were to be completed considering the organisation as a whole and from an all-hazards perspective. Then the participants were invited to read the first part of the REDS scenario (also provided in advance of the workshop) and finally to complete the susceptibility assessment. These results were then either faxed or emailed back to the researcher. A vulnerability matrix was able to be constructed prior to the workshop and the results discussed following the REDS. The organisation CS10 expressed that they were very pleased with the structure and the outcomes of this workshop.

3.4.3 Feedback Loop 3: Linking Data with Propositions

Information related to the third feedback loop makes up much of the results of this research. This feedback loop enabled the researcher to look at the results from each of the case-study organisations individually, relate these results back to the original research questions and propositions, and begin analysing if there were any significant differences. For example, the researcher approached the first case-study from a

dominantly operational perspective (failure of critical services such as electricity etc) when in-fact many of the resilience issues relevant to the case study organisations actually rested in their organisational culture. The key issues to arise from feedback loop 3 are presented in Chapter 6.

3.5 Amalgamation of the Case-Study Methodology

Grounded Theory was used to analyse all the data from each individual case study organisation. At the conclusion of the case studies, and once all data had been gathered, the Grounded Theory approach was used to integrate information from all the organisations. It was important, however, to ensure that the individual organisations did not loose their unique characteristics in this integrated analysis. Therefore, the analysis of data did not attempt to look at all interviews from all organisations as one large data set. Rather, the results from each of the organisations (information in the final reports issued to each organisation) was re-coded and analysed to find common resilience issues across all of the organisations. The results of this integrated analysis are presented in Chapter 6.

3.6 The Reduction of Bias in the Study

The issue of bias is a key problem for most qualitative studies, and it was a significant consideration in the design of this research project. There were several aspects of the study that had the potential to be adversely affected by bias and these are discussed below:

3.6.1 Organisation Selection

As detailed in Section 3.3.1, the selection criteria for organisations participating in this study was developed to help reduce the potential for bias in the research. The potential for bias arose in several areas:

- Does an over-representation of large or small organisations with potentially different resilience issues for each?
- Do private organisations have access to different resources, in different quantities and qualities compared to public organisations thereby causing them to be subject to different resilience issues?
- Is there likely to be differences in resilience issues for organisations that represent different industry sectors?
- Does the location of offices/sites and their distribution (locally, nationally, internationally) influence the emergence of resilience issues?
- Does the exposure to different hazard regimes influence the types of resilience issues that an organisation faces?
- If an organisation has a high dependency on human resources as opposed to physical resources does it face different resilience issues compared to other organisations?

Organisations were selected as best as possible to ensure there was a fair representation of organisations across all of the selection criteria. Limitations were identified retrospectively, however, including the identification of additional types of organisations that may add value to the study (such as co-operative organisations, for example) and considering lifeline organisations under the Organisational Sector criterion rather than as an organisational type (criterion 2).

3.6.2 Data Collection

One of the main objectives in the development of the 5-step process was to reduce the bias in data collection during this study. It was important to find a way to collect information from a group of very diverse organisations in a way that was reliably consistent across the study. It became apparent during the first group of interviews with CS1, the pilot study, that interviewing alone would not be adequate to ensure bias was not introduced, and there was a need for cross-checking of the information gathered. Therefore, the development and introduction of the 5-step process became a vital tool in this respect. Following interviewing, all participants were invited to check their interview transcripts. The interview information was collated anonymously into a Draft Discussion document and a survey was generated based on this information. The survey was given to all participants in the workshop (composed almost exclusively of interviewees in most of the organisations) and the results analysed and used as part of the final report.

The interviews themselves were designed to be open-ended and semi-structured to allow the participants to lead the discussion as much as possible, within the study parameters. As discussed in detail in Section 3.3.2.1. each interviewee was provided with a written brief of the study objectives prior to the interview taking place. Interview topics were focused on these objectives, but interviewees were able to explore those aspects of the organisation that they had the most experience and knowledge of. The researcher was acutely aware of the issue of bias when conducting the interviews, and made every attempt not to lead the interviewee. However, as previously indicated, where particularly interesting topics arose, the researcher did encourage the interviewee to expand on these topics.

3.6.3 Data Analysis

The iterative Grounded Theory approach gave the study a very clearly defined method of analysing information to arise in this study. This was considered to be an important aspect in reducing bias, from a data analysis perspective. In addition, parts of the 5-step process were instrumental in reducing bias from a data analysis point of view. The anticipated strengths and weaknesses of the organisation that became apparent from the interviewing were incorporated into the REDS scenario used in the workshop to determine the accuracy of interviewee's perceptions. Further, the organisational components that were identified as important by participants during interviews were used to look at vulnerabilities; each workshop participant was invited to score each component in terms of its criticality, preparedness, and in most instances, susceptibility. This constant cross-checking of information for each organisation was instrumental in the reduction of bias in this study.

3.7 Qualitative versus Quantitative Data

There were instanced in this study where it was considered appropriate to convert qualitative information generated from the interviews and workshops into quantitative data. The reasons for such conversion were to provide organisations in the study with a method of comparing their performance in the various resilience indicators both internally (between departments and offices) and externally (compared to other organisations within the same sector). This was most pertinent to those organisations who adopted the resilience assessment methodology, the 5-

step process as an ongoing planning, assessment and development tool. These organisations viewed the 5-step process and its outcomes as something that could give them a competitive advantage in their respective industries.

The process of translating qualitative data into quantifiable terms was relatively simple and is described in detail in Chapter 4. The translation took place after all of the organisations had been analysed and the data could be collated. Each organisation's performance in all of the resilience indicators was assessed by the researcher relative to the other organisations in this study. A qualitative scale was produced for each resilience indicator so that the research could produce an overall assessment of each organisation's situation awareness, adaptive capacity and identification and management of keystone vulnerabilities. Each organisation's performance for individual indicators was scored out of 5 (1= very poor performance through to 5=excellent performance) relative to all of the other organisations in the study. These scores were multiplied together to gather an overall score for situation awareness, keystone vulnerability identification and management and adaptive capacity. For example, the maximum value for a moderate collated resilience score is calculated by multiplying 3 (the individual score) by 5 (the number of indicators) to reach 243. Therefore the scale range is between the maximum value for a 'poor' rating (32) and a maximum value for a 'moderate' rating (243). The scale used for collated scores was divided along the best and worst scores possible for each division in the scale as illustrated in Table 2 below.

Multiplication of scores was preferred over addition of scores to better illustrate those organisations that performed well and those that performed poorly for each indicator. Table 3 shows the individual resilience indicator scores generated for each of the organisations and the collated scores across indicators. Because the indicators were only analysed relative to the organisations in this study, it is foreseeable that organisations with better or worse performances in these indicators could be found.

Following the construction of each of the resilience indicators, the researcher cross checked the overall profile with the information gathered during the study; in particular the draft discussion reports and the final reports provide to the case-study organisations. This cross check was important to make sure that the researcher's overall impression of each organisation's resilience was reflected in the profiles created.

3.8 Summary

This chapter described the case-study methodology used in this study. The discussion included the justification for using the case-study method and why a multiple case-study approach was used. The chapter examined the research questions and propositions together with detailing the data collection, analysis and validation methods. Also introduced was the 5-step process; a resilience management methodology developed with the case-study organisations and used extensively in this study as a data gathering tool. Grounded Theory was introduced and examined as the principal method for analysing the data generated in the case-studies. Finally, this chapter discusses the feedback loops that arose as a result of this study and what their implications are on the development of the case-study methodology.

Table 2: Scoring system for both individual resilience indicators and for collated resilience scores.

Scale for individual resilience indicators		**Scale for collated resilience indicator scores.**	
Performance	**Score**	**Performance**	**Score range**
Very Poor	1	Very Poor	0 - 1
Poor	2	Poor	2 - 32
Moderate	3	Moderate	33 - 243
Good	4	Good	244 - 1024
Very Good	5	Very Good	1025 – 3125

Table 3. Summary table showing the individual and collated resilience scores for each case-study organisation. For key to scoring system, refer to Table 3.

			CASE STUDY ORGANISATIONS									
		Label	**CS1**	**CS2**	**CS3**	**CS4**	**CS5**	**CS6**	**CS7**	**CS8**	**CS9**	**CS10**
Situation Awareness	Roles and Responsibilities	SA_1	*3*	*2*	*3*	*3*	*1*	*3*	*1*	*2*	*5*	*5*
	Hazards and consequences	SA_2	*1*	*2*	*5*	*4*	*3*	*3*	*2*	*2*	*5*	*3*
	Connectivity Awareness	SA_3	*4*	*2*	*4*	*3*	*1*	*2*	*2*	*5*	*4*	*5*
	Insurance	SA_4	*2*	*3*	*2*	*5*	*3*	*3*	*2*	*1*	*4*	*3*
	Recovery Priorities	SA_5	*3*	*1*	*5*	*4*	*1*	*3*	*3*	*4*	*5*	*2*
	SUMMARY	**SA_{comp}**	**72**	**24**	**600**	**720**	**9**	**162**	**24**	**80**	**2000**	**450**
			Mod	**Low**	**High**	**High**	**Low**	**Mod**	**Low**	**Mod**	**V.High**	**High**
Keystone Vulnerabilities	Risk mgmt and Planning	KV_1	*4*	*3*	*4*	*5*	*3*	*4*	*1*	*1*	*5*	*2*
	Exercises	KV_2	*1*	*4*	*5*	*5*	*2*	*3*	*1*	*2*	*5*	*2*
	Internal Resources	KV_3	*3*	*5*	*4*	*4*	*3*	*4*	*3*	*2*	*5*	*3*
	External Resources	KV_4	*3*	*4*	*4*	*3*	*2*	*4*	*2*	*3*	*4*	*4*
	Connectivity	KV_5	*1*	*4*	*5*	*5*	*1*	*5*	*3*	*4*	*4*	*3*
	SUMMARY	**KV_{comp}**	**36**	**960**	**1600**	**1500**	**36**	**960**	**18**	**48**	**2000**	**144**
			Mod	**High**	**V.High**	**V.High**	**Mod**	**High**	**Low**	**Mod**	**V.High**	**Mod**
Adaptive Capacity	Silo Mentality Management	AC_1	*2*	*1*	*3*	*3*	*1*	*5*	*3*	*3*	*3*	*5*
	Communications and relationships	AC_2	*1*	*2*	*4*	*2*	*2*	*5*	*2*	*5*	*5*	*5*
	Strategic Vision	AC_3	*5*	*2*	*3*	*3*	*1*	*5*	*3*	*4*	*4*	*3*
	Information and knowledge	AC_4	*3*	*2*	*4*	*3*	*1*	*5*	*2*	*3*	*5*	*5*
	Leadership and management	AC_5	*4*	*2*	*4*	*3*	*1*	*5*	*3*	*4*	*5*	*5*
	SUMMARY	**AC_{comp}**	**120**	**16**	**576**	**162**	**2**	**3125**	**108**	**720**	**1500**	**1875**
			Mod	**Low**	**High**	**Mod**	**Low**	**V.High**	**Mod**	**High**	**V.High**	**V.High**

4 METHODOLOGY FOR ASSESSING AND IMPROVING ORGANISATIONAL RESILIENCE

4.1 Introduction

This chapter details the facilitated 5-Step process that has been developed in this study for assessing and improving organisational resilience and has been used with all of the case-study organisations. The 5-Step process has been an integral part of the case-study methodology detailed in Chapter 3 and has formed the basis of the data collection process. Additionally, this chapter discusses how the 5-Step process has evolved during this study.

Together the five steps reflect the connectivity between situation awareness, keystone vulnerability and adaptive capacity. The steps have been designed to compliment one another and assist in assessing and improving organisational resilience. The steps are:

- Step 1: Building an Awareness of Resilience. This is achieved through the use of interviews, surveys, discussion reports and by the introduction of Consequence Scenarios to assist in increasing awareness of hazards and crises.
- Step 2: Mapping of Organisational Components. Facilitating an understanding of the components of an organisation builds situation awareness and provides a platform from which vulnerability assessment may be performed.
- Step 3: Vulnerability Self Assessment. This involves a facilitated self assessment of criticality, preparedness and susceptibility of the organisational components from Step 2 to determine vulnerability both from all-hazards and for specified consequence contexts.
- Step 4: Vulnerability Matrix. Using the information from Step 3, the vulnerability matrix is a tool offering a visual representation of the vulnerability data and used to assist decision makers in identifying keystone vulnerabilities. This also builds on situation awareness.
- Step 5: Readiness Exercises and Disaster Simulations (REDS). This step builds situation awareness, enhances adaptive capacity and provides a chance to observe and experience vulnerabilities in a simulated crisis environment.

Table 5 illustrates the links between steps and shows how each step relates to the attributes of resilience. Figure 6, a schematic flow diagram, shows some of the process pathways between steps and the iterative nature of the process to build and identify issues of organisational resilience. Each of the steps is described in detail in the following sections.

Table 5. A table showing the connectivity of the steps in the 5-Step process and how the steps relate to the attributes of resilience.

Situation Awareness	Vulnerability	Adaptive Capacity
Step 1 Building Awareness • Interviews, Surveys, Reports Gathering information from key stakeholders and validating that data. • Consequence Scenarios To build awareness of causes and consequences of crises.	**Step 3** Vulnerability Self-Assessment A facilitated self-assessment of mapped components for their **criticality, preparedness and susceptibility** to determine vulnerability. Context dependent.	**Step 5** R.E.D.S Readiness Exercises and Disaster Simulations to improve adaptive capacity looking specifically at: • Capability and capacity • Outcome expectations • Responsibility and accountability • Innovation and creativity • Responsiveness
Step 2 Mapping of Organisational Components Build an awareness of what makes the business tick from an internal and external perspective.	**Step 4** Vulnerability Matrix A visual presentation of vulnerabilities from Step 3 to identify keystone vulnerabilities and enable prioritisation of these for improved resilience.	
Step 5 R.E.D.S Readiness Exercises and Disaster Simulations of different consequence scenarios to build awareness.	**Step 5** R.E.D.S Readiness Exercises and Disaster Simulations to test and identify keystone vulnerabilities in different types of crises.	

4.2 Objectives of the 5-Step process

As identified in Chapter 1, it is important that resilience moves on from being a theoretical concept and becomes an operational construct with tangible outcomes for organisations. The development of the 5-Step process in this research has had two principle objectives; the second objective emerged from the first during the research.

Firstly the methodology was primarily developed to provide an effective, repeatable and verifiable way to gather information from the case-study organisations. In conjunction with both the case-study method and the Grounded Theory method, the 5-Step process offered the researcher a way to gather information from each organisation in the same manner thereby reducing the bias that may be generated by a study of this type. The steps have, therefore, principally been developed as the vehicle for data collection and data validation for the case-study methodology used in this research project, as detailed in Chapter 3. In terms of situation awareness the process was developed to assist the researcher look at perceptions that influence decision making processes, and which impact on existing and future planning strategies. The process offers value from a vulnerability perspective as it utilises several different types of data (surveys, interviews, scenarios) to identify and validate keystone vulnerabilities and decision making around those vulnerabilities. Finally, when tackling data gathering regarding adaptive capacity the process allows observations and interaction with the organisation in a simulated scenario. This enabled the researcher to gather and validate information on communication pathways, decision making and leadership, perceptions and other key areas of study. In all ways, the 5-Step process was designed with information gathering, clarification and verification in

mind and compliments the general research methodologies of case study theory and grounded theory used in this study.

Secondly, the 5-Step process offered the researcher and the organisations a structured methodology for assessing and eventually improving upon resilience within the organisation; an objective that emerged as the 5-Step process was used with the case-study organisations throughout this project. The 5-Step process is designed to act as a bridge to link all the other planning strategies that an organisation may have and it seeks to provide a platform from which these strategies can be used in an overarching, holistic approach. While strategies such as risk management, business continuity and emergency management planning are commonly viewed as intrinsically related, a practical means of linking them is often absent. Implementation of resilience strategies using the 5-Step process could also help an organisation to successfully navigate the post-crisis period and integrate resilience into its day-to-day operations. The process achieves this by encouraging increased situation awareness, a greater understanding of keystone vulnerabilities and improved adaptive capacity. Furthermore, the process concentrates on encouraging decision makers to learn more about their underlying value systems, expectations of their enterprise and key stakeholders, and offers a vehicle for testing strategies and plans in a simulated and educational environment.

4.3 Theoretical Basis of the 5-Step process

Different theoretical ideas and principles form the basis of various parts of the 5-Step process. As discussed above, the original and principal objective of the use and development of the 5-Step process was one of consistency in data collection techniques. However, as the study progressed, the opportunity to develop some of the steps into a tool for organisational development and learning presented itself. This became a secondary, although significant, objective of the final development of the 5-Step process and the focus of its future development. Fundamentally there are three foundation concepts upon which the steps are built. These are described below.

4.3.1 The Grounded Theory Methodology

Grounded Theory has had a significant influence on the development of the 5-Step process as a data gathering tool. Because this study is largely qualitative in nature it is important that data is gathered in a structured and standardised way to discourage bias and to enhance the validity of the results. Because this study was also largely exploratory in nature, the validation of the data by experts was required and this involved feedback from the participants themselves. This was achieved in the extensive reporting and surveying that took place in the study. The reports served a dual purpose. Firstly, the reporting process provided the organisations with an opportunity to validate the information gathered themselves (this was like offering the organisations a mirror of their perceptions, processes, systems and operations) with allowed the researcher additional access to the organisations. The reports and surveys also provided the researcher with a systematic analytical process; a way to look at the data rather than getting lost in looking for data (Robrecht, 1995; Schatzman, 1991). In turn, this meant that information could be analysed systematically for individual organisations and in terms of collating information across the case-studies.

4.3.2 Organisational Learning Theory

The REDS were originally designed as a way of assessing the decision making processes and relationships within the case-study organisations using semi-experimental situations; incorporating scenarios, which are a commonly used method (Ash and Smallman, 2008; Berggen, 2005; Roth, Woods and Pople, 1992). The scenario based approach to the REDS was adopted to enable the researcher to uncover information about organisational decision making in both day-to-day and (simulated) crisis situations and allow comparison across case-studies. The task of designing scenarios for the analysis of crisis situations is traditionally a difficult one. Scenarios in the past have been most typically used to tackle situations where the outcome is known, but where the probability of occurrence and/or the pathway to that outcome is not known. However, organisations are being exposed to an increasing variety of risks and hazards that were previously unanticipated; events which are most often complex, multi-dimensional and often paradoxical in their nature. As such the events have the potential to significantly impact organisational and management structures (Postma and Liebl, 2004).

Scenarios are most useful because of their ability to uncover information on both current and future situations (Carroll, 2006) and they have been used extensively in fields of strategic management and operational design as well as technological fields such as human-computer interaction. Scenario based information gathering may also be useful as a reality check, both for the researcher and for the organisation; allowing testing of 'operational capacity against a likely event that is understood in some way' (Buckle et al., 2000). As a byproduct of the consequence scenario design in this study was the ability to challenge and influence the mindset of managers by offering them a view of possible future perspectives. This, in turn allowed the researcher to observe perceptions and decision making in relation to these perspectives. Further, this may influence an acceleration of organisational learning (Postma and Liebl, 2004, Bood and Postma, 1997), although this was a secondary aspect of developing the scenarios. As this study progressed it became apparent that the 5-Step process could also be used as an organisational learning tool. Therefore, elements of organisational learning theory were integrated into the development of the REDS (a detailed discussion of organisational learning is presented in the literature review in Chapter 2).

4.3.3 The Risk Management and Business Continuity Approach

All but one of the organisations in this study was aware of and/or using AS/NZS 4360; the Australian and New Zealand risk management standard. Additionally, most of these organisations were using the risk matrix in this standard as a tool for risk management, or a derivative of it, as part of their risk management planning strategies. As a result, the majority of the organisations in this study had a working knowledge of risk management and were in varying stages of integrating it into their organisational culture. Additionally many of the organisations were using some form of business impact analysis; derived from a business continuity approach. The aim of using a risk management and business continuity based approach to identify resilience issues was to provide continuity of processes for the organisations, and not to burden them with an additional process that may be considered unwelcome. In order to gain the confidence and buy-in of the organisations it was important to use versions of tools that they were likely to already be familiar with. In particular, the Vulnerabilty Matrix was developed as a way to graphically identify key

organisational components that have the potential to impact on both the risk management process and the business impact analysis. This tool was designed specifically to look similar to traditional risk matricies so that organisations using the tool did not have to learn complicated new strategies for gathering this valuable information.

4.4 The 5-Step Process

4.4.1 Step 1: Building an Awareness of Resilience Issues

In order for resilience management to be effective an organisation must develop a clear understanding of the issues that contribute to its resilience; it must develop its situation awareness. This includes:

- the current and projected reality of the organisational operating environment; the resources that the organisation has at its disposal;
- the expectations and limitations of all stakeholders, and;
- the positive and negative impacts of various types of crises.

The assessment of situation awareness was ongoing with each case-study organisation. It began with the initial data collection phase of interviews with key stakeholders and was followed up by surveys and reporting back to the organisation with the draft discussion document. Additionally, during the workshop session each organisation (two organisations did not participate in this exercise) participated in a brainstorming exercise to assess and build their knowledge of potential hazard situations and their expected impacts using Consequence Scenarios. These techniques are described below.

4.4.1.1 Interviews, Surveys and Reporting

A detailed discussion of how interviewing was carried out is presented in Chapter 3. A brief overview is given here to illustrate how interviewing, surveying and reporting fits into the 5-Step process. Interviewing key stakeholders internally (staff, shareholders etc) and externally (customers, suppliers, contractors and even the wider community etc) is an excellent method for assessing situation awareness. Those conducting the interviews should be experienced interviewers, have a good understanding of resilience management and be able to provide an objective perspective. The individual/s facilitating the interviews need to be aware of the relative importance of information gathered; comments made by only one individual may not be representative of the entire organisation, but if seemingly anomalous comments are made by a senior decision maker, there may be significant implications on overall organisational resilience. Therefore it is important that the interviewer remains objective and open to all potential resilience issues that arise.

Once this initial information has been gathered, it is important to present the findings back to the organisation. Discussion reports are an ideal way of doing this, and they encourage the organisation to look at itself and its perceptions from an external perspective. These types of reports also offer the organisation a mirror of the perceptions (and possibly misconceptions) that pervade the organisation, and of which they may be unaware.

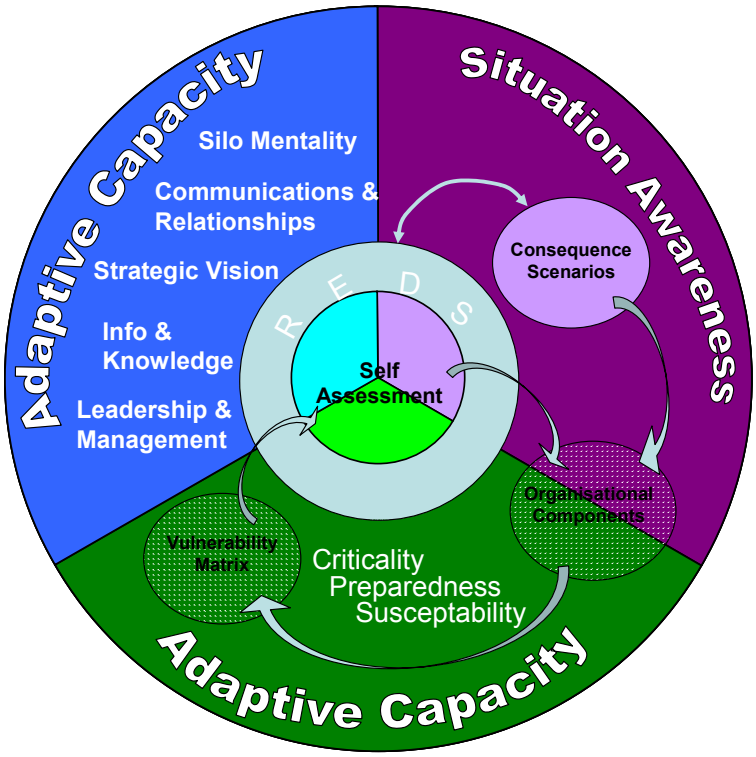

Figure 6. A schematic flow diagram illustrating the iterative nature of the 5-Step process and the connectivity between steps to achieve improved resilience for organisations.

Initial surveys may be created from the discussion document, which help determine the validity of comments made during interviews. The surveys can also assess the degree to which particular views or perceptions permeate the organisation or even external stakeholders. Surveys are valuable for highlighting how well particular strategies or procedures are progressing in an organisation. Many organisations have versions of staff/stakeholder engagement surveys and these can be a valuable source of information for developing resilience management. Furthermore, surveys can be conducted with the wider community to assess connectivity and the perceptions of the organisation in this environment.

4.4.1.2 Consequence Scenarios

It is important to assess the level of understanding that an organisation has of both the hazard events that it faces and the potential consequences that may arise from those hazards. Often, even if the hazards are very low probability, the consequences are so unacceptable that the organisation cannot ignore them. In many instances these are exactly the events that are not planned for and organisations tend to rely on an assumed level of ability to deal with these extreme hazards. Some organisations also have difficulty in moving past those events previously experienced toward a greater awareness of those hazards not previously considered or encountered.

A set of four Consequence Scenarios has been developed to help organisations improve their awareness of crises and consequences. The Consequence Scenarios are designed to simulate a wide range of potential effects on the study organisations. Due to the variability in how specific threats may affect an organisation, specific hazards have been disregarded in favour of a set of particular event consequences. If the particular consequence of interest is complete physical destruction of an organisation's premises, the actual hazard event that produces this characteristic is likely to differ for individual organisations. For example, in

Christchurch an Alpine Fault rupture earthquake might cause this for many organisations, however this event would not have the same consequences in Auckland.

As with any event scenario, there will always be known unknown factors and unknown unknowns. The aim of presenting the case study organisations with these Consequence Scenarios is three-fold.

- Firstly it encourages organisations to identify those events that are foreseeable and also encourages organisations to consider how they might cope with those outcomes that they cannot foresee. To this end, the Consequence Scenarios are also important in assessing the ability of the crisis management team and the overall management structure of the organisation to adapt to situations outside of their expected outcomes. This reflects an organisations adaptive capacity which will be discussed in Section 4.6.
- Secondly, the consequence scenarios provide organisations with a vehicle to investigate how they might address the failure, temporary or otherwise, of linked organisations. It is important for organisations to not only consider how the downfall of an important ally or rival will affect them, but how they might be able to maximise and even prosper from this type of situation.
- Finally, Consequence Scenarios allow organisations to prepare for different hazard events that have similar consequences at the same time. Planning for a range of hazards in a consequence based framework can be more economical than for individual hazards. Often the strategies used to mitigate one hazard can be used for other hazards. Therefore Consequence Scenarios offer an organisation a way of collating the critical components of crisis situations so that it can maximise its resources in preparing for these types of hazards. Table 6 outlines the Consequence Scenario framework developed in this study and used with all of the case study organisations to help organisations identify specific hazards and impacts; both positive and negative.

4.4.2 Step 2 - Determination of Essential Organisational Components

Also important from a situation awareness perspective is an organisations understanding of the essential components that make it tick from both an internal and external viewpoint. Mapping the essential organisational components for each case-study was completed in conjunction with the interviews and refined during the survey and reporting process. The details of organisational component mapping are discussed below.

4.4.2.1 Component mapping

Organisations implementing resilience management strategies should identify the degree to which they intend to apply the process; within senior management, throughout a department, throughout the entire organisation or in conjunction with key linked organisations. The way in which an organisation achieves this is to identify the organisational components that are integral to operations at the chosen scale. Additionally, one of the most critical aspects of this process is the identification of links between organisational components, and the potential weakness/strength of those links as well as the components themselves.

Table 6. Details of the consequence scenarios used to improve an organisation's situation awareness.

Scenario Type	Scenario Characteristics
Regional	This scenario tests an organisation's response to and recovery from significant physical damage to buildings, contents, and resources, coupled with severe disruptions to lifeline services such as transportation, electricity, water and telecommunications.
Societal	This scenario focuses on an event resulting in extended staffing absences. In this event physical infrastructure is intact, but staff are either unable or unwilling to be at work.
Localised	Scenarios of this nature focus on an organisation specific incident resulting in severe disruption to normal operations and reputation impacts and may include loss of life or injury. The intense focus of media and regulatory agencies requires the organisation to focus on managing stakeholder perception as well as the physical response and recovery from the event.
Distal	This scenario tests organisational response and recovery regarding impacts on business flow through the organisational network such as key suppliers or customers. This could include, for example, the impacts of government restrictions on fuel supplies or the collapse of infrastructure such as electricity or telecommunications.

Mapping organisational components is a task that can be a facilitated process but maps should not be compiled entirely by external facilitators. The reason for this is that successful resilience management requires ongoing development of situation awareness within an organisation and involvement in mapping an organisation's key components and the links between them is critical to this development. Furthermore, those responsible for the implementation of resilience management in an organisation should be involved as much as possible with mapping components to increase their own situation awareness.

There is a distinction between internal components and external components for an organisation. Internal components are those that the organisation has the direct ability to manage in terms of resilience. For example, employment contracts with staff would be an internal component. External components on the other hand are those that, while potentially having some influence over component management, an organisation had no direct ability to change. For example, the supply of telecommunications services by a third party supplier would be an external component because although the organisation may be able to manage its response to such an outage, it cannot control the cause of that outage. In this study, organisational components were mapped with each organisation individually. As the study progressed it became apparent that a core set of components was emerging; several components were critical to all organisations studied. Around these core components, another set of organisation specific components were developed. The scale of the component mapping in this study was at a high level strategic perspective of internal and external components. Table 7 shows some of the core components, internally and externally, that were observed from this study. These components are then used to further the resilience management process by enabling organisations to critically self-assess the vulnerability of these components; this is discussed in the next section.

Table 7. An example of the types of internal and external organisational components mapped for organisations in this study.

INTERNAL COMPONENTS					
Physical Components		**Human Components**		**Economic Components**	
Buildings And Equipment	Offices	Communication/ Relationships	General Staff	Direct Planning	Risk Management
	IT Hardware		Senior Staff		Continuity Planning
	Security		Board		Emergency Management
	Vehicles	Management	Leadership		Cash Flow
	Software/IP		Succession		Market/brand Knowledge
	Inventory		Staff Welfare		Insurance
Services	Generators	Information/ Knowledge	Backup		
	Fuel Supplies		Privacy/Protection		
	IT networks		Training/Review		
EXTERNAL COMPONENTS					
Physical Components		**Human Components**		**Economic Components**	
Services	Electricity	Communication/ Relationships	Emerg. Services	Indirect Planning	Interconnectedness
	Water		Local Authorities		Govt. Compliance
	Sewerage		Customers		Contracts
	Telecommunications		Suppliers		Reputation/Image
	Transportation		Media		

4.4.3 Step 3 - Self Assessment of Vulnerability

An assessment of vulnerability is important in resilience management because it contributes to increased situation awareness, promotes the development of adaptive capacity and also gives the organisation something tangible to work towards. Vulnerability is self assessed to improve the organisational buy-in; there is always a danger having an external facilitator assessing vulnerability as key stakeholders may feel misunderstood or misrepresented by the facilitator and not accept the recommendations. Using a self assessment technique of vulnerability the organisation is encouraged to take ownership of the issues that emerge, and consequently can accept accountability for improving vulnerabilities.

An important part of the vulnerability assessment is establishing the context. Initially the assessment should be conducted from an all hazards perspective, and then a more detailed context can be obtained using the consequence scenarios from Step 1. Additionally, the scale of the assessment needs to be established using the component mapping from Step 2. The vulnerability assessment requires consideration of criticality and preparedness with susceptibility also assessed for the chosen context, all at a scale appropriate for the purposes of the organisation. The details of the self assessment process are described below and Section 4.5 details how this assessment is used to identify and prioritise keystone vulnerabilities in an organisation.

4.4.3.1 Selecting the Scale of Assessment

Prior to the development of resilience management strategies, an organisation must first determine the desired scale of assessment. Does the organisation want to explore strategies to target senior management or a particular department, a particular geographic locality or office, or perhaps the entire organisation? If an organisation targets only one part of itself (a single department or business unit for example) then the same techniques should be applied to other parts of the business to ensure all potentially critical linkages between components are identified. Once the scale has been established, the organisation can then assess the vulnerability. The components of vulnerability are discussed below.

4.4.3.2 Criticality

The key question to ask when assessing criticality is 'how important is this particular component to the whole organisations ability to respond to/recover from crises?' The assessment process, therefore, is applied to two distinct time frames in relation to crises; response and recovery. The immediate response phase occurs either during or immediately following the onset of a crisis. This may differ depending on the nature of the event. The response phase for an earthquake may be a matter of hours or days while the response to the outbreak of infectious disease nationwide may be weeks or months. An organisation moves into recovery when it is beginning to think about returning to business-as-usual conditions. The move from response to recovery is not always observed as a discrete period following a crisis and recovery may not be recognisable as 'business-as-usual' conditions because the operating environment has changed dramatically due to the crisis event. Criticality for both response and recovery is divided into four broad categories: very high, high, moderate, low. It is important when assessing criticality the organisation also considers the connections between organisational components, and the potential criticalities of these links.

4.4.3.3 Preparedness

When assessing the preparedness of components the organisation should ask 'what level of planning or inherent robustness does this particular component have for loss or impairment of its function'? Preparedness is therefore measured qualitatively; high, moderate, low, none. For example, electricity services may have a high level of preparedness because the organisation has chosen to purchase a generator. However, an organisation without a generator might consider that its level of planning for the loss of electricity is low. Some components may have an inherent robustness (a highly functioning crisis leadership team with effective decision making, for instance) while others require specific pre-planning strategies by the organisation to increase their redundancy. As with criticality, it is important to consider the connectivity of components when assessing preparedness to ensure that all aspects of the organisational system, in the given context, are captured by the assessment.

4.4.3.4 Susceptibility

An assessment of the susceptibility of components is intended to encourage an organisation to consider more carefully the potential impacts of different types of crises. An organisation should ask 'how badly impacted is the performance of this particular organisational component likely to be in the event of this particular scenario'? For example, electricity services may be highly susceptible to a regional crisis that impacts infrastructure such as an earthquake, but have a very low susceptibility to social disruption such as an influenza pandemic. Susceptibility is therefore determined qualitatively; very high, high, moderate, and low.

In order to successfully assess susceptibility, an organisation should consider a particular context. Organisations can use any number of techniques to provide such context; from experience of a previous crisis situation, to a political push for crisis response to particular impending events. In this study, the Consequence Scenarios (Section 4.2.2) have been used to provide the crisis context for the vulnerability self assessment. When developing scenarios for the case study organisations typically elements of two or more of the Consequence Scenarios were used to provide context. Not only does this provide an economy

of scale for organisations by enabling it to look at more than one scenario at a time, but it also provides a more complex context. This helps an organisation to better approximate the reality of a crisis and will provide a more detailed picture of the organisations strengths and weaknesses and connections.

4.4.4 Step 4 - Identification and Prioritisation of Keystone Vulnerabilities

There are two ways to interpret the vulnerability information from Step 3. Firstly this information can be considered from an all hazards approach using the criticality and preparedness information for response and recovery phases of a crisis. Secondly, the organisation can consider the susceptibility information as part of the vulnerability picture to look at particular vulnerabilities for an event type of immediate concern, for example influenza pandemic or as a review of a previous event. The intersection of the various attributes of vulnerability introduced above (Section 4.4) can help to indicate which organisational components present the greatest threat to an organisation in a given context (all hazards or consequence specific). These are called keystone vulnerabilities. Keystone vulnerabilities are components (or links between components) that, in the event of their failure or loss, have a significant negative impact on the organisation. These may occur as either sudden catastrophic failure in the organisation or be more insidious with cascading failures over time. Identification of keystone vulnerabilities often takes a more considered and structured approach to uncover. These vulnerabilities can be hidden within the system and the organisation may have little or no awareness of their potential to create further crises within the main event.

It is also important that an organisation looks at its keystone vulnerabilities as interconnected parts of a system and not in isolation. There is the potential for some organisational components to be more highly vulnerable when considered as part of a system than in isolation; a cascading failure (Barbarasi, 2002). For example, electricity may be considered as a vulnerability on its own, but when considered as part of a system, its failure may cause other components to become keystone vulnerabilities. It is also possible that the opposite is true; that some organisational components, when considered in isolation, may appear to be more significant vulnerabilities than if considered as part of the whole system. The following discussion outlines the use of the vulnerability matrix. This is a simple visual tool, developed as part of this study, to help organisations identify and prioritise keystone vulnerabilities.

4.4.4.1 The Vulnerability Matrix

Vulnerability matrices are produced using preparedness and criticality data obtained in Step 3. This produces an assessment of vulnerability at an 'all-hazards' level. Additionally, susceptibility information is used to produce a context specific matrix. Examples of both types of vulnerability matrices are presented in Figure 7.

Criticality is plotted on the x-axis and preparedness on the y-axis. Each organisational component is represented by a ‘hole’ in the matrix. For the 'all-hazards' matrix, all the holes are of equal size and it is their position on the matrix that determines their status as keystone vulnerabilities. Susceptibility data however, is indicated by different sized 'holes'; the larger the 'hole' the greater the degree susceptibility. For these context specific matrices, keystone vulnerabilities are identified both by the size of the hole they produce as well as their position on the matrix.

Keystone vulnerabilities are those often innocuous components and links that have the potential to be show-stoppers for an organisation. They should be identified as quickly as possible and as part of an integrated vulnerability assessment. Further, matrices can be produced to look at different aspects of an organisation, concentrating on human resources, external stakeholder links, or essential infrastructure for example. They can also be used to look at keystone vulnerabilities for different business units or departments and compared to overall vulnerability for the entire organisation.

The vulnerability matrix is a tool that quickly assists decision makers to visually identify those components that present the greatest potential threat which can then be collated and treated accordingly. In this way, the matrix is an important vulnerability prioritisation tool for an organisation and can greatly assist in helping focus attention and resources to where they will provide the greatest value for an organisation.

4.4.4.2 Keystone Vulnerability Prioritisation

The matrix is divided into four categories of vulnerability. The highest vulnerability category is in the top right-hand quadrant moving through to the lowest vulnerability in the bottom left-hand quadrant (Figure 7). An organisation plots the results of the vulnerability assessment on the matrix using the criticality and preparedness information. The organisational components that fall within the highest vulnerability categories on the matrix are likely to be the most important keystone vulnerabilities and should be the ones addressed first in any planning strategies. In Figure 7a the matrix shows that components #6 and #1 would be considered as the most important followed by #4, #10 and #2, then #9, #8 and #3.

If an organisation wanted to investigate its keystone vulnerabilities for a particular planning strategy (for example pandemic or loss of a particular link in the supply chain) it would then use the susceptibility information. In Figure 7b, the susceptibility information has been included on the vulnerability matrix. In this example component #1 is a greater keystone vulnerability in this type of event than #6 because it represents a larger 'hole' in the matrix within the same vulnerability category on the matrix (in Figure 7a these components would have been considered relatively equally). The organisation may then identify component #4 and possibly #2 as greater vulnerabilities than component #6, again because of their position and the size of the 'holes' they create in the matrix. In this way the organisation can more specifically target those components that present the greatest keystone vulnerabilities for the particular context being investigated.

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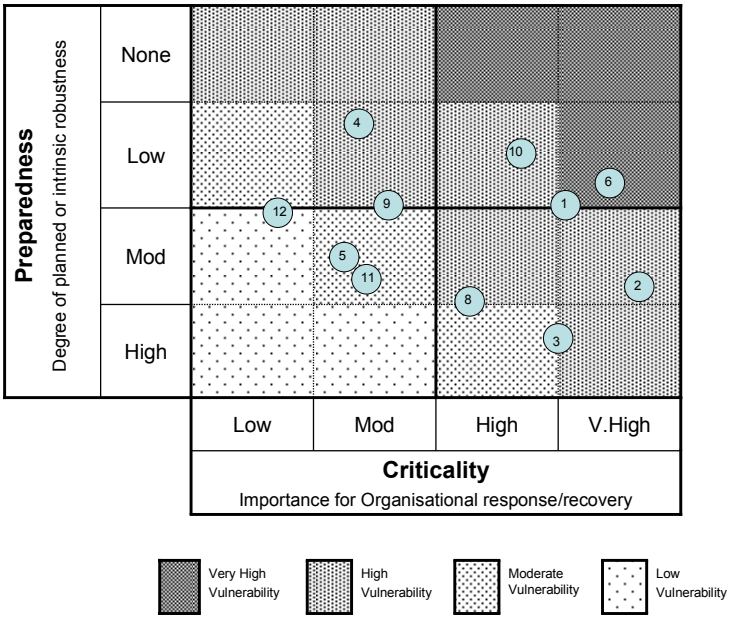
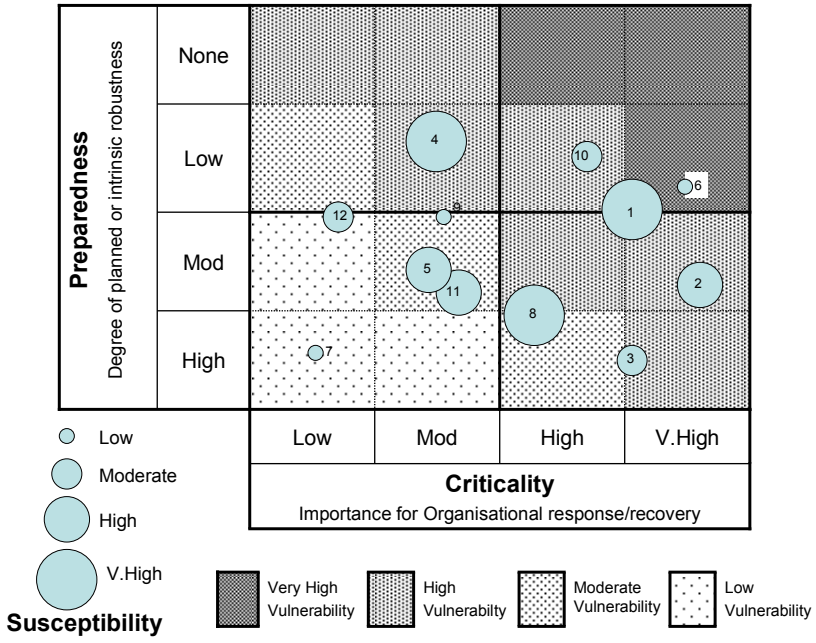
this study the vulnerability matrix has been used entirely from a qualitative perspective, however there exists the potential to create a more quantitative assessment process. This would feasibly help organisations to better identify and rank keystone vulnerabilities, and also better compare vulnerabilities between departments, offices and even between organisations within an industry if required. This is discussed as part of the future work proposed in Chapter 7.



All-Hazards Vulnerability Matrix

Figure 7a. Vulnerability Matrix showing organisational components in an all-hazards context. Circles represent components



Context Specific Vulnerability Matrix

Figure 7b. Vulnerability Matrix showing organisational components in a context specific matrix. Circle size represents susceptibility to a given context.

Figure 7. Sample vulnerability matrices showing (a) an all-hazards approach and (b) a context specific approach to determine keystone vulnerabilities for organisational resilience.

4.4.5 Step 5 – Increasing Adaptive Capacity

The final stage in the 5-step process focuses predominantly on identifying and developing adaptive capacity in an organisation. Adaptive capacity is largely concerned with the cultural capital of an organisation and there are several detailed methodologies in existence to measure some of the psychological aspects of this culture (for a review see Chernyshenko and Stark, 2005). It may be difficult for organisations to incorporate these methodologies into their day-to-day business due to the complexity of these models, financial constraints and the availability and skill of staff to perform the assessments. For this reason, the tools in Step 5 are designed to provide a time and resource efficient way to assess and improve overall resilience for organisations via developing adaptive capacity, without getting lost in too much detail. Step 5 is intended to provide tangible outcomes for organisations, and assist them in developing immediate action plans to address key resilience issues, particularly in relation to adaptive capacity, but also in terms of situation awareness and keystone vulnerabilities.

4.4.5.1 Readiness Exercises and Disaster Simulations

Ultimately, this 5-step process is about providing simple and practical tools for decision makers to assess and increase an organisation's resilience for times of crisis. As such, one of the most important tools used in the process is the Readiness Exercises and Disaster Simulation (REDS). REDS encourage organisations to experience their vulnerabilities and strengths in a simulated crisis environment and offer a platform from which to critically assess decision making and communications. Scenario exercises help an organisation to increase its awareness of the operating environment in a crisis and the potential impacts of different event types. For those organisations that have engaged in producing emergency plans or business continuity planning, scenarios offer an excellent opportunity to test these plans before they are needed in a real situation. The scenarios used with the organisations in this study are presented in Appendix G.

Ideally REDS are conducted with groups of between 8-12 individuals who have wide ranging knowledge of the organisation and represent key decision makers. REDS can be modified for smaller organisations, but for larger organisations, groups should number no more than 12. Additional exercises should be conducted if more people are to be involved. Experience with the case-study organisations has indicated that 12 is the maximum number of participants that can reasonably participate in the REDS and still ensure that all participants can have an active role in the exercise.

REDS are structured into six distinct stages that are conducted sequentially and described below.

- Stage 1 - Group Selection and Scenario Presentation

  If the group numbers more than eight individuals, it should be divided into two smaller groups with equal numbers. The groups are presented with a detailed event scenario and are asked to consider this event from a specific time frame for the immediate recovery phase. (This may be minutes, hours, or days depending on the nature of the event).

- Stage 2 - The Response Phase

Each group is asked to consider the following four questions.

Question 1. What are the major issues facing the organisation at this time (following the crisis)? This is simply a brainstorming exercise where all the potential problems that the organisation faces in the aftermath of an emergency are identified and listed.

Question 2. What are the main priorities that the organisation must consider? The participants must consider what they actually need to do, how, in what order and who will be responsible for what actions.

Question 3. What are the lesser priorities and how long until these become critical? This offers participants an opportunity to view the crisis from alternative time frames. This question encourages participants to do a horizon scan of the issues and to consider within what time frame are these likely to become important?

Question 4. What could the organisation do prior to a crisis to better prepare for this situation? This question is designed to produce an action-plan that can be immediately developed by the organisation to improve its resilience. Here the participants are asked to consider the most significant gaps in the response approach during the REDS and what they could do prior to an event to minimise their impact on the organisation. As part of the action- plan approach, time frames for implementing the plan should also be considered.

Stage 3 - The External Perspective

In the exercise, one individual from each group is taken aside and asked to consider the scenario from the perspective of one or more key stakeholder groups. In many instances the facilitator removes individuals on whom the groups show a high dependence for leadership and decision making. This helps to highlight the possible consequences should these people be absent in a real crisis. The external perspectives of these individuals are later presented to the groups as part of a debriefing to determine if the organisation adequately considered these groups and their concerns/demands/expectations in the overall REDS.

Stage 4 - Break and Review

Participants are encouraged to take a break from the exercise and facilitators can offer comments on how the groups are doing, as well as suggest tips and advice for improvement. This is a valuable chance for participants to reflect on how well they achieved what they were asked to do, and how they might improve their performance, individually and as a group.

Stage 5 - The Recovery Phase

Groups are then bought together for the recovery phase of the REDS. Each group is given an overview of the scenario from a different time perspective. Typically this time frame is well into the organisational recovery from the event. Participants are asked to consider the same questions as in Step 2, using the new

scenario time frame and taking into consideration the comments and advice given during the break in Stage 4.

Stage 6 - Debriefing and Action Plans

At the conclusion of the REDS, the participants take part in a group debriefing that includes the external perspectives obtained in Step 3. Debriefing is a very important part of REDS and a way for the organisational decision makers to create an action plan that can be addressed immediately. The action plan can quickly reduce vulnerability as well as improve awareness, adaptive capacity and, therefore, overall organisational resilience. Creating an action plan at the conclusion of the REDS has another benefit; it can capitalise on the momentum of the organisation and capture the creative thinking that often arises from these exercises.

Over time as part of a resilience management strategy and using different consequence scenarios as the basis for each exercise, REDS can help to highlight some of the cultural strengths and weaknesses in an organisation. REDS also helps the organisation to assess, and subsequently improve, its capacity to meet its obligations in various crisis situations.

During REDS it is possible for an observer to determine the (relative) level of awareness about hazards and the potential impacts on the organisation resulting from these hazards. It also allows the observer:

- To see how well the decision makers understand minimum operating requirements.
- To see how well decision makers communicate the minimum operating requirements to other decision makers.
- To assess levels of awareness regarding roles and responsibilities of key stakeholders.
- To encourage participants to view the simulated crisis situation both from an internal and external perspective.
- To assess the organisations awareness of its connection with stakeholders and the impacts that may arise from disturbance to these links.
- To observe the decision making process in action.
- To assess the organisations strategic vision and purpose and how well this is understood throughout the organisation.

REDS is an excellent way to provide the necessary context for making vulnerability assessments. REDS allows stakeholders and decision makers (both internally and externally) to actually experience these vulnerabilities in an environment simulating a real emergency. REDS helps organisations to see, not only their own vulnerabilities more clearly (and in context), but also the potential vulnerabilities in other linked organisations or system.

4.5 Synthesis

The 5-Step process has been developed in consultation with the case-study organisations to produce a methodology for assessing and improving organisational resilience. The steps target one or more of the attributes of resilience:

situation awareness, keystone vulnerabilities and adaptive capacity. The information generated from using the 5-Step process with the case study organisations forms the basis of the integrated analysis in this study detailed in the following chapters.

4.6 The Resilience Profile

The resilience profile is a relative, qualitative representation of overall resilience in an organisation. The profiles have been generated for each of the case-study organisations and are presented in Chapter 6 along with summaries of the case-study findings. An example of the resilience profile is presented in Figure 8.

Each axis on the resilience profile is divided equally into five categories representing the degree of situation awareness, identification and management of keystone vulnerabilities and adaptive capacity; very high, high, moderate, low and very low. An envelope of resilience is created by joining the points along each axis. As can be seen in Figure 8(a) an organisation with a high degree of resilience will have an envelope of resilience that plots close to the end of each axis, and away from the centre of the diagram; the envelope of resilience is larger for organisations with higher resilience. An organisation with low resilience will plot much closer to the centre of the triangle on each axis. Figure 8(b) shows an organisation with a low overall resilience for comparison. The axes situation awareness and adaptive capacity are simple to conceptualise. An organisation with high situation awareness or adaptive capacity will plot in the high zone on the diagram. The axis for keystone vulnerabilities can be somewhat counter-intuitive however. The very high zone represents increased resilience, and therefore an organisation that plots in the very high zone for keystone vulnerabilities is one which has these clearly identified and well managed.

The degree of each variable is assessed on a qualitative basis by the researcher after taking into consideration all of the information about each case study organisation. A set of resilience indicators has been derived from the integrated analysis of case-study information (see Chapter 5), and each organisation was scaled according to their performance on each indicator relative to the other organisations in the study. Each indicator therefore has at least one organisation with a very high ranking and one with a very low ranking. All other organisations are compared against these two end points and given a relative ranking. Indicators were categorised according to their influence on situation awareness, keystone vulnerabilities or adaptive capacity. The relative rankings of all the indicators for each organisation are presented in Chapter 5.

Once the organisations had been ranked for all the resilience indicators, information was then collated. Indicators were given a numerical value (1 = very low through to 5 = very high), and the results for each organisation were calculated. The numbers for each indicator were multiplied to give a collated value for situation awareness, keystone vulnerabilities and adaptive capacity (Equation 1). These values were in turn graded to represent very low through to very high values, and each organisation was then given a rating on this qualitative scale. Therefore, each organisation was given a rating for situation awareness, keystone vulnerability and adaptive capacity that was between very low and very high.

$$\text{Collated Situation Awareness} = SAi_1 \times SAi_2 \times \ldots\ldots SAi_n$$

$$\text{Collated Keystone Vulnerabilities} = KVi_1 \times KVi_2 \times \ldots\ldots KVi_n$$

$$\text{Collated Adaptive Capacity} = ACi_1 \times ACi_2 \times \ldots\ldots ACi_n$$

i = resilience indicator
SA = Situation Awareness
KV = Keystone Vulnerability
AC = Adaptive Capacity

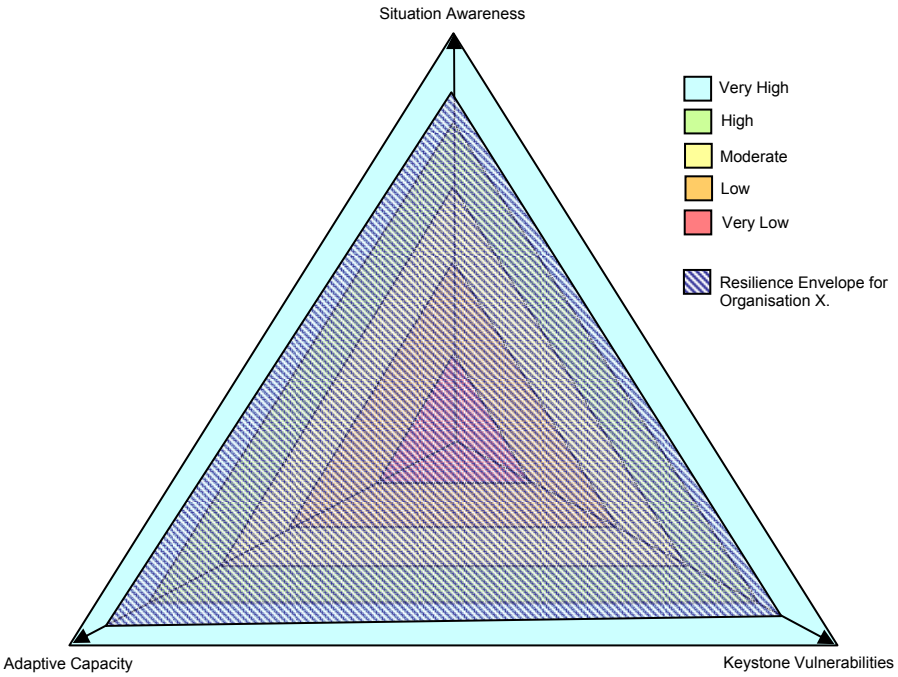
Equation 1. Collation of resilience indicators.

Again, the process of allocating a numerical value for the qualitative rating was applied and the results again multiplied to derive a ranking of Relative Overall Resilience (ROR) (Equation 2).

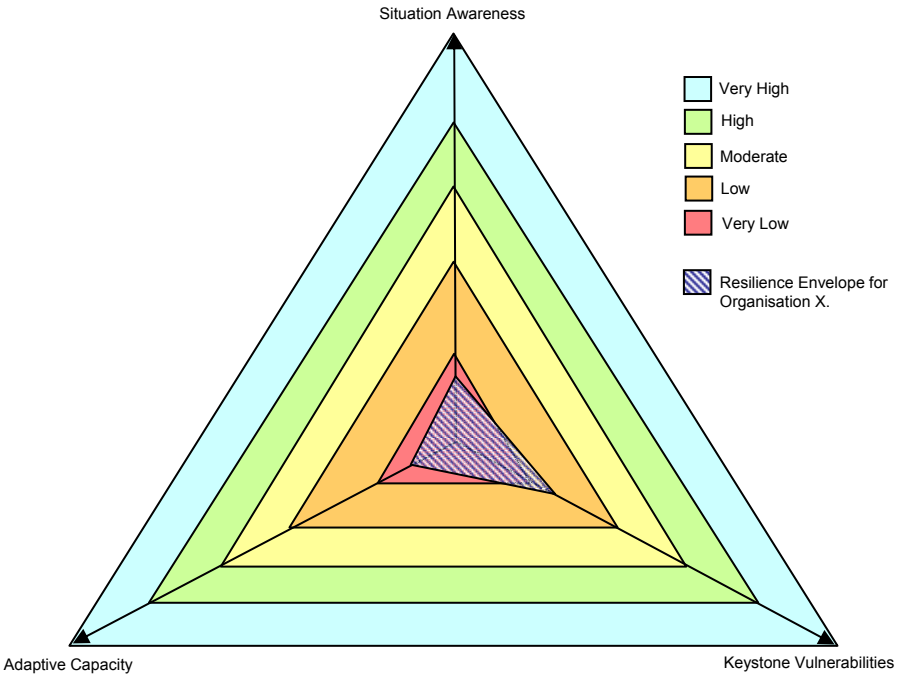
$$\text{Relative Overall Resilience (ROR)} = SA \times KV \times AC$$

SA = Situation Awareness
KV = Keystone Vulnerability
AC = Adaptive Capacity

Equation 2. Derivation of Relative Overall Resilience (ROR) from collation of resilience indicators.



(a) Organisation with Very High Resilience



(b) Organisation with Very Low Resilience

Figure 8. The Resilience Profile. For an organisation with very high resilience (a) the resilience envelope (black and white hashed area on the diagram) will plot close to the apex of each axis of the triangle, in the very high zone. For an organisation with very low resilience (b) the resilience envelope will plot much closer to the centre of the diagram for each axis.

The resilience profiles show the relative rankings for each attribute of resilience, and the envelope of resilience represents the Relative Overall Resilience (ROR) of each organisation comparative to the others in the study. These resilience profiles are presented along with a summary of each organisation in Chapter 6.

4.7 Summary

This chapter outlines in detail the 5-step process that provides organisations with practical tools and a framework which can be used to build resilience both in day-to-day business as well as for crisis management. The 5-Step process centres on increasing situation awareness in organisations, encouraging further identification and management of keystone vulnerabilities and developing adaptive capacity. Each of the five steps addresses one or more of these attributes of resilience. In addition, this chapter introduces the resilience profile. The resilience profile is used to visually present the relative overall resilience for each organisation (see Chapter 6), and this chapter explains how these profiles are generated and how to interpret them. Details of the evolution of the 5-Step process are presented in Appendix B and provide a valuable insight into how the knowledge of resilience has developed over the course of this study.

5 RESILIENCE INDICATORS FOR ORGANISATIONS

5.1 Introduction

All of the case-study organisations were analysed to determine the common resilience issues that emerged. This discussion details these issues and categorises them according to the attributes of resilience; situation awareness, keystone vulnerabilities and adaptive capacity. For each organisation in this study, the indicators were assessed to produce a relative resilience profile and these will be discussed in the following section. It is important to recognise the relationships between the indicators in each section. Situation awareness has influence over the performance of an organisation in identifying and managing keystone vulnerabilities, and both of these influence adaptive capacity for organisations. Where possible, the following discussion details specific issues but the reader is urged to be mindful of these intrinsic relationships.

At the end of this chapter, each organisation is given a rating for all of the indicators relative to the performance of the other organisations in this study. These ratings are then collated and used to produce an overall estimate of relative resilience which is also used to produce the resilience profiles for each organisation presented in Chapter 6.

5.1.1 Maintaining Case-Study Integrity

Each of the case-study organisations were individually analysed using Grounded Theory, with interviews and other information being coded and key resilience issues identified for each individual study. For the integrated analysis, the original information coded from interviews and other data sources was not re-coded. The reason for this was that the uniqueness of each organisation needed to be preserved, and simply combining all the interviews and re-coding them was inappropriate. Therefore, the results of each organisation were coded to look for common resilience issues across the case-studies, without affecting the integrity of each organisation as a unique entity.

5.1.2 Reports and Confidentiality

The final case study reports sent to each of the organisations were used for the integrated analysis. The key resilience issues are summarised in Chapter 6 and a more detailed analysis presented in Appendix C. Due to confidentiality agreements with each organisation, both the individual case-study reports and the summary in the previous chapter were issued to each organisation and reviewed from a privacy protection viewpoint. The organisations had no additional input into the results. Again, it is important to note that the resilience issues to arise for each organisation are relevant to the time the study was conducted. Several organisations in this study have made further progress on some of these issues, and the summaries in Chapter 6 may not be entirely relevant to their present situation.

5.1.3 Keystone Vulnerability Analysis

Additionally, information such as the vulnerability analyses and vulnerability matrices were compared to look for common resilience issues. The organisational components were mapped over the course of this study, and correlated with other case-studies in the research. Additionally, information regarding the

keystone vulnerabilities was integrated across these organisational components; generated from the individual vulnerability analyses and composite matrices for each organisation. Appendix C shows how the set of organisational components has developed during this study, from CS1 to CS10 and also highlights the keystone vulnerabilities identified by organisational self assessment for both response and recovery. The vulnerability matrices are presented in Appendix E.

5.1.4 Composite Awareness of Resilience Indicators

The resilience profiles in Chapter 6 are a relative measure of overall resilience in the case-study organisations. The relative degree of situation awareness, keystone vulnerabilities and adaptive capacity on these profiles were based on the composite results of the resilience indicators presented in this chapter. Chapter 4 explains in detail how the composite assessments are made to produce an overall resilience rating. The organisations identified as being most successful for each resilience indicator are identified, and the other organisations are compared relative to these top performers. It must be noted that those organisations with the highest rating for these indicators are not necessarily ideal performers. This assessment is only performed relative to the other organisations in this study. The discussion in this chapter therefore explores both the weaknesses of how organisations manage their resilience issues, together with how they successfully address them. Further, the information is designed as a starting point for a more quantitative assessment of these aspects of resilience potentially leading to the ability to benchmark organisations, and gather more information from individual industry sectors, business sizes or other characteristics. These possibilities are explored in Chapter 7.

5.2 Principal Resilience Issues

The following discussion presents the results of the integrated analysis of case-study information. Each attribute of resilience (situation awareness, keystone vulnerabilities and adaptive capacity) are subdivided into resilience indicators. Each indicator represents a generic resilience issue that has been observed over the majority of organisations in this study. A more detailed discussion of how each indicator manifests for each organisation is presented in Appendix C and summarised in Chapter 6.

5.2.1 Situation Awareness

Situation awareness refers to an organisations awareness of its entire operating environment, including threats and opportunities, connectivity and internal and external stakeholders. A total of five resilience indicators were identified under the banner of situation awareness are discussed below.

5.2.1.1 Roles and responsibilities (SA_1)

A key awareness issue for all organisations in this study was that of roles and responsibilities; both the knowledge of ones own role in the organisation as well as and knowledge of roles and responsibilities of others in the organisation. Almost all of the organisations in this study displayed significant problems with knowledge of roles and responsibilities in day-to-day operations. Those organisations that had experienced

crises in the past also indicated that these problems were exacerbated in stressful situations. The symptoms of poor awareness of roles and responsibilities included:

- Staff feeling undervalued,
- Staff not being consulted in areas where they had expertise,
- Increasing levels of mistrust of decision makers, and
- Feelings of disengagement with the organisational vision.

'I think the key to it is local people for local solutions, because [there were a few] more problems when [larger, non-local organisation] came on board. That was really difficult, because they've breezed into the [operations centre in the crisis], and they had these textbook solutions that they were going to apply. I thought they had a cheek really, telling us what we had done wrong, and this that and the other thing. It wasn't really the time or place. I found that quite disconcerting'. Staff member describing what happened when a another organisation came in to take over operations during a significant crisis.

'It was more when outsiders came in that things fell apart. That might be an unkind comment to make but the [larger, non-local organisation]. The whole thing was really [about] local people having a sense of ownership. I don't think you can manage disasters by the book. Not going to happen ... with silly things like, you would have to fill out this little incident report, and they were lobbying as well.' It was a really bureaucratic thing'. Another staff member describing the same situation as above.

Many organisations had difficulty in balancing the desire for autonomous decision making and decentralisation with maintaining essential connections with staff, particularly where there is a significant geographic distribution of offices and staff.

'We are migrating closer to the mother ship…there is a history in [this organisation] of units migrating away and getting too close to the fire. There are no thoughts to operationalism. I support moving closer to [parent organisation] but they are understaffed to make the decisions that we need to make. That's because DTA [delegated technical authority] is too hierarchal. We need a more autonomous structure for DTA. When board signs off that [business unit CEO] has x-amount of capital, I should be able to sign off as the chief technical officer for [this business unit]'. Discussion of roles and responsibilities and the link with decision making between a business unit and the parent organisation.

Even in organisations where the geographic distribution of offices was not a factor, staff in different departments often had little or no knowledge of what others in the organisation were doing, or the potential roles that they might play in a crisis. This was a surprising outcome at an executive level in some of the case-studies, and is thought to reflect an underlying silo mentality in these organisations (see Section 5.2.3.1). One organisation did not appear to have a significant problem with knowledge of roles and responsibilities in the organisation. This is thought to be partially due to the relatively small number of staff, a single office environment, and a 'family' philosophy in decision making where all staff are expected and encouraged to contribute to finding solutions for problems.

'[the organisation] promotes a culture where all staff can have input into developing the business and coming up with new ideas and solutions to problems'. Discussion of what the 'family' nature of the business means to the organisation.

Another aspect of this issue is the strict definition of roles and responsibilities in an organisation, and a strong adherence to these descriptions. Two organisations exhibited this clearly. In both organisations the staff display very defined roles in the organisational structure, and their mandate for decision making, and associated responsibilities are clearly spelled out. These employees tend to work strictly within the boundaries of these roles and seem to be very reluctant to step outside of these. Not only does this appear to be a barrier to the flow of knowledge in the organisation, especially of the roles, responsibilities and expectations of others in the organisation, but also reduces the flexibility of the organisation from a decision making perspective. This, in turn, has an impact on the organisations adaptive capacity and will be discussed in Section 5.2.3.

These issues have been previously been identified in the literature. Senge (1990) discusses the issue of shared vision, and the concept of 'common caring' and shared mental models for healthy organisations. Further, Senge talks of a group of learning disabilities that are fundamentally based on a lack of systems thinking for employees and organisations in general. These include:

1. 'I am my position:' just do your job, everything will be OK.
2. the enemy is out there:' Blame someone else
3. the illusion of taking charge:' shoot, then aim.

Many of the difficulties in ensuring appropriate awareness of roles and responsibilities in an organisation centre on common or shared visions of the organisation and of the individual themselves (further discussed in Section 5.2.3.3 on organisational visions).

The influence of the overall organisational culture has been suggested to have a direct impact on the awareness of roles and responsibilities. Klein, Bigley and Roberts (1995) suggest that cultural belief patterns in high reliability organisations (HRO's) are related to the attitudes of staff and 'role perceptions such as whether one has clear or conflicting expectations about what is expected of him/her…' (p 773). The authors also discuss several types of organisational cultures, one of which is particularly identifiable in the organisations of this study.

Turner (1994) identifies that rigid hierarchies in organisations can lead to the stifling of information flow and potentially build up to crises during the disaster incubation period. This, combined with other problems such as inadequate information being available to people who need to have the information, may be indicators of sloppy management as a precondition to disaster.

The impact of an organisation's awareness of external roles and responsibilities are discussed in Section 5.2.1.3.

5.2.1.2 Hazard and Consequence Awareness (SA 2)

Some case study organisations had a good awareness of both the impacts and risks for some hazards. These were typically high profile potential events or events already experienced by the organisation, for example a major earthquake, the threat of influenza pandemic outbreak or a high intensity rainstorm or flood. Overall, however, there was a limited awareness of the range of hazards the organisations may be exposed to as well as the potential impacts of these events.

'Weaknesses…I guess that would be some sort of small system failure that we have not perceived. I don't see any greater risks out there.' Discussion of the range and type of hazards and risks that the organisation in question may be exposed to.

Furthermore, there was also a poor understanding of how manageable these events could be. Even those organisations displaying the highest situation awareness tended to be reactionary in their dealing with crises, and this is partially a function of a lowered awareness of what threats and opportunity these events may present. One organisation, for example, when faced with the loss of telecommunications networks for a week claimed that they would simply shut up shop and go home with no discussion of what they would do once the service was restored. The awareness of high profile events was also limited for many organisations. Earthquakes were particularly misunderstood in the case-study organisations;

'A major disaster for [this organisation] will be when the tsunami or earthquake comes to [town]. And we have no protection for that. The soil we're on will turn into liquid and I hope I'm flying on the day that happens'. Comments about hazard impacts in one organisation.

Those organisations that had experience of significant crises were very aware of the problems associated with any reoccurrence of these events. However, despite good planning in some instances, the planning was very event specific and there was little consideration of extending the planning to incorporate other events with similar consequences.

Many of the organisations in this study had a good awareness of potential pandemic outbreaks and some had invested time in planning for such an event. Unfortunately none of these organisations had considered the long-term effects of large scale human resources shortages in such an event. Furthermore discussion of pandemic typically exposed a perception that pandemic is largely irrelevant as a potential threat. While some organisations had considered what the consequences might be if New Zealand's borders were closed few interviewees believed that this would actually happen. Despite the high awareness and the wealth of information presented to these organisations in the recent past regarding planning for pandemic, little had been done by most case-study organisations. There were some exceptions; two organisations had pandemic plans in place, or were developing them. However, even decision makers in these organisations had not considered the applicability of their pandemic planning to other potential hazard events, or attempted to expand planning into an all-hazards approach.

The holistic viewpoint of systems thinking is often quoted in the literature as the remedy for the problems identified in this study regarding awareness of hazards and their consequences. Senge (1990) proposes that

systems thinking, as a way of seeing wholes, should form the framework from which organisational interdependencies are formed. This includes seeing the complex interrelationships between cause and effect in all situations; a principle facet of such thinking is understanding that cause and effect are not always closely related in time.

5.2.1.3 Connectivity Awareness (SA 3)

Most of the organisations in this study had a good awareness and understanding of their immediate operating environment and the impacts of the loss of key customers, key suppliers and other critically linked organisations. However, an advanced awareness of their connectivity with the entire community of stakeholders was not widely observed. Several organisations claimed that they had a good understanding of the expectations and limitations of their stakeholders, but as the study progressed this understanding was shown to be more limited than anticipated. For example, some organisations highlighted that they have no ability to monitor customer's satisfaction, movement or demand, and have no substantial awareness of what might be expected by these customers in various types of crises.

The awareness of internal stakeholders was also limited in most of the organisations. It appears that few organisations consider their staff as stakeholders, and as such the awareness of employee fears and expectations in a crisis are very poorly understood. Many of the larger organisations commented on the difficulties of informing and engaging staff in planning strategies for emergency management, particularly regarding pandemic (staff not wanting to know, decision makers not wanting to frighten staff unnecessarily etc). However, few of these organisations had made any effort to increasing the awareness of key decision makers about staff issues. Some exceptions included the use of staff engagement surveys (only in one organisation) and small size (number of employees). Additionally, one organisation was making an effort to engage with staff by making them responsible for planning and business continuity in individual offices. However on the other hand, some key decision makers in another organisation viewed staff as a potential liability in a crisis.

'…it's too early to engage in a lot of planning and preparation because we [owners] don't want to scare the staff and customers…'comments from the owners of one organisation regarding the perceptions of staff about emergency planning.

Seeing the whole picture is critical for organisations that wish to understand these complex connections. Again, an awareness of the systemic nature of organisations (both internally and as part of a wider, global network of organisations), is a fundamental skill for the resilient organisation. As Senge (1990) explains, organisations must remember the principle of the system boundary; it is acceptable to see and understand the individual parts of the system, but it is unsustainable without a clear understanding of the integrity of the whole system.

5.2.1.4 Insurance Awareness (SA 4)

The knowledge of levels of business interruption insurance and availability of other insurance products varied considerably in the case study organisations. In most organisations this knowledge only extended to

an assumption that there was some level of coverage, but few knew any details of what this involved. Most participants in this study assumed that business interruption insurance would be immediately accessible following a crisis, and also that it would provide adequate coverage for the duration of the event and expected recovery. After discussions during interviews and REDS some participants commented that the current levels of coverage would be inadequate to cover the duration of several types of events. In addition, there is a general lack of awareness of the expected availability of damage assessors and other professionals to process insurance claims in a large scale physical event.

'I think it's [business continuity insurance] either 18 months or two years, from memory. We have a certain amount of self cover, which is just a pragmatic approach because we can afford to cover up to an excess level...I'm not sure what that is now'. Discussion in one large organisation about the need for, and coverage of, business continuity insurance.

The levels of awareness regarding insurance, particularly in relation to disaster recovery or business interruption have been identified by researchers previously. For example, in their study of the 1993 Northridge earthquake, Tierney and Dahlhamer (1997) discovered that very few businesses affected by the earthquake actually had any insurance coverage for either physical damage or business interruption. While, in New Zealand EQC coverage would be a factor, few of the organisations in this study seemed to have a clear understanding of what such insurance would cover or exclude.

5.2.1.5 Recovery Priorities (SA 5)

'It's a dynamic thing. I don't think it's fair to say that you actually recover back to where you were because things don't stay the same. So you have to look at, you can't measure recovery in terms of time or in terms of events even. You have to look at it in terms of the mental well being and attitude of the group. If you say that someone is back living and enjoying life again and have put the event behind them and I would say that that defines recovery.' A senior manager discussing what recovery means for this organisation and the priorities that stem from that understanding.

Another important component in situation awareness is the level of understanding about minimum business requirements and organisational recovery priorities. All of the organisations in this study had a limited awareness of what might be required of them in a large scale, long duration, or extensive disaster. Several of the case studies were very introspective and had little awareness of the ability of other organisations to meet their needs. These same organisations had a poor perception of the importance of their own needs over the needs of others in the wider community; organisations or individuals. Tierney and Dahlhamer (1997) identified, in a study of business recovery and losses from the 1993 Northridge earthquake that business planning relied heavily on protection of specific business locations rather than identifying and planning for problems that originated offsite; for example, lifeline failures.

While most of the case studies seemed to have a clear understanding of their business priorities during day-to-day operations, this was not apparent from a crisis perspective. Only one organisation clearly identified its key response and recovery priorities and the relationship with business continuity. In contrast, another organisation was unable to identify key recovery priorities and the organisation did not have a clear idea of

minimum operating requirements following a crisis. This was true for most of the organisations. Interestingly, for some organisations in this study, there was an assumption that these key priorities were well known, particularly among the executive or senior management teams. However, during the REDS, it became clear that these priorities were common knowledge only for individual departments and not the organisation as a whole.

'During the workshop it became apparent to participants that [the organisation] has limited knowledge regarding the prioritisation of services to customers; the identification of clients that can cope with a loss of services for extended periods of time and those which cannot. Currently if [the organisation] were faced with the partial restoration of services to customers, the organisation has no systems in place to do this task effectively.' Comment from the final, post REDS report to one organisation regarding recovery priorities.

Researchers have identified the problems that organisations face in terms of recovery, particularly if the event(s) that they experience substantially disrupt business operations (Webb, Tierney and Dalhamer, 2003; Tierney and Webb, 2001).

5.2.2 Keystone Vulnerabilities: Identification and Management

This section discusses common issues surrounding the identification and management of keystone vulnerabilities and their impact on overall organisational resilience. Keystone vulnerabilities are those components of an organisational system that have the potential to cause the greatest negative impact, either catastrophically or insidiously. The following discussion divides keystone vulnerabilities up into a set of five indicators as described below.

5.2.2.1 Planning Strategies (KV_1)

'Interviewer: Is the problem lack of vision, or lack of ability to implement it?

Interviewee: Both! We are not wild enough in the [area of innovation]. There is lots of risk…we are not good at that…we plan things to death'. Middle manager from one organisation commenting on support for innovation in the organisation.

Several of the organisations in this study have ongoing risk identification processes and have engaged in some emergency and recovery planning. These are typically the largest organisations in terms of employee numbers and often have the backing or driving force of a parent company, or even other organisations within the industry. Often when the planning process is directed by (but not performed by) the parent company it is considered to only have partial relevance to the organisation at a local level. As highlighted in Section 5.2.1.2 above, often planning centres on a small number of specific events or risks. Only one organisation claimed that it was attempting an all-hazards approach with its planning strategies, but even in this organisation evidence suggested that the focus was on a small number of specific events. One of the smaller organisations indicated that it was not even aware of relevant risk management standards in New Zealand.

'You are much more likely to get buy-in [in the risk management process] if you have got a strong community and [then] anything you want to change or progress [is possible]'. Risk manager comments on planning.

There appeared to be a handful of drivers for organisations in terms of risk management and planning.

- One case-study organisation indicated that it was engaging in business continuity planning because of insurance company demands. This business was enthusiastic about creating a business continuity plan in order to potentially reduce its business interruption insurance premiums. However there were significant reservations in the organisation about the effectiveness of this as a driver.
- In several organisations the increasing awareness of pandemic proved a clear driver for planning. However, as previously mentioned, this planning was specifically for pandemic, and not extended to include other related hazards or similar hazards at a variety of scales. Directives from other linked organisations or from the parent company were also identified as drivers for planning.
- Some of the organisations in this study have a mutual working relationship for day-to-day operations, and thus the planning strategies of one organisation have the potential to impact on the other. Also, the parent company or group has an influence on the implementation of risk management and other planning strategies. Again, there are concerns that the lack of an internal driver for planning has a negative impact on the enthusiasm for the planning process as well as engagement with all stakeholders.

The vision of what an emergency plan or business continuity plan should consist of was also a contentious issue in this study. One organisation highlighted this problem with a significant number of key decision makers expecting a plan to be a 'magic box' with all the answers and which would spell out all required actions for all hazards. Others indicated that the plan should be little more than a collection of key contact details and some basic procedures for staff from a health and safety perspective. Typically the problems arose when different decision makers in the one organisation had a different vision of the plan and planning process.

'...we haven't worked through the process enough yet and we don't have firm plans in place yet and we don't have that 'locked box' of instruction and the manual of basically what we are going to do [in a crisis].' Senior manager in one organisation discussing his expectations of crisis planning.

'...all the [emergency] plans should mirror what you would do naturally.' Senior manager commenting on the strengths and weaknesses of the organisation's existing planning.

'I don't even know if this [organisation] has anywhere a list of cell phone numbers that may be needed'. Discussion in one organisation talking about the extent of knowledge of the organisation's emergency planning strategies.

5.2.2.2 Exercises (KV $_2$)

Participation in exercises for emergency management is typically restricted in most of the study organisations to fire evacuation drills on a regular (6-12monthly) basis. However, for some of the

organisations in this study, participation in either in-house or externally managed exercises is a regular part of the planning process. During this study the researcher was able to observe three of the case-study organisations in independent exercises. Two organisations participated in an exercise at a regional scale and another ran its own in-house exercise during the interview phase of the study. The value of exercises for emergency management and business recovery is perceived differently by different people and organisations in this study.

'This year we ran a crisis scenario in the business, so now have procedures around a crisis room, tools available, who you call…and one has actually been run. Network computers were crashed…that was the first time we did that one…I can see us doing more of that…Its mind expanding and mentally prepares you for what might occur'. Comments from a general manager in one organisation after participating in an in-house crisis exercise.

Exercises, in the form of REDS, were an integral part of this research, and engagement of organisations was often difficult to secure. Overall, organisations claimed that a major barrier to exercising plans was the availability of appropriate staff, as well as an unwillingness to have any impact on day-to-day business, albeit short-term.

One organisation expressed a significant reluctance to exercise claiming that it was not confident in the ability of its plan to meet the demands of the exercise. Another organisation claimed that its experience in real world events meant that it did not have to exercise. This organisation was very focused on previous experiences, and was largely unaware of the benefits that could be gained taking these experiences into their planning processes. The danger for this case-study was that without exercises, positive lessons from the past would not be transferred to future event management, or to new staff and stakeholders.

'The preparation was good… in terms of preparations we were very well-prepared. We had had exercises in emergency situations, and I must say that the exercises were completely different to what the event…to how you work in the event.' A senior manager from one organisation commenting on the differences between exercises held and actual performance during a real event.

The value of exercises in organisations is debated in the literature. Coming from the perspective of the learning organisation the team's ability to work together seamlessly is critical to success. Senge (1990) supports the view that teams cannot rely upon talent and a shared vision of the organisation and the future; they must be confident of how to act in a given situation and, equally importantly, of how the other members of the team are going to act. A fundamental way to achieve this type of alignment between team members, as well as between teams within an organisation, is to 'practice'. Senge advocates the doctrine of practicing dealing with situations within a controlled environment to ensure that learning is possible.

5.2.2.3 Capability and Capacity of Internal Resources (KV 3)

The following discussion about internal resources is subdivided into three component; physical resources, human resources and process resources. Physical resources include buildings and other structures, internal services and critical contents and equipment. Human resources involve the capability and capacity of

employees in the organisation. Process resources include the capability and capacity of economic and administrative resources.

Buildings and Structures

A substantial proportion of case-study organisations had no planning in place for alternative office space. Most had made significant assumptions regarding the continuation of critical services, and also had high expectations about their ability to work remotely in a crisis. Additionally all of the organisations had not considered limitations on the availability of external trades-people and professionals to assist in rebuilding following a crisis. While some organisations had made significant efforts towards ensuring that their chosen emergency operations centres were well equipped, there were some potentially disastrous omissions or assumptions made. Many of these related to the availability of essential services (water, electricity, telecommunications etc) for these operations centres.

'We've had it [a generator] for a while, but the Auckland power crisis made people think that much harder about not having power. A lot of people put in generators at that time, but have gone back to the old habits.' Observations from a general manager about the perceptions of backup generators in organisations.

A critical point is organisational understanding of the co-dependencies that exist regarding internal services, of which few of the organisations were fully aware. Information technology is a case in point. Several organisations had identified the potential for failure of critical information systems, and had chosen to create backup systems, some even in different cities. However the impact of the loss of electricity for these technology services was not widely recognised. While some of the organisations had purchased diesel generators to provide continued electricity for some key functions only a few people knew which functions these were. Interestingly, some of the smallest organisations in this study had generators compared to larger organisations.

'So things were dropping off line and make life interesting the water ran over and flooded the telephone exchange, close to [nearest city]. So that cut us off and we lost a line going at the other stream. So effectively, we got cut off in the communications sense, because of water taking out some telephone lines and overuse of the system on the battery power. Telecom did a reasonable job of getting batteries in helicopters backup to the exchanges to get things going on, we didn't lose communications for a long period of time, but it was a critical period of time and critical period in the event.' Discussion about the problems an organisation encountered with a recent crisis event and essential services.

Human Resources and Succession

The importance of human resources is highly regarded by all of the case study organisations. However, many of these organisations do not have a full appreciation for how difficult it may be to engage, retain, recruit or support staff in the aftermath of a crisis. Most of the organisations had considered the pandemic scenario prior to their participation in this study and some had engaged in specific planning for pandemic. However, few of these organisations had a full understanding of the extent of the potential human resources shortage, or the duration over which this might be a problem. Further, other types of crises were largely

overlooked from a human resources perspective. For most organisations, the loss of human resources would probably be the result of death, injury or mental trauma in the aftermath of a physical emergency, for example an earthquake, a fire or an explosion. The impacts on staff as a result of reputation impacts (fraud, health and safety problems, legal proceedings) were typically not regarded by any of the organisations other than in passing. This limited the levels of engagement with staff, and potentially has negative impacts for the organisation in communicating with staff in a crisis.

The issue of an ageing workforce and a workforce that is increasingly unwilling to do manual work is also a problem for some organisations. This was highlighted by the recruiting staff issues. There were also problems identified with inconsistent drug and alcohol policies for recruiting new staff across industries; some organisations in an industry may have more lenient policies and make recruitment difficult for other organisations in that industry.

'We have problems were getting all the staff that we want…Getting the experience and all that. We've had a shortage now for about two years. So we've got enough. Well, we get by with what we have, but we could do with more. So, if those people became incapacitated we would be struggling.' Problems with human resources identified by one organisation considering day-to-day operations; problems exacerbated in a crisis.

Succession of staff from an emergency management perspective was shown to be a significant issue. One organisation has already been through the trauma of a major event and identified the problems associated with not having a roster system in place for emergency staff but had not put any structure in place to remedy this situation. Some of the organisations have clearly identified successors for key senior staff and decision makers, even if this has not been translated into a formal planning process. Two organisations favour identifying the most appropriate people for an emergency situation based on the nature of the event. However this technique was not observed during the REDS for one of these organisations. Often some of the most important individuals for crisis management are those who have a vast or critical knowledge and these people are typically not included in any succession planning. Mentoring is often disregarded because of the availability of suitable staff, and the economics of having two or more people learning the same job. Researchers and practitioners alike have identified this dichotomy in business planning. The most valuable resource that any organisation has at its disposal is the knowledge held by the employees and yet no organisation can afford to build redundancy in this knowledge base by employing additional staff, just in case of a disaster (Sheffi, 2001). Therefore the field of knowledge management and human relations management is a pivotal area of organisational planning and learning (McCann, 2004).

There are also issues related to the strategic vision of an organisation and the succession of staff in a crisis, particularly at a decision making level. During the exercise with one particular organisation staff were very reluctant to express their strategic objectives for the emergency response. The main reason was because decision makers have not comprehensively considered the impacts and extent of larger scale crises or the amount of staff that may be required to ensure adequate continuation of services.

Very few of the organisations in this study had considered that crises may occur coincidently with a need to continue business-as-usual and what this might mean from a human resources perspective. During the

debriefing with one organisation, the designated emergency controller expressed his surprise at how many people were needed in the emergency operations centre to ensure the smooth management of the event. Typically the organisations in this study were unprepared for the demands placed on staff in a crisis, and for the numbers of staff that may be required as well as where additional staff may be sourced from.

Process Resources

The standardisation of systems and procedures for organisations is a resilience issue together with the amount of economic and financial support available in a crisis. The creation of systems and procedures that extend across an organisation are typically seen as favourable. For example, Sheffi (2001) stresses that critical processes should be documented and such documents are readily available to all members of an organisation as they are critical to any sort of preparedness training. Further, he states that the standardisation of business processes and practices throughout an entire organisation, regardless of how big or small, is an essential tool in creating redundancy and ensuring the organisation can recover quickly from disasters. However, in this study some organisations that did have these standardised processes available chose not to use them or decision makers were divided about the applicability of the systems and procedures because they were developed by a parent, or other linked, company. In contrast, organisations that did have effective, well communicated and flexible systems and procedures that extended through and were understood by the entire organisations were typically better equipped for crisis than those that did not.

'We have to do things were we are seen to be supportive of the broader organisation...we do NOT have these [necessary] systems and we will build things around those systems…and until someone can do that, we will not be able to achieve our objectives. Accountability and the freedom to achieve the vision without having to toe a line that doesn't reflect the vision…It's about not being encumbered.' Discussion in a business unit of the systems and procedures imposed by the parent organisation.

The organisations financial position, its economic stability and that of any relevant parent or governing organisation were identified as significant strengths. Those organisations that had no debt, a large balance sheet, or the availability of large amounts of money in a relatively short period were often more flexible and creative with their decision making processes. However, there were some notable exceptions where an organisation's assumption of the resources available to it seems to foster an air of complacency in decision making during a crisis.

'…our first task was to fix the problem, then later on we think about responsibility. Comes down to the large balance sheet…we don't have to worry about the cost. We got started and found more cost effective ways as we went. That's from the luxury of a large balance sheet…some companies, even if they want to, can't do that.' Discussion of the approach taken to solving problems during crises and the advantages of an organisation's favourable financial position.

The concept of an organisations pre-disaster financial condition as an indicator of post-disaster survival has been well documented (Dalhamer and Tierney, 1996; Alesch and Holly, 1998). For example Durkin (1984), in a study of businesses that experienced the 1983 Coalinga Earthquake, found that those

organisations which were ‘marginal or in financial trouble’ before the earthquake, were slow to recover, if at all.

5.2.2.4 Capability and Capacity of External Resources (KV 4)

The capability and capacity of external resources highlight concerns for organisations. The development of systems and protocols to reduce these vulnerabilities is very much related to the organisations awareness of its role and its connectivity with key stakeholders. It is also related to an organisations overall recovery priorities as well as the limitations and expectations of linked organisations. There is a considerable body of literature available that focuses on supply chain management and disruption or crisis situations. For example, Sheffi (2001) discusses the issues facing supply chains and organisational systems and procedures following the 2001 terrorist attacks in the USA. He identifies four challenges to organisations in the wake of these attacks; the ability to prepare for further attacks (or the next disaster), managing supply chains under a cloud of increasing uncertainty, managing the private/public organisational relationships and the challenges facing organisations and their cultures internally.

The following discussion focuses on the expected availability of external resources for the case-study organisations and the degree of preparation for the loss of external services and supplies/equipment.

External Assistance

The organisations all appeared to have expectations of emergency services, government agencies and Civil Defence that are disproportionate with the support these organisations could reasonably offer, particularly in a large scale emergency. Many organisations do not have an accurate vision of their own importance in the community and expect that support would be immediately available; extra staff, water supplies, builders, insurance assessors. There was little or no consideration that other organisations would be seen as more important from both a response and recovery perspective in a large scale event. There was one significant exception to this; one organisation viewed itself as a critical lifeline and was attempting to engage with critically linked external organisations. However, this view was not necessarily supported by these organisations. An organisation’s ability (or inability) to clearly see its place in the supply chain is a critical aspect of these observations. Sheffi (2001) clearly identifies that in post 9/11 America organisations need to realise that their long term fate rests not on their own performances alone, but is intrinsically intertwined with their supplier’s, customer’s and even their competitor’s performance, particularly in crisis situations.

‘…but in the immediate aftermath of a major earthquake we’re not on the high list of what people are worried about…they’re going to be worried about the essential services, and we will be down the track, but down the track we’re certainly going to have to do it [recovery] and we’ve got no business continuity planning [currently in place]’. Discussion of one organisation’s role in the community, particularly following a major disaster.

Services

Electricity was the critical service that all organisations were acutely aware of as a keystone vulnerability, closely followed by telecommunications and information technology services. International studies have shown the importance of lifeline services, electricity in particular, for organisational survival. Tierney and Nigg (1995) report that 55% of businesses in their survey in Des Moines consider electricity to be the most critical of lifeline services and 82% viewed electricity as 'very important' to continued operations of a business. Transportation was considered a vital service for some types of events for all case study organisations, and from a recovery perspective water and sewerage services were critical. However, many of the organisations in this study did not have a full awareness of what the loss of these services might mean to continued operations. Therefore they did not adequately plan for either the loss of services or for continued operations once services were restored. Several organisations had considered or purchased backup generators to ensure the continuation of electrical supply to key parts of the business. One organisation claimed that it was too difficult to get resource consent and other permits to install a generator, and that the cost of this process was prohibitive.

'A while ago I identified a backup power supply that wasn't too expensive. Finance rejected it because we haven't had a problem before so it wasn't worth spending the money so we don't have a backup power supply'. Senior Manager discussing the problems encountered in convincing other decision makers that a backup power supply was important.

Other organisations with generators identified that the availability of fuel to run the generator was critical. There was no formal planning for continuation of fuel supply by any of the organisations in this study. Most organisations with generators had partially tested their generators, but there was a significant amount of disagreement within most of these organisations regarding what the generators were actually providing power for. In a survey of the businesses in Auckland and Christchurch in New Zealand (Stephenson, 2007) identified that 46% of organisations in fast moving consumer goods and 32% of businesses in the Auckland electricity crisis in the construction industry had reserve power systems in place. However only 8% of manufacturing businesses in the same survey had reserve systems.

A key problem for organisations in planning for service outages is the perception that they cannot control when they happen or their duration. This appears to encourage a climate of disempowerment in organisations regarding planning for service outages which extends through to limited planning for the return of services to the organisation. The lack of planning therefore is heavily influenced by the organisations awareness of the severity of the event and a tendency for limited strategic thinking and a 'fighting fires' approach to emergency management planning.

Supply Network

The degree to which organisations plan for continued supply of essential goods and services is also identified as a significant keystone vulnerability issue. Only one organisation had approached its most critical suppliers and attempted to establish preferential supply in a crisis situation. This same organisation also had well established and ongoing relationships with a communications consultant for media

management in a crisis. Some organisations identified that their most important suppliers and consultants were likely to be limited in their ability to provide support in a crisis, but these organisations had made no steps to ensuring the services of alternative organisations, or establishing preferential service agreements.

'We are dependant on a number of specific suppliers and in some cases products that they provide to us are unique to us so we can't get them from anywhere else'. Manager from one of the organisations discussing the limitations of the supply chain.

Most organisations in this study believed that their day-to-day relationships with critically linked organisations (including customers and competitors) were excellent and that this would be enough to ensure a continuation of expected levels of service and communications in a crisis. Sheffi (2001) identified this as being a potentially critical issue for organisations in the aftermath of the 9/11 attacks stating that *'clearly, suppliers are likely to allocate products first to customers with whom they have long-term relationships, giving this type of relationship added value in the new environment' (p2).* None of the organisations in this study had considered in any detail the problems associated with a large scale crisis; for example, the availability of builders, plumbers and electricians or the availability of damage assessors for insurance in a large scale regional wide earthquake. The problems for organisations dealing with supply chain crises are covered extensively in the literature (see Khan and Burnes, 2007 for an overview). Senge (2006) uses the global food market as a case-study of the supply chain network and discusses the need for individual organisations to begin looking at the system wide issues, rather than coming from a singular perspective. Practically speaking, however, the tools available to organisations to manage their risks from the supply chain network are limited and untested (Khan and Burnes, 2007) making this an area of significant vulnerability for all organisations.

5.2.2.5 Organisational Connectivity (KV_5)

Some organisations seemed to have excellent relationships and a good understanding of the connectivity to other critical organisations in day-to-day operations. However, there was significantly less thought put into how to maintain these relationships in a crisis. Connectivity awareness is discussed in Section 5.2.1.3 and the following discussion echoes many of the sentiments expressed there. Even with a clear understanding of the relationships between contractors, suppliers, consultants and staff, for example, very few organisations had actually formally (or even semi-formally) engaged in planning to address these issues.

As previously mentioned most organisations in this study believed that their day-to-day connections would be the same ones they would need in a crisis. Only one organisation had considered a different perspective and was actively approaching emergency management agencies to establish contact. Some other organisations had ongoing relationships with these organisations due to regular participation in multi-organisational exercises or because of their role in the community. Those organisations that viewed their contribution to society as being critical to emergency response and/or recovery typically had endeavoured to establish emergency relationships with key response organisations like Civil Defence.

This phenomenon has been discussed by several authors. For example Turner (1994) discusses the problem of 'groupthink' as a cause of sloppy management and disaster generation. The 'blinkered,

unrealistic view' that senior managers have of their own organisations can contribute to inadequate management of potentially dangerous situations. The influence of groupthink on not just events but also on staff can create a situation where the decision makers in an organisation ignore or overrule warnings from outside their organisation. If groupthink can have such significant influence over an organisation's perceptions of its own operations, then perhaps it is foreseeable that groupthink can also influence an organisations perceptions of other linked organisations in its sphere of operations.

'Interviewer: The uncertainty you talk about, where does that uncertainty stem from?

Interviewee: I'm not worried about the leadership team. They guide us. [You] let us know what hill you want, we capture it and we report progress…I expect visibility and stability…at the moment they [leadership team] aren't delivering that. I need strategic direction. We are getting it but it's not clear or consistent; it's confused. So I just go where I want until someone stops me….providing it's not too far to the left or the right'. Middle manager in a business unit discussing the problems with internal and external connectivity.

Many of the strategies employed to ensure effective connectivity with external stakeholders are also discussed in Section 5.2.3.2; communications and relationships.

5.2.3 Adaptive Capacity

Adaptive capacity includes the elements that make up the culture of an organisation and that allow it to make decisions in both a timely and appropriate manner in a crisis and to identify and maximise opportunities. The indicators of adaptive capacity identified in this study are discussed below.

5.2.3.1 Silo Mentality (AC_1)

The concept of silo mentality is not new. It has been widely recognised in the literature (for example see Gill, (2006), Davidson, (2005), and Hasanali, (2002)) and in organisations often represents a decentralised structure, an individualistic approach to achieving goals, and a limited understanding of the overall vision of the organisation. Typically, silo mentality is viewed as a feature of organisations that experience considerable growth (Cote, 2002), but in this study, silo mentality was observed in all of the case-studies irrespective of their size. The field of knowledge management has contributed significant advances on understanding the causes of silo mentality. Researchers in knowledge management recognise that the culture, organisational infrastructure and creativity all contribute to reducing silo mentality (Goh, 2002, Nonaka, 1994, Senge 1990). Another considerable factor in the development of silo mentality for organisations is the ability of groups of people, as well as individuals, to see the bigger picture, and relate this to the overall organisational vision (Senge, 1990). These 'mental models' often serve to tie people, and organisations as a whole, into a pattern of behaviour that can be destructive.

'I don't think we are too silo like…Head Office people do need to get out of Head Office though…they don't appreciate that getting out to the regions and sites, that's when we really get some traction. Working away here [in isolation], that may be related to us, but that would lead to more silo mentality. But [the

organisation's] policies around travel are adequate to allow people to get out and about…' Senior manager talking about their perceptions of internal silo mentality in their organisation.

Another feature of silo mentality appears to be related to Groupthink. Several of the organisations in this study exhibited varying degrees of this kind of thinking that may have influenced, in part, the levels of silo mentality. One of the most important factors in the development of groupthink in an organisation is cohesiveness (Janis, 1982); where the closer the members of the group are, the less likely they are to raise questions and issues that will challenge the thinking of the group. However, traditional thinking states that groupthink will not eventuate from a cohesive group unless specific situations occur:

- Structural issues and deficiencies in the organisation including overbearing leadership, isolation and insulation of group members and a lack of normative processes, or
- Situations where there is high stress present from external threats, problems relating to decision making and recent organisational failures.

The incidence of silo mentality in organisations was not unexpected. However, the degree to which silo mentality appears to underpin many critical aspects of organisational resilience was a significant feature of this study. The occurrence of silo mentality is something that organisations are both unable and unwilling to remove. It is an intrinsic feature of the autonomous decision making structures that feature in modern organisations, and is important for ensuring loyalty and pride, as well as competition, into an organisational framework.

I don't work for [parent organisation]; I work for [business unit].' Senior manager in one business unit talking about the loyalty that they, and many other staff, feel for their part of the organisation rather than identifying with the larger organisation as a whole.

However, the negative aspects of silo mentality appear to be poorly identified and largely misunderstood by the organisations in this study. These effects include:

- Poor knowledge of roles and responsibilities of others in the organisation (Section 5.2.1.1),
- poorly understood and utilised communications pathways (Section 5.2.3.2),
- destructive and detrimental relationships developing both internally and externally (Section 5.2.3.2),
- non-transparent governance and decision making structures (Section 5.2.3.5), and
- low levels of trust and loyalty from staff and others.

'…certainly my perception is that there is a bit of a silo approach out there at the moment… people perceive that they work in the [department] rather than [the organisation] as a whole…and I think that's a shame and we have to be very careful about that, because one of the things strategically…staff in the [departments] are not doing the same thing. Some pieces might work but some of them are either contradictory to other [departments] or not in line with what the [organisations] procedures are perceived to be'. Comments from the risk manager in one organisation dealing with the perceptions in a number of different business units within the organisation.

It is important therefore to realise the impact of silo mentality on the overall resilience for organisations. For example, one organisation had identified the negative impacts that silo mentality was having on staff and on the overall work environment. Decision makers chose to address this at executive levels, hoping that the positive spin-offs would filter down to other levels in the organisation. This approach was not apparently successful and the negative effects of silo mentality were having a profound impact. Other organisations claimed that silo mentality had no great influence on operations and on decision making. However, the symptoms of negative silo mentality were evident, particularly during the REDS and other crisis exercises. These manifested in an observed lack of respectful communications, poorly understood roles and responsibilities, unrealistic expectations of key stakeholders, to name a few.

'…at the macro level there is a thing called [specific term that employees in this unit use to identify themselves]…that's a big silo…the people in [the parent organisation] don't know about this thing. There is a distinct disconnect between the two as they are two different businesses'. An executive manager in a large business unit highlighting the gaps between knowledge in the business unit and within the parent company.

'I inherited a leadership team that did operate from a silo basis. If you look at my leadership team it is very open plan office, there's only one person that has an office at this business. But that did not break down silos. Sales ran sales, marketing ran marketing and IT ran IT. Much friction was a result of people not working together and not communicating. I have worked hard to break those silos down because silos like marketing and sales must work close together and marketing and IT. People would ask me if this is a sales lead organisation or marketing lead and I would say why does that matter? I don't think that's important. I have worked with my leadership team, many of who I have changed now. Inside of the culture was a silo mentality…they had lived that for a long time. If you don't have that team environment at the leadership level you will never get it working down beneath the organisation… one of the core dysfunctions was that people didn't trust each other. Unless you can build trust at the leadership level you will never get rid of some of that silo mentality. We're on a journey. We are nowhere near where we need to be'. Senior decision maker discussing his perceptions of silo mentality in the organisation.

5.2.3.2 Communications and Relationships (AC_2)

As mentioned in Section 5.2.3.1 above, the effectiveness of communications and relationships in an organisation is somewhat dependent on the negative aspects of silo mentality. The importance of creating effective communications pathways based on mutually respectful relationships is apparent to all organisations in this study.

'Lot of travel, phone calls…keeping communication channels open. Key people get out to site a lot; possibly need to do so a bit more. Press the flesh, names to faces… [it] makes telephone conversations more effective'. General Manager of one site in a large organisation, distant from the organisation's head office location.

However, while most of the organisations recognise that these communications and relationships issues are a problem, the full extent of their potential impact on the organisation in a crisis is largely unrecognised.

There were some exceptions, mainly those organisations that experience small scale crises on a relatively regular basis but even these organisations had a limited understanding of the potential impact in a large scale emergency.

Internal communications and relationships internally were viewed as problematic, particularly for general staff seeking to communicate upwards in the organisation. Typically, between senior and executive staff, communications and relationships were viewed as healthy and effective. These senior staff also viewed their communications to general staff as effective. Those that did recognise problems in communication strategies at different levels of the organisation were doing very little to encourage engagement and ensure a better understanding of staff expectations and limitations. One exception was observed. The senior decision makers in this organisation clearly understood the need to engage with the general staff, and were endeavouring to break down the silo mentality perceived as a barrier to effective communications. One way to achieve this was to ensure staff at all levels in the organisation had breaks in the same cafeteria. A previous arrangement of one cafeteria for general staff and one for administrative staff was viewed negatively by most in the organisation. Therefore, a larger single café was being built to accommodate all staff on site. This was seen as a key action to improve relationships, enhance communications and begin to break down the negative impacts of silo mentality.

'…while crises are going on, we have a meeting once a day at least…it's not one person calling the shots…and this time [CEO] not directly involved. He was informed and invited to comment and he is aware of what's going on. Recognising the different roles that we all play and making those decisions and for the most part it seems to work. We have a mature group despite some of the ages…' Senior Manager discussing how crisis communications work, and have evolved in the organisation.

This type of phenomena has been comprehensively observed in other organisations. For example Perrow (1999) discusses the concept of 'incomprehensibility'; a situation whereby communications between the top and the bottom of an organisational hierarchy are limited. The 'top dogs' have very little or no real information about a particular situation while those at the bottom of the hierarchy only have protocols, the last orders given and their own instinct and intuition to deal with the same situation.

The influence of a clear awareness of roles and responsibilities in an organisation is also a substantial influence on the development of effective communications and relationships. Several organisations in this study had offices and sites distributed throughout New Zealand and internationally. In several instances, staff do not move between offices and therefore an understanding of the key issues, roles and responsibilities for different sites is limited. From a communications perspective, and more specifically from an emergency management perspective, this has a negative impact on organisational resilience. Further, this barrier to resilience is not limited to geographically distributed offices; it is also an observable feature between departments in some organisations. One organisation offered a clear example of this issue. Employees in different parts of the organisation had developed communications strategies and established clear relationships internally, but had great difficulty in communicating across groups. The main reason behind this problem was silo mentality, but also because there were no common or reciprocal strategies linking groups in the organisation. The systems that were in place were either misunderstood or mistrusted by staff. Employees were not confident that their communications needs would be met by these systems.

Thus, independent systems had developed, further isolating groups in the organisation from other groups and perpetuating silo mentality. Another organisation also illustrates this problem. Strategies for emergency management were well established in one department (information technology) but these were not communicated throughout the organisation. Therefore, valuable management strategies were not being utilised as effectively as possible across the organisation. Additionally, staff outside the IT department had little knowledge of the communications pathways within, reducing their ability to interact with staff in this department.

'Information sharing is something that happens quite well, in general, but there it is still in silos in some areas. Definitely silos in some places. Communications? [CEO] states that he doesn't believe you should communicate! But communications at a one-on-one level work very well. But we don't communicate from corporate level as a leadership team as [well as] other companies do…so the feedback is that we don't always communicate well with our directions [to other staff].' Senior manager in one organisation discussing the problems associated with internal communications and information sharing in the organisation.

The phenomenon of 'groupthink' is an important consideration. Although the term is originally attributed to Whyte (1952), considerable work has since been done by Janis (1972, 1982); groupthink is 'a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action'. Turner (1994) also discusses the problem of communications in an organisational setting. He claims that while failures in communications are likely to contribute to almost all disasters, these failures are almost endemic in organisations; that most organisations actually operate with a degraded communications system as the norm (after Weir, 1991).

Clearly there is a link between effective communications pathways, respectful relationship development and the ability to acquire, transfer and retain critical information in a crisis. Most of the organisations had difficulty in addressing this problem. Effective information acquisition and transfer in a crisis is vital, but can only be effective if all employees appreciate who will need what information, in what type of format, and in an appropriate time frame. In the absence of clearly defined and efficient communications pathways most of the organisations in this study struggled with the successful flow of information in a crisis situation. Some of the case study organisations were working towards addressing this problem however. One strategy being used to minimise the negative effects of silo mentality on communications and information flow was to encourage a more personal approach to communications; one organisation is actually quite dismissive of email communications. These case-study organisations generally have a wide distribution of offices and sites throughout New Zealand, and their senior staff members travel extensively to ensure that personal contact and communications are made.

Communications and relationships with external stakeholders were also observed to be an issue for adaptive capacity. Some of these problems stem from organisations having an inaccurate perception of their importance in the community post disaster. This may be partially linked to the concept of Groupthink (Janis, 1982; Turner, 1994) as discussed in Section 5.2.2.5. but also an organisation's awareness of itself (including the broadly defined roles and responsibilities of the organisation as a whole). Several of the

organisations consider that their relationships and day-to-day communications with external stakeholders (customers, suppliers, consultants etc) are excellent. These organisations and individuals are expected to offer preferential service or be accommodating as customers in the event of a disaster. However, few case-study organisations have engaged in discussion with these stakeholders specifically about emergency response and recovery, and even less have any sort of agreement or memorandum of understanding in this regard. Some of the organisations have not even considered how they may communicate with customers and clients in a crisis, or what sort of information would need to be communicated. Further, relationships and communications with the media are often overlooked from an emergency perspective. Two organisations are notable in their poor understanding of clients and media relationships. For both organisations this appears to originate in their perceptions of the organisational vision, and strategic purpose. However, other organisations in this study have specific policies in place for these stakeholders employing communications consultants to ensure that appropriate messages are created for particular stakeholders, and also to deal with media exposure. These organisations view this as a positive way to maintain good relationships with external stakeholders.

5.2.3.3 Strategic Vision and Outcome Expectancy (AC_3)

The importance of the organisational vision for resilience was shown to be significant. All of the organisations in this study had some form of defined purpose or vision statement that underpinned their operations. Some organisations were driven by service to customers; some by supporting the community and some driven by improving the success of key stakeholders. However, the operational reality and the communication of this vision throughout the organisation were less successful. One organisation had two distinct groups representing two different organisational visions. The result was one group always feeling isolated and excluded from the decision making process because they don't perceive that process as representative of their organisational vision. One organisation had such a strong vision, and was so structured around this vision that it was seen to have significantly reduced flexibility and creativity in decision making structures.

'I see that there is an element of 'this is the way it is in this organisation, this is the way I have seen it, and this is how it will continue to be'... a lack of definition between the frontline staff, and the management…there is no-man's land between…causes us lots of trouble in terms of both upwards and downwards communications…its very rubbery…things get lost in the middle…and at the end no one know who said what.' Middle manager in an organisation discussing the problems that an inflexible strategic vision has in terms of communications internally.

No matter what degree of organisational vision each case study had, there were three critical aspects to consider from an adaptive capacity perspective. Firstly, how well is the vision articulated and communicated through the organisation? Secondly, how well do the day-to-day operations represent that organisational vision? Thirdly, how well does the organisation look towards that vision for direction when engaging in emergency situations?

For those organisations with a clear sense of their purpose and vision, the ability to articulate and communicate this throughout the organisation was evident in their day-to-day operations. The impacts of a

heightened situation awareness around the organisational vision was also an important factor; several of the case study organisations were very clear about their roles in the aftermath of a crisis in terms of the wider community of stakeholders. Other organisations were much less clear about their overall purpose and their role in response, and also recovery for key stakeholders. These organisations also had very high levels of silo mentality which impaired their ability to communicate any sort of vision to staff and external stakeholders. The use of the organisational vision as a critical crisis response tool was also not widely understood. Many of the organisation commented that their approach to emergency management was one of 'fighting fires'; an approach observed in several REDS and other exercises. These types of response appeared to be impacted by the decision maker's ability to make sense of large amounts of information in a relatively short period of time. For those decision makers without the ability to look towards the organisational vision, and identify where the organisation should be heading in a crisis, fire fighting is the alternative. For example when faced with a crisis that impacted on essential services for an extended period of time, the key decision maker in one organisation claimed that they would all just go home. After some coaching and strong suggestions by facilitators, this organisation began to use its organisational vision for customer service as a motivating force and help determine the emergency response, also creating an easier transition to recovery.

'Family companies have less strategic outlook. Have a lower governance focus (corporate), more caviller approach to risk. Give it a lot less consideration and back themselves to deal with it on the day. That's the mindset'. Perception of one group manager from a large organisation regularly working with smaller, family run organisations.

Senge (2006) identifies similar characteristics in organisations where the long-term strategic thinking of an organisation is more accurately described as short-term and reactive thinking. He quotes Hamel and Prahalad (1989) 'Although strategic planning is billed as a way of becoming more future oriented, most managers, when pressed, will admit that their strategic plans reveal more about today's problems than tomorrow's opportunities'. Senge proclaims the importance of building a shared vision in an organisation and that these shared visions must come from personal visions in order to derive and maintain the energy and commitment that is required to be successful.

'It's impossible to create a culture across that [size of the business unit] entire workforce. I don't believe that you can or should create a company wide culture. You can create one set of values or standards, but you still need to have the framework to be yourself within that framework. It's about engagement with the staff'. A senior manager discussing the problems associated with strategic visions and cultural styles in an organisation created by the parent corporation on behalf of all business units and sites.

5.2.3.4 Information and Knowledge (AC_4)

Building on the issues already discussed regarding communications and relationships, and roles and responsibilities is the potential impacts from the flow of information and knowledge in organisations. There is a larger amount of literature on the pitfalls surrounding the acquisition and the transfer of knowledge particularly in relation to learning organisations (O'Dell and Grayson, 1999; Senge, 1990; Nonaka, 1994; Turner, 1994; Murray, 2002). Goh (2002) for example describes the results of a survey of

1,500 employees in 12 organisations where the ability to transfer information scored consistently lowest as an attribute of organisational learning.

As previously mentioned, the strict adherence to set roles and responsibilities, and little motivation or expectation for staff to step outside these roles has a potentially negative impact on the effectiveness of communications pathways, and on the quality of the information being communicated. This is evident in day-to-day situations for many of the organisations in this study, and was significantly exacerbated during exercises and for organisations experienced in emergency management. Two organisations in this study have a policy of encouraging staff to move around the organisation and to gain experience in a variety of roles and with a variety of responsibilities. For one, many members of the leadership team had entered the organisation as general staff and worked their way up to executive positions; this was encouraged in other staff in the organisation. The broad knowledge of the organisation held by these decision makers was evident. Even in these organisations, however, there were still some individuals that held a large amount of specialised knowledge that was not readily accessible for others in the organisation unless those individuals were available.

'You did what was necessary, and you filled the role of the job that was required at the time. You didn't stop and think that's not my job. It's not about little boxes. The other thing is that we found that the knowledge at the decision-making power was vested in only a few heads. And that put those of us with the heads under a lot of stress.' A general manager in an organisation which had recently experienced a crisis situation discussing the link between roles and responsibilities and knowledge.

Research into the link between co-operation and knowledge transfer reveals some interesting observations. Goh (2002) discusses the need for groups in organisations to share information and knowledge and collaborate in order to create successful knowledge transfer processes. Another essential element is trust (Smith et al, 1995) which is a pre-requisite for co-operation as well as transparent and open decision making by managers. This is complimented by the fact that breaking down of rigid hierarchies in organisations can help foster effective knowledge transfer (Nonaka, 1994; Goh, 2002) which in turn assists in the removal of silos (Bartlett and Ghoshal, 1998).

All organisations in this study were somewhat adverse to the introduction of additional systems and procedures to capture the information held by these individuals, and the availability of staff to participate in a mentoring program for the continuation of specialist information was difficult to facilitate.

Another aspect of information and knowledge sharing for organisational resilience was the problem of the nature and format of information to be shared. Very few organisations in this study had considered the sort of information that would be required to maintain an emergency response and ensure a successful recovery. These organisations had also given little thought to how information would be transferred to key people in the absence of traditional communications networks. An illustrative example was during one of the emergency exercises. This particular organisation needed to share information usually contained in maps and plans, however with the loss of telecommunications the fax and internet were largely unavailable. This case-study organisation had not considered any alternative means for communicating this essential

information in an emergency. The dependence on traditional telecommunications networks is a significant barrier to ensuring resilience of information and knowledge sharing during a crisis.

'Perhaps the best way I can describe it as, if you haven't been through one of these before. It was like sitting in a submarine. The only thing you've got is the electronic Communications that are coming in to the submarine. You can't see anything outside, and all you get his reports from the sonar or whatever. And in the morning, we might be able to surface and put a periscope up and actually see something. But you only see that much [indicates]. You don't see the whole picture. And so it's very hard to get a whole picture during the disaster of what is going on.' Comments on the difficulty of communications and knowledge acquisition during a crisis event.

5.2.3.5 Leadership, Management and Governance Structures (AC_5)

One of the most important features for adaptive capacity and overall resilience in organisations is the way in which organisations are lead and managed both in day-to-day and crisis situations. Organisations in this study all clearly understood the link between developing resilient day-to-day operations as a way to improve the resilience for emergencies and crisis situations. All except one organisation expressed a strong preference for ensuring high levels of autonomy and decentralised decision making for day-to-day operations. However, most of these organisations had not considered or planned for the changed circumstances that an emergency would present from a decision making perspective; even those organisations that have experience of significant events. There are several contributing factors.

Firstly, organisations in this study had little awareness and understanding of the consequences of events that encompass a large geographic area (multi regional) or affect a very large number of people (pandemic, war, civil disruption etc). Generally, their expectations for decision making in a crisis is that individual offices or sites (even down to the scale of departments within an organisation) can continue to operate autonomously in these types of events, reflecting a focus on small scale and more discrete events rather than events that encompass either a significant period of time or large scale consequence (in terms of people affected, geographic area, economic disruption). Murray (2002) identifies that the current thinking in organisational settings often forms a boundary to decision making which, in turn, alters and distorts an organisation's understanding of its environment both in terms of perception and interpretation. Similarly, the environment that organisations find themselves operating in also influences this decision making and related perceptions of hazardous events. McCann (2004) identifies that organisations are facing a shift, over the past 30 years, from periods of episodic change to a more disruptively changing environment. The development of the organisational 'network' and the vast inter-dependencies has meant increased capacity for dynamic decision making ultimately leading to increased growth and opportunity for those organisations that embrace the change (D'Aveni, 1994).

'I think we are slow to change. I think that's part of the culture of the organisation; we really have been slow to change…it's partly to do with the New Zealand culture and it's partly to do with [this organisation]. A significant part of the strategy in development, for example, and in marketing was to bring in overseas personnel. But having done that, we have changed but we changed remarkably

slowly…the old tanker in full reverse would be a good example'. The CEO in one organisation reflecting on the ability and willingness of the organisation to face change.

Secondly, many organisations displayed inadequate emergency communication systems, both the physical network and from an information sharing and relationships perspective with staff and other stakeholders. The need to co-ordinate and communicate, not only with emergency services and civil defence organisations, but also with other offices, departments and decision makers within the organisation, is often not clearly appreciated. Critical decisions and their expected outcomes have not been considered, and communications and decision making structures have not been tested. As expressed by Khan and Burnes (2007) managers and decision makers need to balance the various interests of a wide range of potential and actual stakeholders.

Thirdly, many organisations do not have a clear view of their response and recovery priorities, minimum operating requirements or the support structures that are required to ensure these are achievable. There were some exceptions to this in the study. Two organisations working together in an emergency exercise displayed a much clearer understanding of these requirements, but one had yet to translate this into emergency decision making structures. Another organisation in the study had not explored the realities of how decision making in an emergency could continue to be successful if communication pathways broke down, or even if key individuals were absent. Yet another of the organisations was largely unaware of its minimum operating requirements other than in isolated pockets within the organisation. One of the other organisations believed that it had a clear mandate to make decisions for some specific external stakeholder groups because of the history of good relationships and communications built up over time. However, this organisation seemed to be unaware of the expectations this bought from those stakeholders; that all key decisions could and would be deferred to the case-study organisation rather than the stakeholders taking responsibility in a crisis. This is likely to break down extensively if the physical communications network was compromised, as there is no clear decision making structure for this eventuality.

'If we looked purely at dollars and cents, we could have a much leaner and meaner ship by running things from corporate but what we found, and that includes the finance and infrastructure side, is that there is a huge benefit from having people in the regions because you get that regional flavour and feel. We've become a lot more aware of the local issues…you end up with more people as a result of that you end up with people who can react quicker because they're closer to the coalface and know what's going on. I would agree with that. It does mean at times there are differences of opinion, because you get the local perspective, rather than what we want from a corporate perspective.' A discussion with the Chief financial Officer in one organisation discussing the problems associated with centralised and decentralised organisational structures.

The link between decision making, organisational structure and communications and relationships is clear (see also Section 5.2.3.2). There seems to be a paradox here; the balance that needs to be achieved between a decentralised organisational model and the ability of people at all levels and locations in an organisation to be leaders (Senge, 2006). There is a need to clearly identify the diversity of leadership roles for various situations and at a number of levels within the organisation. Developing this depth of leadership allows for sustained change to be accommodated, and possibly even benefited from.

'…the empowerment to manage things well. When people are empowered and you have a crisis situation at any time no matter how big that may be...they [staff] tend to be better prepared to act and also, they are better prepared to accept the authority and those of the situations. It comes to authority; they are authorised to do what they are doing and…empowerment gives them that authority. It was really a cultural zone of personal responsibility and a general feeling of empowerment, and probably one of our biggest concerns is where people go. Sometimes they take that empowerment too far and are too enthusiastic about what they do… [but] they are always well-intentioned.' The CEO in one organisation that has a number of regional offices.

Also related to communications and relationships, the importance of leadership visibility and availability, and decision making transparency has a marked impact on adaptive capacity. Senge (2006) advocates the old adage of 'actions speak louder than words' in relation to organisational leadership, particularly for those leaders who are the most visible. The case study organisations which had the highest degree of adaptive capacity all showed excellent visibility of the leadership and decision making team, and all staff were able to communicate directly with these individuals if required. Furthermore, the decision making process was relatively transparent, and was supported with good communications internally to all staff. Conversely one case study with the least adaptive capacity in this study had a very rigid hierarchy for decision making, and the ability to communicate with the leadership team was not equal for all employees. Additionally, this organisation had a very poor decision making transparency. For this organisation staff commented that they are often frustrated because the degree of accountability they have for decisions and the input they have into making those decisions are not comparable, nor do decision makers adequately communicate to all staff why decisions are made. Other organisations in this study reflected this feeling, some comments originating from experience in real world crises, and other coming from day-to-day operations.

'There is progress…improvement that [new CEO] is driving in building a team. This is just my opinion…he is succeeding in building a team. He realized that he can't make changes down the organisation if he doesn't change leadership'. Comments from a senior manager in one organisation reflecting on recent changes in leadership of the business unit.

5.3 Synthesis

Each of the organisations in this study was assessed according to their performance in all of the above indicators of organisational resilience. Table 8 shows the results of this process, and presents the individual ratings of situation awareness, identification and management of keystone vulnerabilities and adaptive capacity for each organisation. These ratings were used to produce the composite scores for the individual resilience profiles presented in Chapter 6. Further details of individual organisations performance are presented in Appendix C. Chapter 4 details how these composite scores were calculated. The discussion in this chapter regarding integration of the case-study information also addressed the original research questions and proposition in Chapter 3. Additionally, this discussion presents the emergency information that arose from the case-studies which was not necessarily foreseen as relevant in the original research questions and propositions.

5.4 Summary and Conclusions

A number of indicators of organisational resilience have arisen from the case study organisations. These organisations were specifically selected to represent the widest range of organisations possible to investigate the hypothesis that there are likely to be generic resilience indicators common to all organisations. From the set of 10 organisations studied in this work, a number of common factors have been identified which have been categorised according to which aspects of resilience they impact most; situation awareness, keystone vulnerabilities or adaptive capacity. These factors have been subsequently summarised into a set of 15 resilience indicators: this set is intended to provide organisations with an effective overview of the key resilience issues that they are likely to face. The case-study organisations have been given a relative rating for each indicator; comparing individual organisations with the others in this study. The individual ratings have then been collated to give an overall relative rating for the degree of situation awareness, the identification and management of keystone vulnerabilities, and the extent of adaptive capacity for each organisation. The link between some of these indicators is apparent. For example, the degree of awareness for roles and responsibilities has an impact on the effectiveness of communications and relationships within an organisation which in turn impacts on the success of strategies for the acquisition, transfer and retention of information and knowledge. Additionally, an organisations awareness of the range and impacts of hazard events influences its recovery priorities, its commitment to planning and engagement with emergency exercises, and has a significant impact on the development of relationships with key stakeholders.

Chapter 7 explores the strategies for resilience management and tools for implementation that could be used to address some of these resilience issues for organisations and examines the work that needs to be done in the future to expand the knowledge gained in this research.

Table 8. The relative ratings of case study organisation for each resilience indicator identified.

		CASE STUDY ORGANISATIONS									
	Label	**CS1**	**CS2**	**CS3**	**CS4**	**CS5**	**CS6**	**CS7**	**CS8**	**CS9**	**CS10**
Situation Awareness	Roles and Responsibilities	SA_1	*Mod*	*Low*	*Mod*	*Mod*	*V.Low*	*Mod*	*V.Low*	*Low*	*V.High*	*V.High*
	Hazards and consequences	SA_2	*V.Low*	*Low*	*V.High*	*High*	*Mod*	*Mod*	*Low*	*Low*	*V.High*	*Mod*
	Connectivity Awareness	SA_3	*High*	*Low*	*High*	*Mod*	*V.Low*	*Low*	*Low*	*V.High*	*High*	*V.High*
	Insurance	SA_4	*Low*	*Mod*	*Low*	*V.High*	*Mod*	*Mod*	*Low*	*V.Low*	*High*	*Mod*
	Recovery Priorities	SA_5	*Mod*	*V.Low*	*V.High*	*High*	*V.Low*	*Mod*	*Mod*	*High*	*V.High*	*Low*
	SUMMARY	**SA_{comp}**	**Mod**	**Low**	**High**	**High**	**Low**	**Mod**	**Low**	**Mod**	**V.High**	**High**
Keystone Vulnerabilities	Risk mgmt and Planning	KV_1	*High*	*Mod*	*High*	*V.High*	*Mod*	*High*	*V.Low*	*V.Low*	*V.High*	*Low*
	Exercises	KV_2	*V.Low*	*High*	*V.High*	*V.High*	*Low*	*Mod*	*V.Low*	*Low*	*V.High*	*Low*
	Internal Resources	KV_3	*Mod*	*V.High*	*High*	*High*	*Mod*	*High*	*Mod*	*Low*	*V.High*	*Mod*
	External Resources	KV_4	*Mod*	*High*	*High*	*Mod*	*Low*	*High*	*Low*	*Mod*	*High*	*High*
	Connectivity	KV_5	*V.Low*	*High*	*V.High*	*V.High*	*V.Low*	*V.High*	*Mod*	*High*	*High*	*Mod*
	SUMMARY	**KV_{comp}**	**Mod**	**High**	**V.High**	**V.High**	**Mod**	**High**	**Low**	**Mod**	**V.High**	**Mod**
Adaptive Capacity	Silo Mentality Management	AC_1	*Low*	*V.Low*	*Mod*	*Mod*	*V.Low*	*V.High*	*Mod*	*Mod*	*Mod*	*V.High*
	Communications and relationships	AC_2	*V.Low*	*Low*	*High*	*Low*	*Low*	*V.High*	*Low*	*V.High*	*V.High*	*V.High*
	Strategic Vision	AC_3	*V.High*	*Low*	*Mod*	*Mod*	*V.Low*	*V.High*	*Mod*	*High*	*High*	*Mod*
	Information and knowledge	AC_4	*Mod*	*Low*	*High*	*Mod*	*V.Low*	*V.High*	*Low*	*Mod*	*V.High*	*V.High*
	Leadership and management	AC_5	*High*	*Low*	*High*	*Mod*	*V.Low*	*V.High*	*Mod*	*High*	*V.High*	*V.High*
	SUMMARY	**ACcomp**	Mod	Low	High	Mod	Low	V.High	Mod	High	V.High	V.High
	Total Resilience Rating	**RES_{tot}**	**Mod**	**Mod**	**V.High**	**High**	**Low**	**High**	**Mod**	**High**	**V.High**	**V.High**

6 THE CASE-STUDY ORGANISATIONS

6.1 Introduction

This chapter is structured to provide a comparative overview of the case-study information. Each organisation is briefly described, key issues reviewed and a resilience profile presented (Chapter 4 details the creation and interpretation of resilience profiles). The resilience profile is a qualitative assessment of the overall resilience of an organisation based on the relative degree of situation awareness, management of keystone vulnerabilities and adaptive capacity for each organisation. The resilience profiles are relative representations and individual profiles are created in relation to the other organisations in this study. A detailed discussion of how to interpret the resilience profile is given in Chapter 4. The resilience information from each case study organisation is used in Chapter 5 to identify generic issues of resilience for organisations in New Zealand. These generic resilience issues provide the basis of the qualitative resilience assessment and the generation of the relative resilience profiles in this chapter. At the end of this chapter the resilience profiles are compared and organisational resilience is analysed in relation to case- study selection criteria described in Chapter 3. Future applications of the resilience assessment process and uses of the resilience profile are explored in Chapter 7. Complimenting the following discussion of resilience for each organisation a detailed discussion of resilience issues is presented in Appendix C. Appendix C outlines more specifically the key strengths and weaknesses identified for each organisation in this study.

The discussion of resilience in each of the case study organisations that follows is structured to represent the three attributes of organisational resilience: situation awareness, identification and management of keystone vulnerabilities and adaptive capacity and summarised by the resilience profiles. The profiles (Figure 9 to Figure 18) are presented with the discussion for each case-study organisation.

6.2 CS1 - Private Manufacturer

The pilot case-study organisation (CS1) is involved in the manufacturing industry in New Zealand with both domestic and international markets. CS1 approached the researcher to take part in this study, and was an enthusiastic participant. This organisation offered the research project an ideal pilot study with a view from a large private organisation in the manufacturing industry (Secondary sector) and which has a widespread customer base (nationally, internationally and, to a lesser extent, locally). CS1 also relies heavily on both human resources and machinery and has both locally based and international offices.

Figure 9 shows the resilience profile for CS1 which is given a moderate overall resilience relative to the other case study organisations based on moderate rankings for situation awareness, identification and management of keystone vulnerabilities and also adaptive capacity.

Figure 9. The resilience profile for CS1, the Private Manufacturer.

Overall, situation awareness is moderate for CS1. While CS1's situation awareness in relation to its competitors and the supply chain is good the organisation has a more limited awareness of the community of stakeholders outside of its immediate operating environment. CS1 also has a limited understanding of some common hazards and their potential consequences as well as the wider social and economic networks in New Zealand.

CS1 exhibits a moderate rating for its identification and management of keystone vulnerabilities. Generally CS1 has identified many of its key risks and internal vulnerabilities and is working towards managing them appropriately. Critical exceptions include the loss of electrical services and a focus on managing the causes of events rather than managing its own response to crises.

"electrical…probably the thing we have the least control over. If the power cable got severed outside the building, or the sub-station went down then there's not a lot we can do about that. We don't have backup generation..." comments from senior manager in CS1.

Overall, CS1 is given a moderate ranking on the resilience profile. In terms of its adaptive capacity, CS1 has difficulty with the flow of communications and development of relationships internally and is a symptom of a negative silo mentality. Also in a crisis CS1 may have a limited ability to respond and recover because of ineffective transfer of critical information. CS1 is influenced by a strong organisational vision of the purpose and future direction of the business but, this may have a negative impact on CS1. Decision makers appear to be impaired both in their flexibility and creativity for problem solving, and also the ability to make decision in a timely manner due to the rigour with which CS1 adheres to this vision.

"And another problem I have here [at CS1] is that there isn't management support for health and safety. We might talk the talk…but you need leadership right from the CEO. It needs to be a very important aspect and he needs to be passionate about it and behind it and filter it down…" Comment from middle management in CS1.

"The other main key risks for us [that] I see, is the loss of key information. So, if something happens to our information technology systems, we have obviously a hell of a lot of intellectual property stored on those networks that has taken years to develop…if something was to go wrong there that's a huge risk there…if we were to have a significant network failure we would come to a standstill basically." Senior manager in CS1 commenting on key risks in the organisation.

6.3 CS2 - Local Authority

The researcher was approached by CS2 who expressed a strong interest in taking part in the study after reading the Resilient Organisations website. CS2 is a relatively small local authority organisation consisting of less than 40 full time staff, serving a predominantly rural community. In terms of its inclusion in this study, CS2 offered significant value and was a good contrast to the pilot study CS1. As a local government organisation CS2 is responsible for civil defence responses and this was an important facet to study, particularly given CS2's recent experiences with natural disaster. This provided an excellent opportunity to test the interview technique and adjust as outlined in Chapter 3. CS2 services the tertiary sector and has only one office. As with most local government organisations in New Zealand, CS2 has contracted out much of its physical services (road works, rubbish collection etc) and therefore has only a moderate dependence on resources. CS2 does have a high dependence on its human resources including staff and its association with community groups and organisations.

CS2 has a moderate overall resilience based on a low ranking for both situation awareness and adaptive capacity, but a high rank for its identification and management of keystone vulnerabilities. The resilience profile for CS2 is presented in Figure 10 below.

Figure 10. The resilience profile for CS2, the Local Authority.

When considering situation awareness CS2 displays a poor understanding of staff roles and responsibilities and also in terms of CS2's role in the community. Furthermore, CS2 has a poor knowledge of the range of hazards and events it may be exposed to as well as a limited understanding of the potential consequences from these events.

"Generally, people had to find their own jobs [during the emergency response], and I felt as though I was floating a lot and not being given clear directions. I feel it's important that the controller should take charge and give specific instructions as to who should be doing what." Comments from senior manager at CS2.

Typically CS2 has most of its keystone vulnerabilities clearly identified, although management of several significant issues is more limited. They include a lack of human resources in an emergency, breakdown of communications due to failure of telecommunications and electricity supply. However, CS2 has established an emergency operation centre separate from the main offices, and provided for the continued use of that space in future crises.

In terms of adaptive capacity, CS2 has an advantage in its ability to gain support and resources from other local government and national government sources, but this is a restricted resource and is likely to be only appropriate for some types of crises. CS2 also has a substantial resource available to it in the form of the community it serves. However, poor communications and a breakdown of relationships with the community (volunteer groups, emergency services, support agencies etc) were influential in past events and there is evidence for a strong silo mentality culture at CS2 impairing its adaptive capacity.

Researcher: I have read the regional plan, and you have the hazards [addressed in there]. But it doesn't address [this organisation specifically]. I was just wondering if [this organisation] have their own plan for continuity of its own business.

Interviewee: No, we haven't. if this building was taken out by an earthquake or something then we haven't got anything. I acknowledge we need to do something." Comments by senior manager in CS2.

6.4 CS3 - Private Contractor

CS3 is a large private contracting firm that has offices throughout New Zealand. Interviews were conducted in both the corporate offices and in regional offices. CS3's inclusion in this study was valuable because it offered the viewpoint of a large private organisation in a contracting environment and in an industry (both primary and secondary industry sectors) that deals with small-medium scale crises on a relatively regular basis. In addition, CS3 provided the opportunity to study an organisation that has a distribution of regional offices around a central corporate hub as well as an international influence (this was one of only three organisations in this study with the same characteristic). CS3 provides services and products from its operations in New Zealand throughout the country, but international operations remain separate in terms of supply distribution. Further, the organisation was confirmed as being highly dependent on both human and physical resources.

Following the issue of the final report to CS3, this organisation has actively pursued the learnings from the 5-Step process and extended the concept of resilience. CS3 are developing a regional emergency management plan with a view that it may become a template for the rest of the organisation. They have also engaged in additional workshops at a variety of levels in the organisation.

Overall CS3 has a very high level of resilience bought about by its high rankings for both situation awareness and adaptive capacity and a very high degree of identification and management of keystone vulnerabilities. This is illustrated in Figure 11 below.

In relation to situation awareness there are some issues with the knowledge of roles and responsibilities throughout the organisation, most notably between head office and the regional offices as well as between offices in different regions. Additionally, CS3 has a clear understanding of a handful of crisis events although planning for emergencies is dominated by its experience of previous crises. While this highlights a somewhat reactive approach to emergency management the organisation does have effective planning small to medium sized events that do not involve a multi region response.

In general, CS3 has clearly identified many of its keystone vulnerabilities and is working towards appropriately managing them. CS3 has identified alternative sites for emergency co-ordination, has a good understanding of the limitations of its various buildings and has considered the impacts of the loss of key services. CS3 has also begun to engage with other organisations regarding the availability of specialised equipment and essential supplies.

"Interviewee: We have all the phone numbers and we know all the sub-contractors to [contact]. I know who call before we need to get [to a level of a] civil defence [emergency]. We had a civil defence emergency last year with the trouble in the Park at [specific location].

Researcher: How did he chain of command work in the event [at specific location]?

Interviewee: It did [breakdown] when we had the big one. They [critically linked organisation] didn't know about any contact details…and all it needed was communication.

Researcher: So, it wasn't a physical communication breakdown…the network was still there, but people didn't know how to use it?

Interviewee: Yep, that's exactly right…but that's been sorted out and it works really good now." Discussion with departmental manager at CS3.

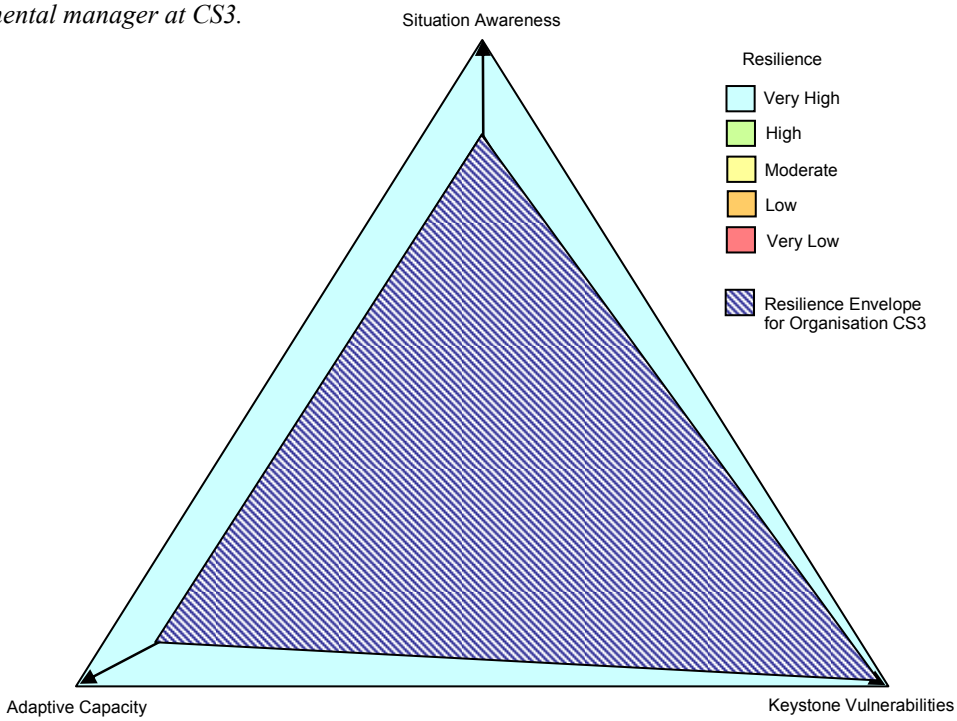


Figure 11. The resilience profile for CS3, the private contractor.

CS3 typically has a high adaptive capacity based on an organisational culture of responsibility, autonomy and empowerment. There are generally good communications at CS3 within regions although communications are less robust between the regional offices. However, the 'hands-off' approach of head office to the regional management of crises and emergency planning is potentially limiting for CS3.

6.5 CS4 - Public Utility Provider

CS4 is a moderately sized public utility organisation with regional offices in numerous centres throughout New Zealand. The organisation was selected as a case-study organisation because of its size, as well as its status as a public life-line organisation (the only one in the study). In addition, this organisation was the only organisation which had a relatively low dependence on physical resources, while being highly dependent on its human resources (this includes critically linked organisations). The widespread nature of the organisation's offices was also an important element is CS4 being included in this study.

While interviewing with this organisation went smoothly, a workshop date was not forthcoming and the researcher was unable to collect survey and vulnerability data or observe CS4 in a REDS. However, the researcher was given the opportunity to observe CS4 in a large scale simulated national disaster exercise, Capital Quake and this proved very valuable for data collection and verification of information from interviews.

The resilience profile for CS4 is presented in Figure 12 and shows a high overall relative resilience based on a high situation awareness, a very high level of keystone vulnerability identification and management as well as moderate adaptive capacity.

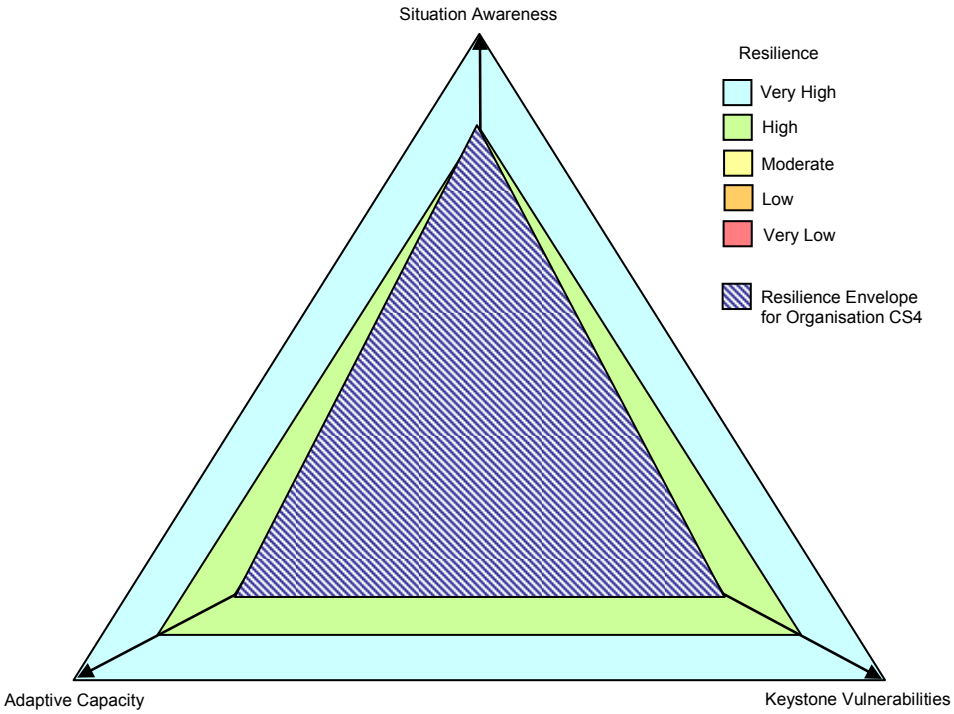


Figure 12. The resilience profile for CS4, the Public Utility.

In terms of situation awareness there are some issues with the understanding of roles and responsibilities at CS4, particularly how they would work in a crisis event both internally (between national and regional offices) and

externally (between CS4 and other linked organisations). However CS4 has a very clear understanding of its recovery priorities, for itself as an organisation and from the perspective of its community of stakeholders.

Although the vulnerability assessment wasn't able to be completed in this case-study, those that have been highlighted appear to be generally well managed and identified. While those keystone vulnerabilities that have been identified in this investigation do have the potential to significantly impact the organisation, they are relatively few in number. Prominent vulnerabilities identified include the fragility of the communications network, protocols for succession in a crisis, and the transfer of information throughout the organisation. CS4 has also taken part in several training exercises for emergencies.

"…when we ran the exercise, there had already been a couple of exercises beforehand where [this organisation] had sat on the outside…but the last exercise…it was a desktop exercise and essentially what I did was take the operation's next scenario, and I grabbed all our troops in the room and said 'right this has just happened, what do we do?'…and we spent half a day going through how we might automate that response from here [regional office]. That gave us a framework to work with." Regional manager commenting on past experiences with exercises.

Adaptive capacity is enhanced by CS4's clear vision of its role in an emergency, although this is not always well communicated between offices internally. Governance and leadership issues within the organisation reflect a strongly autonomous culture, but it is one that has a limited strategic outlook in a crisis. This also illustrates problems with the negative impacts of silo mentality, showing up prominently in communication and relationship difficulties for CS4.

We need an integrated approach, and we need a hierarchy of response. We need to understand the major different types of scenario that might affect us, the hierarchy of response and the major risks that we face…understanding the major risks we face regionally, nationally and so forth. In some way, we need to bring all that stuff together and communicate it well to everyone…so that everyone has a good understanding of what needs to happen, when, where and why. It sounds very waffly but that's where we're at with it…" Senior manager in head office.

6.6 CS5 - Education Provider

CS5 is an education provider. It is a large employer for the local community and has an established reputation both within the New Zealand context and internationally. CS5 has followed up on some of the resilience issues and recommendations to arise from this study and the organisation is currently engaged in writing and implementing a disaster response and recovery plan. CS5's inclusion in this study is justified because of its moderate size and because it services the quaternary sector (the first one in this study). In addition, CS5 was thought to have a high dependence on its human resources and a low dependence on physical resources. The organisation's dependence on physical resources is more appropriately categorised as moderate. Additionally, CS5 provides services for local, national and international customers but has a very localised distribution. Finally, CS5 has a high value as a case study because of the relationship that it has with its community of stakeholders and the linkages of the organisation through to the wider community.

The resilience profile for CS5 is presented in Figure 13 below showing a low overall ranking relative to the other organisations in this study. CS5 scores low in both situation awareness and adaptive capacity with a moderate ranking for its identification and management of keystone vulnerabilities.

Figure 13. The resilience profile for CS5, Educational Organisation

Situation awareness is low at CS5 is shows that there are substantial differences of opinion among groups of employees as to the organisations priorities in terms of customers and principal stakeholder groups in the event of a crisis. A considerable contributing factor is a poor understanding of other people's roles and responsibilities at CS5. There are also problems with a poor understanding of the likely expectations of some stakeholder groups and what this may mean for CS5's in terms of reputation impacts.

"The staff welfare issue also arose during the REDS. At no time did any of the groups adequately consider the needs of the staff to have better information regarding the situation at CS5 in a crisis. Additionally there was not adequate consideration given to staff pay, leave entitlements or even continuing employment if CS5 was forced to close for an extended period of time. Interestingly, this lack of consideration was driven by the staff themselves, suggesting that the conceptual change in thinking about staff as a liability or asset is very pervasive at CS5. The staff may see themselves as being entirely expendable in a significant crisis." Extract from final report to CS5

The identification of keystone vulnerabilities is relatively advanced at CS5 from an operational perspective. Some of the most significant vulnerabilities include the relationships and communications between some key groups, the physical communications network and communications pathways internally and externally in a crisis. CS5 has a poor understanding of the less operational vulnerabilities, a limited application of planning as exercises and training for all staff, together with some significant physical vulnerabilities for buildings, structures and equipment.

From the perspective of adaptive capacity, the most significant issue for CS5 is the negative impact of a strong silo mentality in relation to communication, relationships and the transfer of information in the organisation. There are

some pockets of employees within CS5 where adaptive capacity is high, but the organisation has no systems and procedures in place to integrate these initiatives and improve adaptive capacity overall. There is also perceived to be a lack of transparency in decision making, particularly where an employee's ability to make decisions and their accountability for the results of those decisions are perceived to be at odds.

"I found it quite astonishing coming from the public sector, because the public [service in this particular part of the organisation] had a lot of continual change in the last 10 years…and almost change for changes sake which can be just as harmful…but they were very forward thinking and had already moved to significant structural changes. [But] coming here was like taking…well, [this organisation] can be a world in itself, and it can be quite insular." Deputy manager in discrete part of the organisation.

6.7 CS6 - Private Wholesale Distributor

CS6 is a large private wholesale distribution organisation operating in the tertiary sector. This organisation was important to the study because of the relationships that this organisation had with other linked organisations. In addition, the organisations local and national distribution networks were an important consideration for its inclusion in this study. The organisation had a reputation among its workforce as a family oriented working environment. CS6's high dependency on its staff as a resource was a key factor as well as the importance of the products that the organisation is responsible for distributing. While not classified as a lifeline organisation, CS6 had previously argued with local authorities about its possible role in the aftermath of a major community wide disaster. This internal perception of the organisation's importance was a critical factor in CS6's inclusion in this study. Additionally CS6 operates as a large central hub which services a number of additional offices nationwide.

The resilience profile for CS6 shows it to have a high relative resilience derived from its moderate situation awareness, its high degree of identification and management of keystone vulnerabilities as well as a very high ranking for adaptive capacity. This profile is reflected in Figure 14 below.

CS6 has a somewhat limited situation awareness of what key stakeholders may expect of the organisation in a crisis response and recovery including both internal (staff) and external (customers, suppliers etc.) stakeholders. A limited awareness also contributes to knowledge of the consequences of various hazards CS6 may be exposed to.

CS6 has made some very good progress on identifying its keystone vulnerabilities and managing them accordingly. This success is linked to the longevity of key decision makers in the organisation and their detailed knowledge of the business. However, there were some significant vulnerabilities highlighted in this study including the implications of the loss of electricity and the reality of a breakdown in the telecommunications network on a regional scale. In addition the organisation has some very vulnerable buildings and equipment to some types of hazard and has not considered alternative plans for continued operations.

Typically CS6's adaptive capacity is a significant strength, supported by the structure of the organisation and the inherent trust of key customers that provides the mandate to make decisions quickly and authoritatively. Barriers to improving adaptive capacity at CS6 include an apparent inability to acquire appropriate information to support decision making in a crisis and a lack of specific strategies to disseminate this information throughout the organisation, and to key stakeholders.

"…we have moved through different departments on our career paths…we have a pretty good understanding of the business…when you work long enough with these people they also become friends. You work with these people and we just seem to click and it has always been the case. I've been here more than 15 years…you don't make an appointment to go and see these guys, you just go and see them. We know each other and how we work. It's not all clear sailing but it we're a very close team…it's not the ivory tower and we don't like to think of it as set away from the rest of the company, but we do work very closely…we discuss everything." Senior decision maker in CS6.

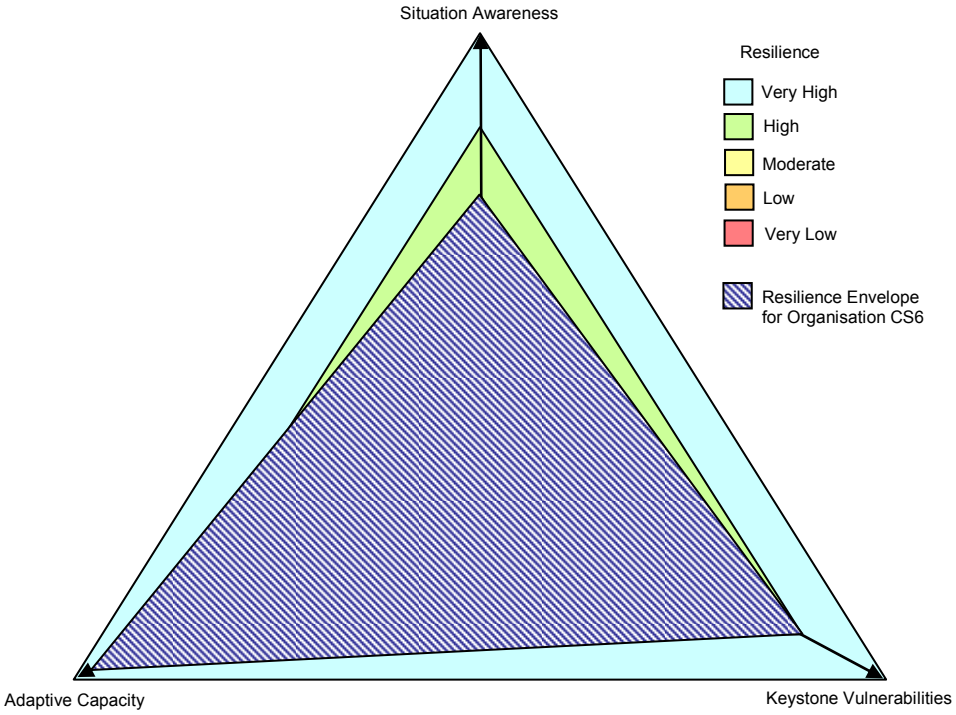


Figure 14. The resilience profile for CS6 - Private Wholesale Distributor.

6.8 CS7 - Private Utility Provider

CS7 is a discrete business unit within a large private organisation that has a widespread distribution of offices throughout New Zealand. Although the organisation as a whole is considered to be a lifeline utility, the business unit studied did not fall under that classification. However, the implications of the status of the whole organisation as a lifeline organisation on the operations and performance of the business unit were an important area of consideration when selecting CS7 for this study. The selection of CS7 was appropriate for the research because of its relationship with its parent company, its nation wide distribution and its status as a utility provider. This was also one of the few organisations in the study that were perceived to have less dependence on people than on physical resources. The organisation operated with a large central hub and many regional centres throughout New Zealand. Although the organisation as a whole has international offices and sites, CS7 as a business unit within this organisation did not.

The Resilience profile for CS7 presented in Figure 15 below shows a moderate overall resilience. This resilience profile reflects a low degree of situation awareness as well as the identification and management of keystone vulnerabilities, and moderate adaptive capacity.

When considering situation awareness at CS7 roles and responsibilities are well known within individual business units in the organisation, but there is almost no movement of staff between departments and units.

Additionally, situation awareness is weakened by a poor understanding of the potential impacts of some key hazards and the ability of the organisation to effectively respond to them. Recovery priorities are limited but CS7 does have a clear understanding of its market, and of its competitors. It is also acutely aware of the capability and capacity of key external stakeholders and shows a weakness is in its connection to customers, having no ability to map customer movement or demands.

"We are in a very unique position…I think it would be difficult to kill it [this business unit] overnight, even if bad decisions are made…but, in saying that, its more like death by a thousand cuts really…so, we treat the cuts. I think that crisis is wrong word for it [the types of events that impact the organisation]…" Comments from a strategy manager.

In terms of the management and identification of its keystone vulnerabilities, CS7 has made some attempt at planning, but there is a significant reliance on the parent company to perform this task. CS7 has some significant assumptions about its ability to operate remotely, but it has not developed any plans around this eventuality, or attempted to test the validity of this assumption. CS7 has some key vulnerabilities in terms of the loss of key services and also buildings and equipment, the loss of telecommunications services, poor staff welfare systems as well as the potential loss of intellectual property and security of databases and critical information. CS7 has an experienced team of people available through its parent company but due to the very autonomous nature of the organisation, this resource is not widely utilised.

Figure 15. The resilience profile for CS7, Private Utility Provider

For CS7, considering its degree of adaptive capacity, there are some significant problems with silo mentality that has become entrenched in the organisational structure over time. However, the greatest weakness in CS7 is the poor ability to make decisions in an appropriate and timely manner. This is primarily because the organisation does not currently have the necessary systems in place to ensure that the information it is gathering (either in day-to-day business or in a crisis situation) is accurate or appropriate for the given situation. Also, while CS7 is relatively agile

in its decision making in-house, it is limited by the decision making ability of its parent company; a reflection on the size and structure of the parent organisation.

"Observations during the REDS suggest that there is limited cohesion in the Leadership Team with regards to leadership roles and how to transfer those leadership roles over, if necessary, in a crisis. In the absence of the GM [general manager], one individual was observed to take on a strong leadership role for this crisis. This is a very positive development for [CS7]. However when the GM returned to the group he was only given a cursory update on the situation and there was no apparent consideration given within the Leadership Team as to his further leadership role for this crisis. While some individuals showed themselves to be very clear and effective leaders in their own right the issue of leadership succession was not clearly addressed either before the discussion group convened or following the return of the GM." Excerpt from final report to CS7

"Staff…also need to understand how destabilising comments about the dispensability of particular groups of staff can be to the entire organisation. Immediately upon hearing the details of the proposed scenario, one staff member was overheard to say that it didn't matter if [CS7] lost sales or IT staff to a competitor because they could be easily replaced." Excerpt from final report to CS7.

6.9 CS8 - Private Retailer

CS8 is a medium sized retail operation (operating in both the secondary and tertiary sectors) that services a rural community in New Zealand and is also part of a group of other branded organisations throughout New Zealand. CS8 is serviced by a wide range of organisations and is a significant social and information hub for the local community. This organisation was chosen because of its size; up till this point in the research the case-studies were over-represented by large organisations. Additionally, CS8's location in the retail industry, as well as the small, rural based community that it serves, were important selection factors for this organisation. CS8 was only one of two organisations in this study that were locally based; although CS8 has significant linkages with other organisations both nationally and internationally it only services it's local community. Additionally, the organisation has an owner/operator structure that previously had not been explored in the research.

The resilience profile for CS8 presented in Figure 16 indicates that CS8 has a high resilience based principally on the organisations high adaptive capacity, and also a moderate rating for both situation awareness and its identification and management of keystone vulnerabilities.

Internally CS8 has a good situation awareness, particularly of individual roles and responsibilities, but there is almost no movement of staff between departments. There is also a clear lack of understanding and awareness regarding hazards and impacts, both those affecting CS8 and those that affect the community CS8 serves. While CS8 has a good awareness of its importance to the community and to its customers and of its recovery priorities, this awareness of the importance to the community may be overly positive, with CS8 seemingly unaware of the potential negative impacts of rumour and gossip.

"…most of the staff tend to stick to themselves and to the departments that they work in. Once they begin working in a particular area of the business, they don't really like to move around too much…" Comments from business owner.

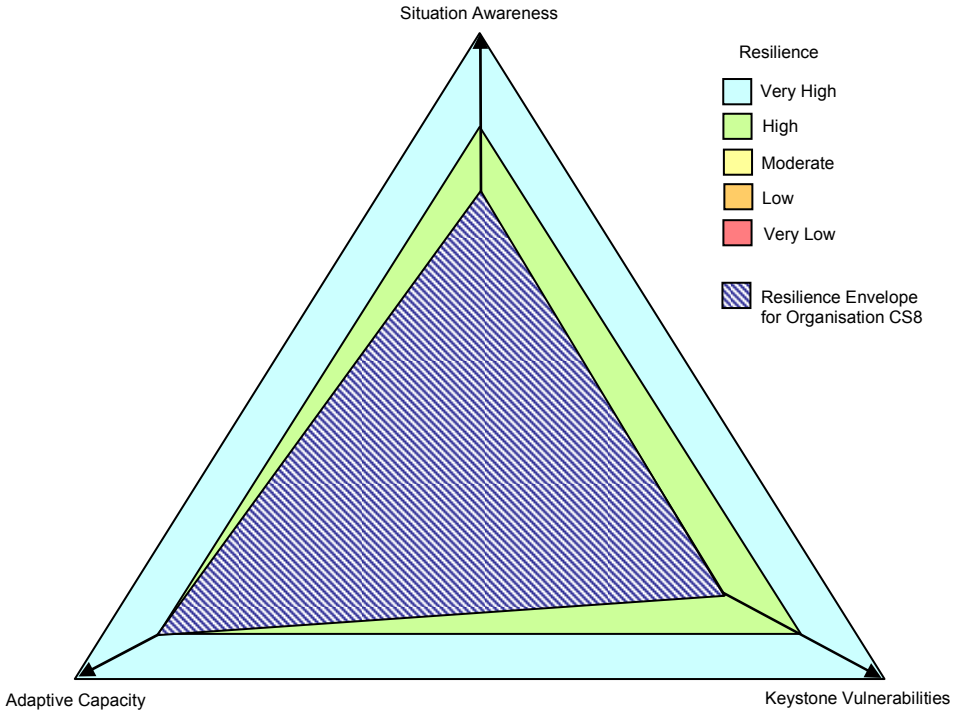


Figure 16. The resilience profile for CS8, Private Retailer

The self assessment of keystone vulnerabilities at CS8 indicates that the organisation may be significantly overestimating its preparedness and underestimating both susceptibility and criticality of organisational components. This seems to be due to the relationship with the wider organisational network of branded operations of which CS8 is a member. As a retail operation keystone vulnerability is the integrity of the transportation network, both from a customer and staff access perspective, but also from a supplier viewpoint. CS8 has not engaged in any planning independent from its organisational network, and has never participated in emergency exercises other than for fire evacuation.

CS8's strength lies in its adaptive capacity. The organisation is relatively flexible, has the capacity for creative decision making, the support of a large organisational network and positive, hands-on leadership. This organisation also favours a substantial degree of autonomy in the workplace for decision makers, but this resulted in senior management being unaware of some key issues because staff believed they had responsibility for decision making.

6.10 CS9 - Private Primary Producer

CS9 represents the New Zealand operation of a large primary producer with international markets and a strong relationship with its parent company. The New Zealand side of the organisation is large and has a wide distribution throughout New Zealand with approximately 35 centres serviced by a central hub. Although the study already had several large organisations represented, CS9 was selected on the basis of its role in the primary sector; only the second organisation in the study as such. CS9 was not the organisation initially selected for this position in the study. However, the organisation approached before CS9 were unable to take part within the time-frames that the research demanded. A key contact came forward after being approached by another member of the resorgs research team, and CS9 were confirmed as part of the study.

The resilience profile for CS9 is presented in Figure 17 showing very high overall resilience relative to the other organisations in this study. This is due to its very high ranking for all attributes of resilience: situation awareness, identification and management of keystone vulnerabilities and adaptive capacity. It is very important to note that although CS9 has a very high resilience in this study this can only be compared to the other case study organisations and is not intended to represent the highest possible resilience for organisations in general.

Typically CS9 has a very high degree of situation awareness of its operating environment, its reputation in that environment, its key stakeholders and its risk profile. Overall, the only weaknesses for CS9 in situation awareness are related to its lowered knowledge of the impacts of large scale events on critical regional networks like electricity and telecommunications.

While CS9 has identified some significant keystone vulnerabilities most of these are already being actively managed at the present time. These include the fragility of the telecommunications network and changes to the legislative environment in New Zealand. This organisation conducts extensive risk management programs on a regular basis and also engages regularly in emergency scenario exercises, based predominantly on emergency communications.

'I like to think our [emergency] plan is a list of phone numbers…it's not much more than that'. CEO in CS9

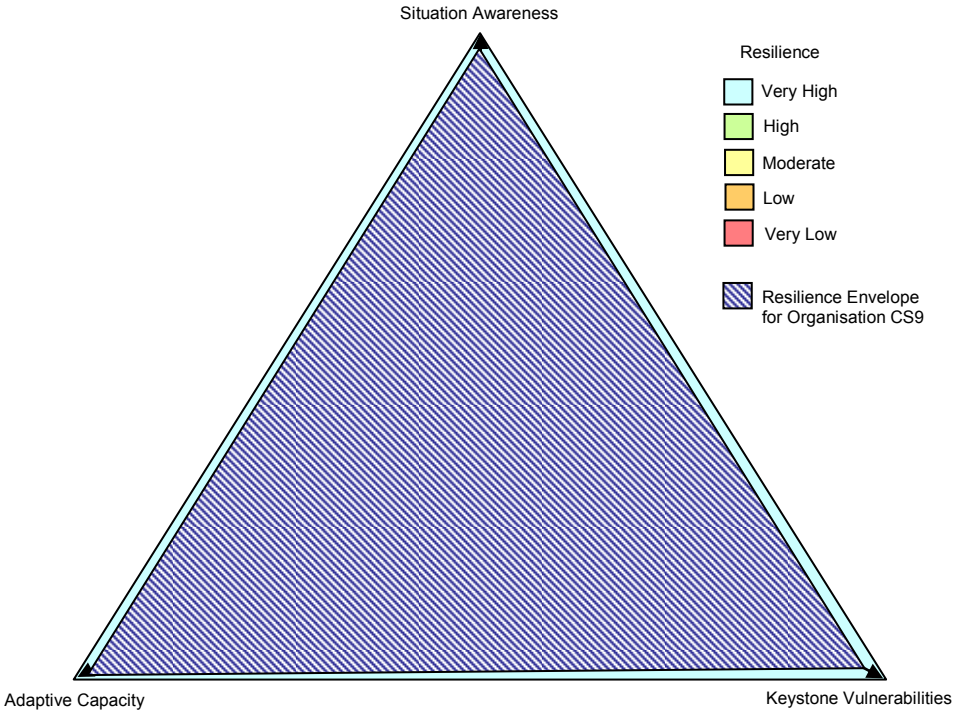


Figure 17. The resilience profile for CS9, the Primary Producer.

From an adaptive capacity perspective, CS9 has significant flexibility in decision making due to the financial, logistical and technical support of the parent organisation. The other side of this coin, however is that for very large events, the distal nature of the parent organisation may impact on effective and timely communications and consequently on the resilience of CS9. Silo mentality is an issue, but improving communications and awareness of this issue significantly limit negative impacts.

"[We are] a bit of a closed mind, even at relatively senior level to the potential of the org to do better. Perhaps a bit too analytical…almost to the extent of paralysis by analysis." Middle manager, CS9

'[The organisation has] become more able to cope with unexpected things in last 4-5 years because we had more of those kind of things…we now look at totally new way to do things. People move out of their comfort zone. We have developed greater levels of management judgement, contingency planning and our awareness of the environment has grown, at corporate and at site level in most cases. Most sites [regional offices in New Zealand] have had a lot of change in the last few years.' Senior manager, CS9

6.11 CS10 - Private Technology Provider

CS10 is the smallest organisation involved in this study with just eight full time employees and was selected primarily because small organisations were under-represented in the study. The organisation is a private business that operates in the supply of technological services to clients (Quaternary sector; one of only three organisations to do so in this study). In addition, CS9 has an owner/operator governance structure and this offered a chance to look more deeply into this type of structure; a different perspective to most of the other organisations in this study. Furthermore, CS10 was only the second organisation in this study to only have a single office and hence an entirely localised operation; an important selection criterion.

The resilience profile for CS10 in Figure 18 shows a high overall resilience. CS10 shows a very high adaptive capacity, high situation awareness and a moderate ranking for the identification and management of keystone vulnerabilities. CS10 has a good situation awareness of its operating environment and how its place in that environment may change quickly. The organisation is limited in its ability to prioritise customers in terms of recovery because it doesn't adequately understand the requirements and dependencies of its customer base. Additionally, the organisation is only just beginning to appreciate the range of hazards that it may face and their potential ongoing consequences for the business.

"During the workshop it became apparent to the participants that [CS10] has limited knowledge regarding the prioritisation of services to customers…Currently, if [CS10] were faced with the partial restoration of services to customers, the organisation has no systems in place to do this task effectively…" Excerpt from final report to CS10.

Despite some significant keystone vulnerabilities, most notably the telecommunications and electricity services, CS10 generally identifies and manages its keystone vulnerabilities well. This is due in large part to the organisations understanding of its operating environment. The organisations principal keystone vulnerabilities include the availability of fuel for its generator and the ability for maintenance for the generator as well as the limited communication of strategic direction throughout the company. The organisation has not yet engaged in planning exercises, but it has performed some planning, and this is an ongoing priority for CS10.

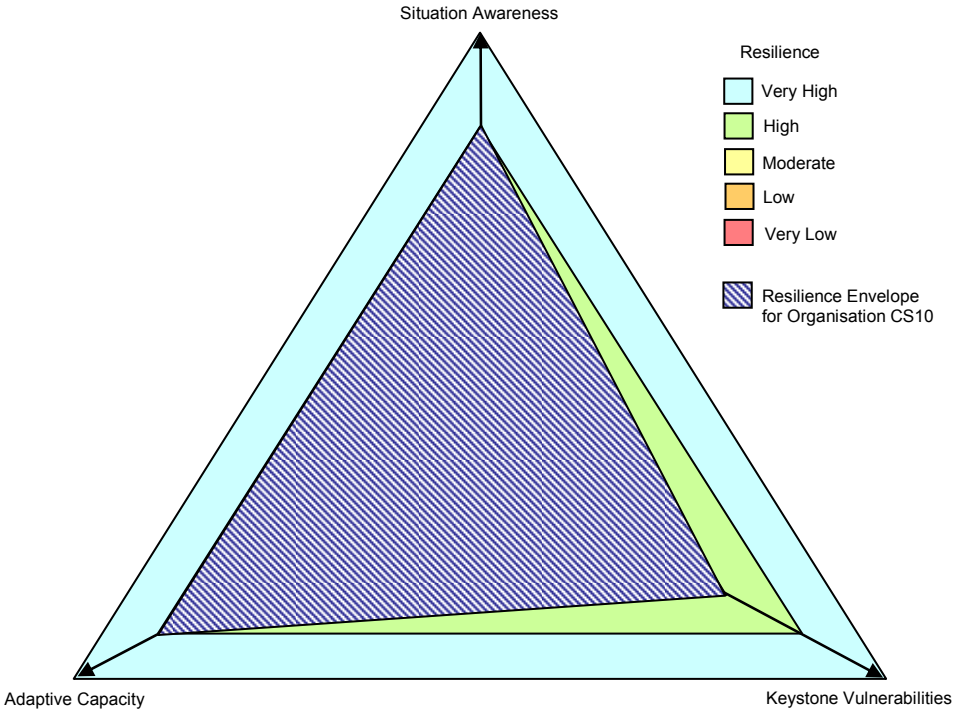


Figure 18. The resilience profile for CS10, the Private Technology Provider.

CS10 has a very high adaptive capacity based around the culture of the organisation, a strong balance sheet and financial stability as well as excellent communications internally, and good communications externally. CS10 does identify a lack of a strategic direction being clearly articulated in the organisation, leading to a 'fighting fires' mentality when dealing with crises.

6.12 Results of the Case Study Organisations

The results of each case study have been introduced in this chapter and each organisation has been assigned a resilience profile that summarises its relative overall resilience at the time of the study. A simple ranking system has been used in conjunction with the resilience profiles to give each organisation in the study a composite resilience score. Table 9 shows the composite scores for each organisation and the results are discussed below.

It is important to note here that detailed final reports were sent to all of the case-study organisations, other than those who did not participate in the workshop processes before the production of this thesis. These reports highlighted the resilience issues to arise from the 5-Step process and were specifically tailored to each organisation. In addition, a detailed action plan was created in conjunction with the organisation to address the identified resilience issues.

Table 9. A summary table showing the relative rankings and associated scores for each organisation in this study, together with a composite ranking of total resilience.

Case-Study Organisation	Level of Situation Awareness	Management of Keystone Vulnerabilities	Degree of Adaptive Capacity	Overall Resilience
CS1	Moderate	Low	Moderate	Moderate
CS2	Low	High	Moderate	Moderate
CS3	High	Very High	High	Very High
CS4	High	Moderate	Moderate	High
CS5	Low	Low	Low	Low
CS6	Moderate	High	Very High	High
CS7	Low	Very Low	Moderate	Low
CS8	Moderate	Moderate	High	High
CS9	Very High	Very High	Very High	Very High
CS10	High	Moderate	High	High

The organisations were analysed for patterns of resilience by looking at the different organisation selection criteria previously discussed in Chapter 3 and comparing relative overall resilience scores for each category (Appendix F). The categories included the distribution of the organisation's offices (local, national, international), the distribution of the supply/customer network (local, national, international), the size of the organisation (number of full time employees), the expected relative dependence on people or other resources, the type of organisation (private, public, lifeline, government) and the sector (primary, secondary, tertiary, quaternary). Unsurprisingly, given the small sample size of organisations in this study and the intention to select organisation as diverse as possible, there were no observable patterns in the resilience information. It is beyond the scope of this study to look in depth at particular types of organisations or industries or business sizes etc and determine relative resilience. However it may be possible to apply this methodology to a larger sample size within an organisational group and possibly establish some quantifiable metrics for assessing resilience. The merits of this will be discussed in Chapter 7.

6.13 Summary and Conclusions

Each organisation in this study was investigated individually to discover the key resilience issues relevant to that organisation. This information has been summarised in this chapter and the results presented as a relative overall resilience profile, comparing each organisation against the others in the study. Comparison of the profiles shows no observable pattern in overall resilience for a variety of categorisations; number of employees, industry sector, size, geographic distribution etc. This is no surprise as the organisations were selected to represent the greatest diversity possible and to ensure that resilience issues identified were applicable for all organisations.

7 IMPLEMENTATION STRATEGIES AND FUTURE WORK

7.1 Introduction

A set of 15 resilience indicators have been identified from the case study information. Each of these indicators relates specifically to one of the attributes of resilience: situation awareness, keystone vulnerabilities and adaptive capacity. The description of the indicators is presented in Chapter 5.

A key point to note regarding the resilience indicators is that they should not just be considered in isolation. Several indicators are intrinsically linked and highlight the relationship between situation awareness, keystone vulnerabilities and adaptive capacity in addressing overall resilience in organisations. Identifying some of the relationships between the indicators is the first step to developing effective implementation strategies for organisations seeking to improve their resilience. Table 10 shows a matrix of the resilience indicators and illustrates which indicators appear to be influenced by, or have influence over other indicators. A full statistical analysis of this information was outside of the scope of this research given the largely qualitative nature of the data. Future work would ideally investigate these relationships more definitively using factor analysis and verification.

Table 10. A matrix showing the relationships between each of the resilience indicators.

	SA_1	SA_2	SA_3	SA_4	SA_5	KV_1	KV_2	KV_3	KV_4	KV_5	AC_1	AC_2	AC_3	AC_4	AC_5
SA_1	✓			✓				✓	✓	✓	✓	✓		✓	✓
SA_2		✓		✓	✓	✓	✓	✓	✓						✓
SA_3			✓		✓		✓	✓	✓	✓	✓	✓		✓	
SA_4				✓	✓	✓		✓	✓	✓			✓		
SA_5					✓	✓	✓	✓	✓			✓	✓	✓	✓
KV_1						✓	✓	✓	✓	✓		✓	✓	✓	✓
KV_2							✓	✓	✓	✓		✓	✓	✓	✓
KV_3								✓		✓	✓	✓			✓
KV_4									✓	✓	✓	✓		✓	
KV_5										✓	✓	✓		✓	
AC_1											✓	✓		✓	✓
AC_2												✓	✓	✓	✓
AC_3													✓	✓	✓
AC_4														✓	✓
AC_5															✓

In developing strategies for addressing organisational resilience it is important to provide tangible, economic and effective outcomes. A key issue in this study was engaging organisations and making the concept of resilience an attractive and attainable goal, not just another imposed process that involves a lot of time, effort and, critically, human resources. Another important point to communicate to organisations is that developing resilience in day-to-day business will improve the performance in the event of a crisis or emergency. For example, the ability of organisations to develop effective communications structures, increase their awareness of stakeholders limitations and expectations, invest in emergency exercises and planning, together with clarifying recovery priorities and enhancing the effectiveness of governance structures. An organisation investing in developing these is very likely to improve its ability to conduct business in both crisis and non-crisis times. This is somewhat of a paradox because the way that organisations operate in response to a crisis is different to that for business as usual situations. The strategies included in this chapter are designed to improve the ability of an organisation to respond to a crisis by

improving the performance of critical areas of the business that will impact on the effectiveness of its emergency response and thereby increasing overall resilience. Additionally, this chapter discusses the use of the 5-Step process as a vehicle for beginning the resilience process and encouraging its development in organisations over the longer term. This chapter also explores some of the future work identified as a result of this study and its outcomes.

7.2 Strategies for Improving the Management of Organisational Resilience

At the end of each case-study, a set of resilience recommendations were produced; partially created in conjunction with organisations during the workshops. These are called Action Plans and indicate where the greatest issues for organisations lie in terms of developing resilience. The Action Plans form the basis of the resilience management strategies suggested in this study. Table 11 shows which of the resilience indicators are addressed in each of the following strategies and highlights that by using all of the strategies proposed below, an organisation can effectively target each of the resilience indicators.

7.2.1 Communications Strategy

A communications strategy for organisations targets the creation and maintenance of effective and respectful communications and relationships with all stakeholders, internally and externally. This strategy is broken down into units that address selected resilience indicators namely SA_1, SA_3, KV_3, and $AC_{1\text{-}5}$.

7.2.1.1 What Do Others Here Do?

In order to address issues relating to roles and responsibilities, improve the negative aspects of silo mentality and improve communications, relationships and the flow of information, it is important to understand who does what in the organisation and who might replace them. This includes identifying those employees with key skills and specialist knowledge who are likely to be important for a range of different crisis types, and ensure the maintenance of those skills and knowledge over the long term.

Organisations can create semi-formal succession plans based on the sharing of roles and responsibilities between departments and even offices. These may take the form of short term secondments or the inclusion of identified key staff in emergency planning and crisis communications exercises (see Section 7.2.3) to facilitate sharing of knowledge.

7.2.1.2 Leadership and Governance

An important part of leadership in a crisis is the ability for all key decision makers to have an equal voice. This research showed that having an equal voice does not always come naturally for organisations and teams and individuals can use emergency exercises to help develop this ability. Different members of the decision making team can take on the primary communications and leadership roles and practice succession of leadership and governance in an organisation. This also helps to break down silo mentality across departments and between decision makers.

7.2.1.3 Keep in Mind the Bigger Picture

For all staff, it is critical to clearly delineate the organisational goals and objectives, how the organisation intends to achieve these in various crises and what are the organisations minimum operating requirements. These then need to be communicated to all employees to ensure they essentially have the same goals and vision for the organisation. Staff engagement surveys and regular exercises can be used to help decision makers target groups that may not have an adequate understanding of the organisational vision, and also encourage staff to consider their own roles in achieving this in an emergency.

7.2.1.4 Stakeholder Welfare

An organisation should continue to develop a clear understanding of the expectations, obligations and limitations for both itself and of key stakeholders. This can be achieved by employing staff surveys, encouraging the development of discussion groups across the organisation, and engaging in specific pre-crisis communications with key customers, suppliers, consultants etc. As part of the communications with external stakeholders, an organisation may consider discussing preferential service agreements with consultants and suppliers, or engage in performance guarantees with key customers or clients. Creating clear and effective communications pathways with stakeholders will improve relationships, improve information flow and the quality of information and break down negative impacts of silo mentality. It will also increase the awareness of stakeholder groups throughout the organisation and improve loyalty and commitment to the organisation.

Table 11. A table showing which of the resilience indicators are targeted by the proposed resilience management strategies.

	Resilience Management Strategies		
Indicator	Communications	Business Resources	Emergency Planning
SA_1	✓		✓
SA_2		✓	✓
SA_3	✓	✓	✓
SA_4		✓	✓
SA_5		✓	✓
KV_1			✓
KV_2			✓
KV_3	✓	✓	✓
KV_4		✓	✓
KV_5		✓	✓
AC_1	✓		✓
AC_2	✓		✓
AC_3	✓	✓	✓
AC_4	✓	✓	✓
AC_5	✓		✓

7.2.2 Business Resources Strategy

A key part of developing resilience is for organisations to have a clear understanding of what resources they have available to them and what is required to meet minimum operation functions. In order to achieve this, an organisation must also develop its awareness of the range of events and the potential consequences

it is exposed to. The business resources strategy addresses this from a physical and human resources perspective and targets resilience indicators SA $_{2\text{-}5}$, KV 3-5, and AC3 and AC $_{4}$.

7.2.2.1 What could hit us and how bad could it be?

Often looking at hazard events from a traditional risk viewpoint creates an incomplete picture of the threats to organisations. There are always going to be events that cannot be prepared for because they have not been identified. Or there are hazards that are of paramount importance because, despite their low probability of occurrence, the outcomes are entirely unacceptable for organisations. Additionally, some events occur together, or one event triggers another resulting in cascading failures which may not even originate with the organisation in question. Therefore, it is critical that organisations engage in identifying the range of hazards that pose a potential threat and their consequences together with identifying the opportunities that may arise. Additionally, looking at resilience from a consequence based perspective rather than looking at individual hazards enables organisations to address specific outcomes when developing planning strategies. These outcomes may arise from a wide range of hazards which can simplify the planning process.

7.2.2.2 What are we all about?

It is critical for organisations to accurately spell out what their strategic vision for the future is, and if possible, how it intends to achieve this broadly speaking. Not only is this important for day-to-day decision making in a complex environment, but in crises it is the ability to look forward and have something to work towards that assists an effective response. This is only achievable if all employees, and even critical external stakeholders, also have a clear view of where that organisation is intending to head. This is crucial for effective leadership and decision making, particularly in an emergency situation. In addition, an organisation must then clearly identify its principal business functions and its minimum operating requirements. This is likely to include recovery priorities.

7.2.2.3 What do we have at our disposal?

Once an organisation has a good awareness of the range of threats and their expected consequences and has established its essential functions, it can then identify the resources needed to maintain those functions in a crisis. Essentially this involves a business impact assessment looking at buildings and other structures, contents and security issues, critical services and where the organisation would conduct an emergency response from. This also involves what would be required to facilitate and maintain operations from a remote location if this was desired or required. Physical resources may also involve an inventory of what services and equipment could be provided by external stakeholders and considering how to secure those in a crisis. This is likely to include insurance issues.

In identifying minimum operating requirements it is critical to also identify the individuals and groups who are responsible for achieving these. Organisations should be aware of what staff limitations may be in a crisis, what additional human resources may be available, as well as how to engage with employees and

with external stakeholders to assist in meeting minimum operating requirements. Many of the points already highlighted in the communications strategy can also be employed to assist here.

7.2.3 Emergency Planning Strategy

Developing resilience in an organisation goes hand in hand with developing some emergency planning strategies to assist in getting over the trauma of an event and quickly towards recovery. This strategy incorporates the most important aspects of emergency planning for organisations and it addresses all of the resilience indicators.

7.2.3.1 Response to Crises

Organisations need to consider some basic principals when developing emergency plans. Firstly they need to identify key individuals who might be required in different types of emergencies, ensure that contact details for these people are readily available and updated and that they are aware of their potential input. There should also be a system in place for the rostering of staff and broad knowledge of stand- down periods. Secondly, a pre-arranged meeting place and an alternative should be selected. Organisations should also establish a protocol so that staff know who should meet, when, and where and what alternatives will be available. Thirdly, organisations should ensure that all staff have some degree of personal preparation both at home and at the workplace. Finally, an effective protocol for deciding what information to communicate to stakeholders is required together with alternative strategies for how this may be achieved in different events.

7.2.3.2 Recovery from Crises

As organisations move into a recovery phase there is a different set of requirements that will be critical. Firstly, organisations should consider how they stand-down from an emergency response, what the leadership structure will be and how stakeholders will be informed. Secondly, there should be an ongoing survey of the organisation, its operating environment and markets to see if the organisational vision and strategic plan are still applicable moving forward into recovery. Thirdly, organisations should have a good understanding of what external assistance may be available, and the details of business interruption insurance. This also involves a clear awareness of the limitations of external organisations to provide assistance following a large scale event in a time frame that is appropriate for the organisation. Finally, there is often going to be long term, ongoing issues in terms of stress and trauma for employees following a crisis and the organisation should consider how it can monitor the health of its workforce and meet ongoing requirements of assistance.

7.2.3.3 Exercises

Planning for emergencies is only effective if the plans actually work. It is critical that organisations engage in training and informing all staff of what is expected in a crisis. Exercising enables an organisation to test its plan, identify aspects that do or don't work as well as expected and raise the level of employee awareness of both hazard consequences and organisational obligations. Developing a working plan and training and educating staff can also be a significant marketing tool for organisations.

7.3 The 5-Step Process as an Implementation Tool

The 5-Step process detailed in Chapter 4 has been created both as an assessment tool and as a resilience management and development tool. This process can therefore assist organisations to implement the above resilience management strategies. In addition, the scaleable nature of the 5-Step process means that organisations can use it to analyse different departments, groups within the organisations, leadership teams, and even individuals if required. Further, an organisation can use the process to address resilience issues between itself and its key external stakeholders by applying the tools at a multi-organisational scale. The details of how various parts of the 5-Step process may be used to achieve this are discussed below.

7.3.1 Consequence Scenarios

A significant issue for organisations in this study has been the poor awareness of the range of hazards an organisation is likely to be exposed to, and the consequences that result from these hazards. Further, organisations do not have a clear understanding of the relationships between events, or the possible opportunities that could arise. The Consequence Scenarios are a valuable tool when used in conjunction with the above strategies for communications, business resource prioritisation and emergency planning. As previously mentioned above, often organisations find it difficult to approach planning from an all-hazards approach. This is somewhat contrary to how many organisations identify risks and is often an onerous task to consider planning for all possible events, or even engaging in planning for the top 10 identified risks.

Therefore approaching planning from a consequence perspective, in conjunction with traditional risk identification and management practices, is valuable. Organisations can still engage in traditional risk management and conform to current risk management standards. However, they can also look at these risks from the perspective of their broad consequences and then create resilience management strategies to address these rather than plan for every possible risk. This also enables organisations to address the consequences of events that they may not have previously identified. Often a range of hazards will have similar consequences therefore planning on a consequence based platform can be more economical and practical for organisations.

7.3.2 Keystone Vulnerabilities and Matrices

The value of identifying keystone vulnerabilities and the use of the vulnerability matrix is also important for the implementation of the resilience strategies outlined above. Organisations can utilise the above strategies to identify the most important components for various types of events and consequences, and then isolate those that present the greatest threats and opportunities. At present the vulnerability matrices are only produced on a qualitative basis and in order to provide more value there is a need to quantify this process. This is explored in Section 7.4.1.2. Additionally, as mentioned in Chapter 4, the vulnerability matrices are potentially valuable for organisations wanting to plan for particular events such as a pandemic or as demanded by clients, for example. The use of the susceptibility information from the self assessment can be used to clearly identify the keystone vulnerabilities for a particular event, and provide the organisation with a more specific target for planning. This technique can also be used as a marketing strategy to illustrate to (potential and existing) clients and customers the advanced ability of the

organisation to identify and address its keystone vulnerabilities. Finally, the vulnerability matrices and assessment process can spark considerable debate regarding the prioritisation of issues, and this can be viewed as a positive step to improving communications pathways, the flow of knowledge and the break down of silo mentality in an organisation.

7.3.3 Readiness Exercises and Disaster Simulations (REDS)

During this study, the value of the REDS was significant for organisations in improving their situation awareness, allowing the identification and experience of keystone vulnerabilities together with advancing adaptive capacity. The simple structure of the REDS is a strength and it is a technique that is flexible enough to meet an organisations time limitations and still provide value. The importance of exercising was highlighted as a resilience indicator (KV_2, See Chapter 5) and REDS offers an effective tool to help organisations facilitate this. REDS can be used at all stages of the resilience management process, from planning, through testing of the plan, and then to implementation and ongoing training of staff. REDS can also be used to assist the management of resilience issues at a variety of scales, and explore team dynamics and leadership qualities within specific teams of individuals. They can also be used to increase the awareness and shared objectives of different organisations that require a close working relationship in day-to-day situations and in crises.

7.4 Future Work

This research has highlighted some areas for future work to further improve the knowledge of resilience in organisations and develop better strategies for implementation and some suggested areas for future research are discussed below.

7.4.1 Quantification of Resilience Measures

A potential weakness of this study is that it only offers a qualitative assessment of resilience for organisations. The following discussion explores how the information from this study could be modified to offer organisations a semi-qualitative or fully quantitative assessment of resilience. The reasons for organisations seeking such an assessment is for a more standardised assessment of their operations and strategies against other organisations, possibly in the same industry, for a competitive advantage as well as for corporate social responsibility. The value of this is significant from the perspective of individual organisations, but also from a wider community perspective; this would potentially encourage organisations to become more resilient and increasingly resilient organisations are likely to contribute to more resilient communities.

7.4.1.1 Benchmarking of Resilience Indicators

The identification of resilience indicators in this study is significant. Benchmarking of these indicators is the next step to increasing the applicability and robustness of this process, and providing organisations with a standardised measure of resilience. Future work is likely to include a detailed analysis of the components for each resilience indicator and establish metrics for assessing them across organisational boundaries.

This would include a better understanding of the range of performance for each indicator; what does a top performing organisation in each indicator look like compared to a poorly performing organisation?

7.4.1.2 Quantification of Keystone Vulnerabilities

As outlined in Section 7.3.2, there is a need to quantify keystone vulnerabilities for organisations. Organisations that identify their keystone vulnerabilities are likely to need a more structured approach to prioritising them, and a quantifiable model would assist in this process. Additionally, it is important that the process is standardised across an organisation (between groups or departments or offices) and this may also allow comparison of keystone vulnerabilities for organisations in the same industry or sector. Potentially, this may present a way for organisations to highlight industry wide problems, and offer a way to measure any policy implemented to address them.

7.4.2 Resilience Maturity Models

In order for resilience management techniques to work on a wider scale than in this study, there needs to be a more detailed understanding of how these techniques lead to more mature organisations in terms of resilience. The case-studies offer an insight into what a highly resilient organisation may look like compared to an organisation that has low resilience. However, for resilience management strategies to be appealing to organisations there needs to be a measure of improvement. Organisations need tangible evidence that they are moving forward in their resilience management strategies, and be able to promote this as an organisational strength. It is likely that resilience will need to be assessed in organisations that have had experience with managing large scale disasters both successfully and not so successfully. Given that the New Zealand context is relatively devoid of any such events in the recent past, this will need to be done from an international perspective. This will have the added benefit of increasing the knowledge of how cultural differences impact on organisational resilience and may have relevance given the multi-cultural nature of New Zealand society.

7.4.3 Communication of Resilience

One of the biggest problems for the implementation of resilience management strategies into organisations is effectively communicating the need for the strategies. Additionally, for those organisations that do choose to engage in resilience management, ensuring that the strategies are adequately communicated within the organisation is important. Future work could include research into how to best ensure that resilience management is implemented and what the barriers are likely to be to this process.

7.4.4 Resilient Sectors

This research has concentrated on a number of different industries and organisational types to identify common resilience indicators. As seen in Chapter 6 and in Appendix D, there are presently no apparent patterns to the degree of resilience for different industry sectors of types and sizes of organisation. Future work could address this by looking at various sectors, for example critical infrastructure, and determining what is the range of resilience in these organisations. Sectors could be compared against one another to identify which sectors are likely to need more attention in terms of resilience management from a policy

perspective. Additionally, a strength of the methodology developed in this study is that it can be scaled to meet the requirements of the assessment. Therefore, it is possible to use this methodology to look downwards into individual sectors, or upwards to look across sectors, and potentially to look at governing bodies and agencies.

7.4.5 Resilient Leadership

Another key area of organisational resilience is the influence of leadership, both in times of crisis and during day-to-day business. This may be more relevant for smaller organisations where the resilience of the owner/operator may constitute the majority of the organisations resilience. Some interesting questions arose during the case-studies that have relevance in future work on resilient leadership. How heavily does an organisation lean on a highly resilient leader, and what happens to that organisation if this leader is removed? What influence does the leadership have on the 'personality' of the organisation? How can engagement between leadership and staff be improved to enhance overall organisational resilience? What is the link between a resilient individual and a resilient organisation? As discussed in Section 7.4.4. the methodology developed in this study is scalable, and therefore could be used to assess the resilience of individuals or small leadership teams within organisations.

7.5 Summary and Conclusions

The identification of resilience indicators that are common to all of the organisations in this study has been used to propose resilience management strategies and approaches for implementing them. Three resilience management strategies are proposed; a communications strategy, a business resources strategy and an emergency planning strategy. Table 8 illustrates which of the resilience indicators is addressed by each strategy. The tools with which to assist implementation of these strategies are also discussed. The value of the 5-Step process (Chapter 4) is considered, particularly the consequence scenarios, the vulnerability assessments and matrices and the Readiness Exercises and Disaster Simulations (REDS). Finally, a discussion of future work explores how further research can be targeted to address some of the key issues to arise from this study. These include a need for a more standardised measurement of resilience by benchmarking resilience indicators and quantifying keystone vulnerability assessments. Additionally, future work could target resilient leadership, resilience maturity models, communication of resilience strategies and detailed assessment of resilience in various industry sectors or across governing bodies.

8 SUMMARY AND CONCLUSIONS

8.1 Overview

This research project has investigated the resilience of organisations in New Zealand. The following chapter outlines this study, and offers a synthesis of the information included in the previous chapters. This chapter looks at the definitions developed during this project and upon which much of this research is based. The methodology is introduced and how that methodology has been used to gather information is explained. The organisations that participated in this study are briefly described and the resilience indicators generated from the case study information are also described. Finally, there is a short discussion of the proposed strategies for addressing the resilience indicators in organisations and possible methods of implementation.

8.2 Definitions

The definition of organisational resilience developed in this study is specific for organisations, and has originated as the result of a detailed review of relevant literature and from discussions with the case study organisations. Organisational resilience is defined as a function of the situation awareness, keystone vulnerabilities and adaptive capacity of an organisation in a complex, dynamic and interdependent system.

The attributes of resilience introduced in this definition also warrant some clarification. Situation awareness is a measure of an organisations understanding and perception of its entire operating environment. This is the ability of an organisation to look forward for opportunities, identify crises and their consequences accurately and also understand the trigger factors for crises. It also includes the organisations awareness of the resources it has available, its minimum operating requirements and the expectations, obligations and limitations in relation to its community of stakeholders, both internally (staff) and externally (customers, suppliers, consultants etc).

Keystone vulnerabilities define those aspects of an organisation, operational and managerial, that have the potential to have significant negative impacts in a crisis situation. These may relate to specific tangible organisational components such as buildings, computers and individual managers but these may also be less tangible components such as relationships between key groups, communications structures, and perception of the organisational strategic vision. The impacts of keystone vulnerabilities may be either catastrophic (occur suddenly and take the failure of only one component to have a significant negative impact) or insidious (small failures of key components lead to a large scale cascading failure). It is important for organisations to also have a clear understanding of the links between components and the vulnerabilities that may arise from these also.

Adaptive capacity is a measure of the culture of the organisation that allows it to make decisions in a timely and appropriate manner both in day to day business and also in crises. Adaptive capacity considers aspects of an organisation such as the leadership and decision making structures, the flow of information and knowledge and the degree of creativity and flexibility that the organisation promotes or tolerates.

8.3 Methodology

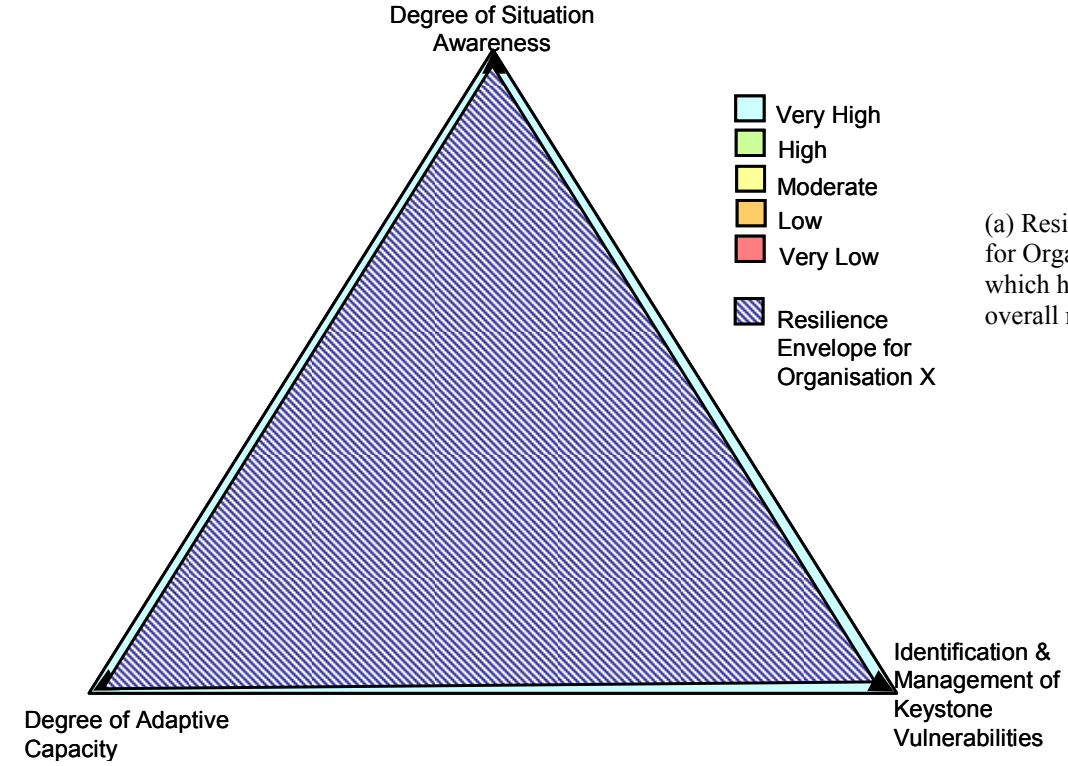
The methodology used in this research follows that of a multiple case study analysis. The main research question forming the basis of this study is 'what are the key resilience indicators that are common to all organisations'? Ten case-study organisations have been selected to represent the widest possible diversity in terms of organisational size, sector, market distribution, type and location including private and public utilities, an education provider, a small technology provider and a rural local authority. The organisations were studied individually using a 5-Step process developed during the study and designed in conjunction with the organisations themselves. Table 12 outlines the 5-Step process.

A Grounded Theory method has been used to analyse the information for each case-study organisation and also used to assist in collating information across the organisations.

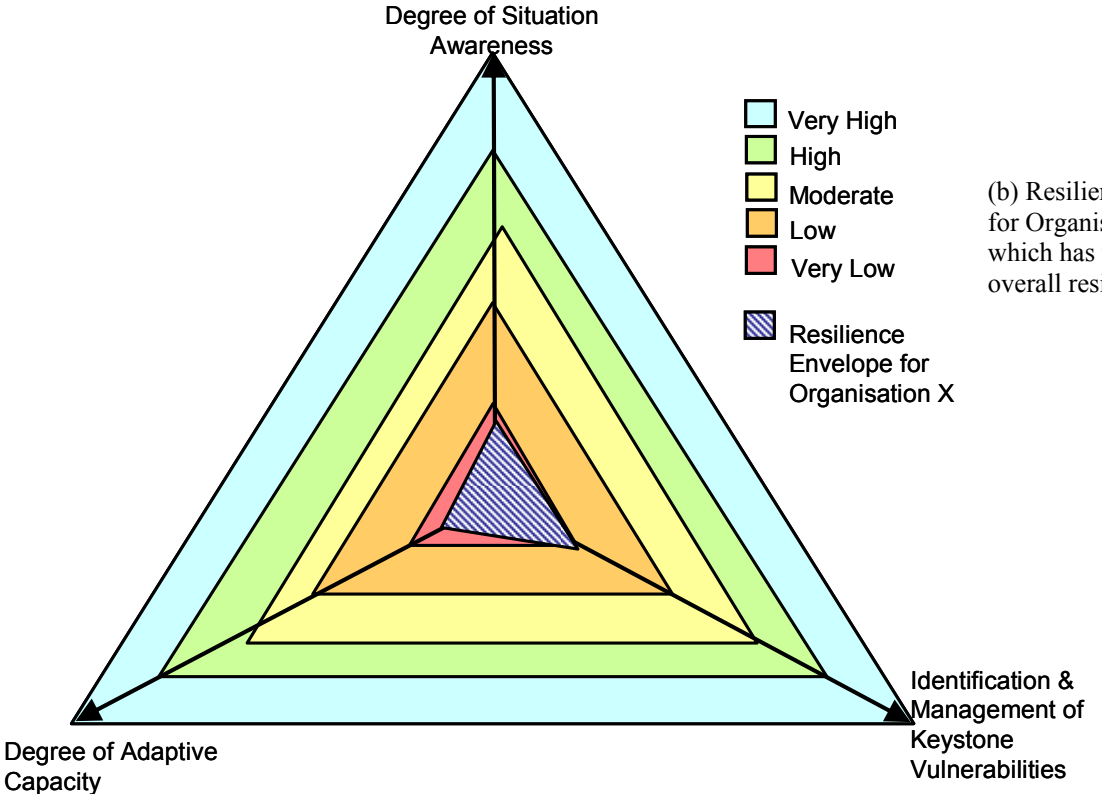
A resilience profile was developed to assist organisations in visualising their overall resilience and to help identify the location of any weaknesses and the prioritisation of resources for further resilience management. The resilience profile is assessed on qualitative scales of measurement, ranging from none to very high. Collation of qualitative data is performed by giving each increment of resilience a numerical value (none = 0, low = 1…very high = 5) which are then multiplied to give an overall resilience rating. Figure 19 shows two sample vulnerability profiles; profile (a) shows a very resilient organisation which rates very highly for all three attributes of resilience while profile (b) shows an organisation with less resilience. Table 13 shows the relative levels of situation awareness, identification and management of keystone vulnerabilities and adaptive capacity, together with overall resilience for each of the case-study organisations.

Table 12. Details of the 5-Step process and the attributes of resilience that are addressed by each step.

Step	Details
Step 1	**Interviews, Surveys and Reports** Open ended interviews with key staff to gain a detailed understanding of the organisation in question. Interview data is collated and a discussion document issued together with an anonymous survey to help validate the information. A final report is also issued. **Consequence Scenarios** A set of four scenarios that help organisations to visualise the types of events and the expected consequences they may be exposed to. These are also used to encourage organisations to look at the opportunities in different types of events and to see the critical linkages between event types and their consequences.
Step 2	**Organisational Components** The collation of a set of components that broadly represent the organisation at a pre-selected scale of study. This is a quick systems mapping exercise and helps the organisation to identify its key functions and systems together with the potential links between them. This may be scaled to suit the organisation.
Step 3	**Vulnerability Self-Assessment** The organisational components in Step 2 are assessed by the organisation according to their criticality for continued operations and the degree of preparedness the organisation believes it has in the event of their failure. Assessments are performed initially from an all-hazards perspective for both the response phase and recovery phase of a crisis. Additionally, an assessment for susceptibility may be performed to determine the variation in influence of components relative to specific events or types of events.
Step 4	**Vulnerability Matrices** A visual tool modelled on traditional risk matrices (AS/NZS 4360: 2004) that enable organisations to identify their keystone vulnerabilities and determine priorities regarding which components should be addressed first from a mitigation perspective.
Step 5	**Readiness Exercises and Disaster Simulations (REDS)** A desktop exercise whereby key employees participate in a simulated crisis event and develop tangible action plans to address critical issues. This exercise also improves situation awareness and allows participants to experience keystone vulnerabilities in a simulated situation, as well as developing adaptive capacity skills.



(a) Resilience profile for Organisation X which has very high overall resilience



(b) Resilience profile for Organisation X which has very low overall resilience

Figure 19. Resilience profiles highlighting the difference between an organisation that is very highly resilient overall (a) and one which displays a very low overall resilience (b).

Table 13. Overview of the case-study organisations and the relative degrees of resilience determined for each.

Organisation		Resilience			
		Situation Awareness	Keystone Vulnerabilities*	Adaptive Capacity	Overall Resilience**
CS1	Private Manufacturer	*Moderate*	*Moderate*	*Moderate*	Moderate
CS2	Rural Local Authority	*Low*	*High*	*Low*	Moderate
CS3	Private Contractor	*High*	*Very High*	*High*	Very High
CS4	Public Utility	*High*	*Very High*	*Moderate*	High
CS5	Education Provider	*Low*	*Moderate*	*Low*	Low
CS6	Private Wholesale Distribution	*Moderate*	*High*	*Very High*	High
CS7	Private Utility	*Low*	*Low*	*Moderate*	Moderate
CS8	Private Retail	*Moderate*	*Moderate*	*High*	High
CS9	Primary Producer and Manufacturer	*Very High*	*Very High*	*Very High*	Very High
CS10	Private Technology Provider	*High*	*Moderate*	*Very High*	High

** Represents the identification and management of keystone vulnerabilities in the organisation*

***Overall resilience is determined relative to the other organisations in this study.*

8.4 Resilience Indicators

A set of 15 resilience indicators have been identified in this study. These indicators identify common issues of resilience for all of the 10 organisations in this study. Each of the indicators is related to one of the three attributes of resilience that are described in Section 8.2 above; situation awareness, keystone vulnerabilities and adaptive capacity. Each organisation has been analysed to provide a relative estimate for each indicator which are in turn collated (see Section 8.3) to provide the overall estimate of relative overall resilience presented in Table 13. Table 14 shows each of the resilience indicators, their governing resilience attribute and a brief description of what features in the organisations contribute to them. It is important to note that there are several intrinsic relationships between resilience indicators, just as there are key relationships between the attributes of resilience. For example, indicator SA_1, roles and responsibilities are governed by the attribute of situation awareness. However, there appears to be a link between SA_1 and other indicators, for example KV_5: organisational connectivity, AC_1: silo mentality, AC_2: communications and relationships and AC_4: information and knowledge.

Table 14. A summary of the resilience indicators representing key issues for all organisations in this study.

Attribute	Resilience Indicator		Description
Situation Awareness	Roles & Responsibilities	SA_1	Awareness of roles and responsibilities of staff internally in an organisation and the roles and responsibilities of the organisation to its community of stakeholders
	Hazards & Consequences	SA_2	Awareness of the range of hazard types and their consequences (positive and negative) that the organisation may be exposed to.
	Connectivity Awareness	SA_3	Awareness of the links between the organisation and its entire community of stakeholders, internally (staff) and externally (customers, local authorities, consultants, competitors etc.)
	Insurance	SA_4	Awareness of the obligations and limitations in relation to business interruption insurance and other insurance packages that the organisation may have or have available.
	Recovery Priorities	SA_5	Awareness of the minimum operations requirements and the priorities involved in meeting those requirements, together with expectations of key stakeholders.
Keystone Vulnerabilities	Planning	KV_1	The extent to which the organisation has participated in planning activities including risk management, business continuity and emergency management planning.
	Exercises	KV_2	The extent to which the organisation has been involved in external emergency exercises or created exercises internally for staff and stakeholders.
	Internal Resources	KV_3	The capability and capacity of physical, human and process related resources to meet expected minimum operating requirements in a crisis. Includes economic strengths, succession and structural integrity of buildings.
	External Resources	KV_4	The expectations of the organisation for the availability and effectiveness of external resources to assist the organisation in a crisis.
	Connectivity	KV_5	The extent to which the organisation has become involved with other critical organisation to ensure the availability of expertise and resources in the event of a crisis.
Adaptive Capacity	Silo Mentality Management	AC_1	The degree to which the organisation experiences the negative impacts of silo mentality and the occurrence of strategies in place for mitigating them.
	Communications & Relationships	AC_2	The effectiveness of communication pathways and relationships with all stakeholders, both internally and externally in day-to-day and crisis situations.
	Strategic Vision	AC_3	The extent to which the organisation has developed a strategic vision for the future operations and the degree to which that is successfully articulated through the organisation.
	Information & Knowledge	AC_4	The degree to which information and knowledge is acquired, retained and transferred throughout the organisation and between linked organisations.
	Leadership & Management	AC_5	The degree to which leadership and management encourage flexibility and creativity in the organisation and how successful decision making is in times of crisis.

8.5 The Case-study organisations

A total of 10 organisations have been analysed in this study. All organisations have had the opportunity to review the information pertaining to them in this research to ensure their complete anonymity. Interviews were conducted with up to three employees at a time, typically over a one hour period and most interviews were digitally recorded. Between four and 21 interviews were conducted with each organisation depending on their size and the availability of participants. A discussion report followed the interviews to present this information to the organisations, together with a proposed set of organisational components for review. A workshop date was determined and all but two of the organisations chose to participate in this part of the research (negotiations are still proceeding with one of these organisations to participate in a workshop at a later date). The workshop ranged from between two hours to approximately four hours depending on the availability and willingness of participants. Workshops provided an opportunity to present and test the 5-Step process and were valuable from a participant observation perspective. Workshops typically involved between 50% and 100% of interviewees.

The data collected for each organisation was analysed and presented to the organisations as a final report, including a set of tangible action plans that were partially developed at the end of the workshop with participant involvement.

The information from each organisation regarding resilience is presented in Chapter 6. Resilience profiles were generated for the organisations upon integration of all the data to offer a picture of resilience relative to the other organisations in the study. Table 10 (page 108) shows the overall information relating to resilience in each of the case study organisations together with a brief description of the organisations for comparison.

8.6 Strategies for Resilience Management

During work with all of the case study organisations a set of tangible action plans were developed with workshop participants forming the beginnings of a strategy for improved resilience management. All of these plans have been collated and the information is presented as three generic resilience management strategies for organisations. They include a resilient communications strategy, a business resources strategy and an emergency planning strategy. They are designed to target all of the resilience indicators in Table 11. The three proposed strategies are described below.

8.6.1 Resilient Communications Strategy

What Do Others Here Do? Identification of key employees and external stakeholders with specialist knowledge and/or skills. Involves a plan of knowledge sharing and awareness building of who has what knowledge and who will replace them if required. This may involve short term secondments or semi formal succession plans to build knowledge and awareness.

Leadership and Governance. Develop the ability of all key decision makers to have an equal voice in a crisis and build an understanding of the individual strengths and weaknesses of decision makers in the organisation.

Keep in Mind the Bigger Picture. Provide clear delineation of the organisations strategic goals and establishing effective means for articulating this vision to all employees. Also, provide further monitoring and ongoing involvement in exercises to ensure that the message is reaching all target groups.

Stakeholder Welfare. Encourage the development and maintenance of policies to ensure a clear and enduring understanding of the expectations and limitations of all stakeholders, internally and externally.

8.6.2 Business Resources Strategy

What could hit us and how bad could it be? Allows a deeper understanding of the range of potential events that the organisation may be exposed to and the expected consequences. This can involve brainstorming exercises, risk identification strategies and scenario creation to build awareness.

What are we all about? Identification of the key business functions, minimum operating requirements and the long term organisational strategy and vision. This is linked to the resilient communications strategy.

What do we have at our disposal? Ensuring that the resources the organisation has available are adequately prepared to meet the requirements of the organisation in a crisis. This may involve an inventory of internal and external resources and their potential limitations.

8.6.3 Emergency Planning Strategy

Response to crises. Crises differ significantly from day-to-day business. Organisations need to develop business as usual resilience which is in turn complimented by emergency response principles for different types of crises. This will include rostering of staff, personal preparedness measures, establishing emergency operations centres and alternatives for crisis communications networks.

Recovery from crises. Recovery is rarely a discrete time frame, so organisations must consider how to stand down from an emergency, what external assistance may be available, how to assess the applicability of the strategic vision for potentially changed markets and environments and ongoing trauma for staff and external stakeholders.

Exercises. Testing plans is vital as is adequately informing and training staff about expectations during a crisis. Exercises can be used to test and modify plans, train employees and engage with key external stakeholders.

8.7 Implementation Issues

The 5-Step process was designed as a resilience management tool as well as being a methodology to assess organisational resilience. The use of the consequence scenarios could provide organisations with a valuable tool to further knowledge and awareness of the range and consequences of events that may be a threat. This is critical for organisations developing the business resources strategy. The consequence scenarios are also useful for the development exercises as suggested in the emergency planning strategy. The consequence scenarios are a useful tool to prompt discussion and debate regarding the degree of impact of particular types of events. This can help the

level of awareness of roles and responsibilities by improving understanding of how badly impacted the organisation may be in different types of emergencies.

The use of vulnerability assessments and matrices together with appropriate selection of organisational components is another valuable tool for organisational resilience. These tools together assist organisations in seeing where their principal weaknesses lie, the vulnerability of the links between organisational components and help to determine management priorities for keystone vulnerabilities. This is important from a communications perspective because different people and groups are likely to have different perceptions about what issues should be addressed first. It also has value from a resources perspective by helping organisations to focus their attention, time and resources on the issues that matter the most. Finally from a planning perspective, it is important that organisations identify their keystone vulnerabilities for both response and recovery.

Readiness Exercises and Disaster Simulations (REDS) offer significant value to organisations for the implementation of the suggested resilience strategies. These encourage participants to broaden their understanding about the skills and knowledge of others in the organisation, help to facilitate successful emergency communications, allow the experience of keystone vulnerabilities in a simulated event and assist in developing decision making skills.

8.8 Future Work

Further development of the methodology would include a more standardised approach to both keystone vulnerability prioritisation and for the measurement of the resilience indicators in organisations. This is likely to require a more quantifiable methodology than is currently available. Further, the extent of resilience in this study is limited to the case-study organisations. Because the researcher did not know prior to this study what a resilient organisation would look like, it is impossible to say if any of the case-studies represent the most or least resilient organisations possible. Future work would include expanding the methodology to look at organisations that have significant experience with large scale disasters, as well as organisations from other countries to investigate the importance of cultural issues in resilience. This also means that further work needs to be done to create maturity models of resilience; organisations need to have tangible and achievable goals in becoming more resilient in order to maintain their engagement with the process.

8.9 Synthesis

The creation of more resilient organisations has some significant implications for improving resilience of entire communities. This study has highlighted a set of 15 resilience indicators that are common to 10 case study organisations, selected to offer a wide representation of organisations in New Zealand. In addition, this study has developed a resilience assessment and management methodology, the 5-Step process. This process has been created in conjunction with the case studies to provide a real world context and offer tangible, achievable goals for organisations seeking to become more resilient. This is hoped to have implications on developing more resilient communities through the increasing resilience of organisations.

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APPENDIX A Summary of interview prompt questions

- What level of knowledge do staff have of their own individual roles and responsibilities in the organisation?
- What level of knowledge do staff have of other's roles and responsibilities in the organisation?
- How much flexibility do staff have in their roles and responsibilities in the organisation?
- What sort of hazards do you think this organisation is exposed to?
- What do you think the consequences of these events would be on the organisation?
- How well can you manage these events and what level of control do you think the organisation has over this?
- What degree of connection does this organisation have with its wider community of stakeholders?
- How well does the organisation engage with and seek to understand its staff?
- What level of business interruption insurance or external aid is available to the organisation?
- How suitable is this for the expected range of hazards and their consequences on the organisation?
- How well do you understand what the wider community is likely to expect of this organisation in a crisis situation?
- How well do you think that other organisations will be able to meet your requirements and demands in the aftermath of various crises?
- How well do you understand this organisation's importance to the community in the aftermath of a disaster relative to other organisations?
- Does this organisation engage in
    - Risk management planning
    - Business continuity planning
    - Crisis management planning
- And is this from an all-hazards or a hazard specific perspective?
- How well integrated are existing planning strategies in the organisation?
- Who or what primarily drives this type of planning in the organisation?
- What does, or should, an emergency management plan look like for this organisation?
- What level of emergency management exercises does this organisation engage in? How frequently?
- What are the principle barriers to participation in exercises in this organisation?
- Are there any plans for alternative offices/space if your main premises are not able to be used?
- How well equipped is your emergency management office if you have one set up?
- How well prepared is this organisation for the loss of internal services such as power, telecommunications, water, sewerage etc.?
- How easy/difficult is it likely to be to engage/retain/recruit or support staff in the aftermath of a crisis?
- How well prepared is this organisation for the impacts on staff during and following a major crisis?
- How easy/difficult is it to retain/recruit staff at present?
- To what extent does this organisation engage in succession planning?
- How well prepared are staff for an emergency where day-to-day operations must continue while the crisis is dealt with?
- To what extent does the organisation have effective organisation wide systems and procedures?
- How do staff feel about using these systems and procedures?

- What is the general financial situation of the organisation?
- What sort of relationships does this organisation have with external organisations, including suppliers, service providers, emergency management organisations etc?
- What are the organisation's expectations of these same organisations in a crisis?
- How much has the organisation thought about the loss of external services and also the restoration of these services following any major outages?
- What specific preparations have been made to maintain and develop good relationships with critical stakeholders in this organisation?
- To what extent does this organisation experience the negative impacts of silo mentality and where does is primarily come from?
- How easily can staff communicate upwards and downwards through the organisation?
- How effective are communications and relationships between:
    - departments, business units, regional/national offices etc?
    - External stakeholders?
- Does the organisation have a strategic vision/mission statement?
    - How clearly is this articulated through the organisation?
    - How closely do day-to-day operations reflect this vision/mission
    - To what extent is this vision likely to impact on the performance of the organisation during and after a crisis?
- What does recovery mean to the organisation?
- Describe the prominent decision making style in the organisation? How effective is this?
- What drives the decision making style and how successful is this likely to be/has already been in a crisis?

APPENDIX B Evolution of the 5-Step Process

The information in this appendix supports the detailed discussion of the 5-step process for assessing and developing organisational resilience presented in Chapter 4. The following discussion outlines how the 5-Step process has evolved and been modified over the course of this study, and how it has changed from CS1 to CS10. This discussion analyses how these steps have been modified and the tools used with each step have developed.

B.1 Step 1: Building Situation Awareness

The consequence scenarios have altered little since the pilot study. The first conception of the scenarios proved to be very successful with the pilot case-study organisation. While there have been no significant iterations of the consequence scenarios since the beginning, there have been some subtle changes in thinking around their application with organisations.

Originally these were called event scenarios or hazard scenarios. It quickly became apparent that this terminology was misleading and did not represent the direction of the research. Consequence scenarios as a name arose from trying to find ways to make the 5-step process attractive to organisations of all sizes and descriptions; including those organisations who have limited resources. As previously mentioned in this chapter, the idea behind looking at consequences rather than events is twofold. Firstly, more than one event type can cause the same or similar consequence for an organisation; likewise different events will necessarily have the same effect for different organisations. Secondly, in terms of providing value for money/time/resources, it is useful to consider how to mitigate the consequences of a number of hazards that have the same effects than trying to curb individual hazard situations.

In addition, there was a time during the study when the structure of the consequence scenarios was debated. Each scenario was looked at from the perspective of what it would 'test' from an organisational perspective. The focus of the scenarios was critically debated and there were/are two schools of thought;

The consequence scenarios represent different scales of consequences for the organisational network whereby the focus ranges from a global influence (scenario 4 - distal) to a local influence (scenario 3 - localised).

The consequence scenarios represent impacts to different aspects of the organisation ranging from physical structures and services (scenario 1 - regional) to human resources (scenario 2 - national).

It became apparent that using the scenarios to 'test' aspects of the organisation specifically was inappropriate; it did not allow for enough flexibility with the variety of organisations that this study included and would not add as much value to organisations in terms of improving resilience. Therefore the approach of using the consequence scenarios to represent different scales of consequences for the organisation in question was favoured and used with all of the case-study organisations.

B.2 Step 2: The Organisational Components

The variety of organisational components used in this study has increased in detail since the pilot case study. The reason for this change has ultimately been from a subtle change in focus of the research; from dominantly operational to a more cultural focus. In addition, following the pilot study, and after interviewing with CS2, it became apparent that there were two distinct categories of components. The difference between internal and external components bought a greater complexity to the analysis, but this distinction also highlighted the importance of organisational connectivity. Further, with the first 2 case studies, the level at which the investigation was pitched was still relatively unknown. While the participants in the workshop for CS1 were all senior department managers, CS2 was represented by people in a greater variety of positions in the organisation. Hence organisational components were selected to represent that variety somewhat. By CS3 it was apparent that the scale of the assessment was critical to the investigation, and from this point onwards, the organisational components were relatively consistent between organisations; while the details varied between case studies, the categories of components remained the same. This enabled, also, a continuity of assessment with each organisation because the level of the investigation was similar for each case-study.

B.3 Step 3: The Vulnerability Assessments

The need for both preparedness and criticality in the vulnerability assessments was identified from the outset of this study. As the study progressed the entirely qualitative measures of criticality and preparedness were questioned. It became apparent that if a metric of resilience was going to be achieved (as part of the Resilient Organisations project) then it a more quantitative measure would eventually be required. The scale of measure for criticality was briefly changed to represent time as a semi-qualitative measure and used with one case study organisation. However, the development of metrics for assessing vulnerability and, more broadly, resilience were seen to be outside the scope of this project. The qualitative measures described in Section 4.4 were therefore favoured over the semi-quantitative measure for criticality.

It also became apparent during this study that some organisations may require a more specific context for the vulnerability assessment. Participants in one case-study organisation found it difficult to visualize the preparedness and criticality of components for the whole range of situations presented in the consequence scenarios; different scenarios could result in different vulnerability assessments. Also, several of the organisations in this study were embarking on planning programs that were targeting specific hazards and some measure of the vulnerability of the organisation to specific events or types of events was needed. The component susceptibility was therefore introduced. In one workshop participants were asked to perform the entire vulnerability assessment, including susceptibility, after the REDS. It quickly became apparent that this offered little in the research as results between organisations could not be compared unless the same event was used in each REDS. Therefore, remaining organisations were asked to perform the criticality and preparedness assessments prior to the REDS and consider an all-hazards perspective. Following the REDS a susceptibility assessment was performed. The changes to the workshop accommodating a more context driven vulnerability assessment are detailed in Chapter 3.

B.4 Step 4: The Vulnerability Matrix

As the method for vulnerability assessment changed, so too did the vulnerability matrix. Initially the vulnerability matrix represented the intersection of criticality and preparedness and followed the broad structure of traditional risk matrices such as ANZS 4360 (2004). With the introduction of susceptibility as an assessment category for vulnerability, it was necessary to change the vulnerability matrix to reflect this context. This change occurred relatively late in the study and was applied with just the final three case- study organisations. While there has been a relatively short period of time in which to test this new structure for the vulnerability assessment and matrix, the response from case-study organisations has been positive. The visual presentation of 'holes' in the matrix, particularly in the higher vulnerability areas of the matrix is a powerful and seemingly instinctual way to conceptualise vulnerability. Additionally, the applicability of the susceptibility assessment to identify keystone vulnerabilities for specific types of events, ones that are currently on the agenda in terms of public pressure, health and safety and/or governmental concerns, is valuable.

With the pilot study the facilitators tried to compile and present a finished vulnerability matrix to the organisation before the discussion of resilience issues in the workshop. This involved a large volume of work in a limited time frame, even for the three facilitators present, and was ultimately unsustainable if only one person was available to facilitate the workshop. In remaining workshops, the vulnerability matrix was presented as indicative only; selected organisational components were assessed and plotted onto the matrix to illustrate the value of the method.

B.5 Step 5 Building Adaptive Capacity

B.5.1 Development of the REDS Methodology

During the pilot study, the concept of crisis exercises was not well developed. At the conclusion of the vulnerability self-assessment the crisis exercise began as a discussion about electricity failure in the organisation. This discussion did not have any predefined structure or plan. Therefore the outcomes of this discussion were more difficult to interpret than for the remaining case study organisations. Prior to the workshop for the second case study, the REDS were developed, much in their present form. The reasons for the development of REDS include:

- To provide the organisations with a practical closure for the resilience workshop.
- To provide the organisations with practical tools for achieving improved resilience outside of this study.
- To allow workshop participants the opportunity to experience some of the key resilience issues identified.
- To provide validation of data collected during the research by means of participant observation.

B.5.2 Participant Selection for REDS

It became apparent during the first REDS that selection of participants for the exercise was very important to the success of the exercise. Additionally, during CS-5 the value of adequately selecting appropriate teams for the REDS became apparent. It is important that facilitators of resilience management consider REDS groupings early on in the process and decide how much they want to challenge the organisation during the REDS. With some of the organisations (CS5 and CS7 in particular) it was difficult to gain buy-

in for the process with some of the workshop participants. With CS5 these people were split up among the groups in the REDS, while in CS7 they were not. In CS5 the participants who were overtly negative about the process quickly engaged with their group and ultimately became very important contributors to overall resilience development in the REDS. In CS7, however, this did not happen and the participants with a negative perspective actually blocked the flow of ideas and information for the group. Therefore the division of participants in the REDS into groups is a critical aspect of the success of the process and facilitators must be very aware of the personalities of individuals and how they might react under pressure, even the simulated pressure of a REDS situation. This was an important development of the REDS for this study.

B.5.3 Flexibility in the REDS Methodology

As the case-study organisations came on board and participated in the study, the flexibility of the process, and in particular the REDS became critical. Because REDS is so important to developing improved resilience in organisations, it was critical that it could be modified and adjusted to fit in with the requirements of the organisations. Examples include:

REDS with CS6 involved a small group of senior executives and it was not possible to split the participants up into separate groups. In this instance, the key decision maker (the CEO) was removed from the exercise and asked to provide the external perspective for the group.

In CS8, the room used for the REDS was too small to enable the group to be broken up, and therefore the REDS was completed with one larger group.

In CS4 and CS9 REDS were not able to be conducted at all; however the researcher was able to directly observe these organisations in their own emergency exercises and use this as a substitute REDS.

In CS10, the smallest of the case-study organisations, the entire workshop including the REDS was cut down in duration to just two hours and this organisation was informed of the scenario event in advance. This was to enable the greatest use of the exercise without using valuable time on a scenario briefing.

For several of the organisations, key decision makers were able to come and go from the exercise, primarily to attend to important business away from the REDS. While this was initially considered a negative for the research, it actually simulated the movement of key individuals in many types of events and was therefore a valuable addition to the exercise.

B.5.4 Alternative Perspectives in REDS

A significant part of the REDS role in increasing situation awareness was addressed by encouraging participants to look at the situation from a different perspective. During the REDS one or two members from each group (depending on the size of the groups) were taken out of the exercise (in accordance with some development in the scenario) and asked to consider the current emergency situation as if they were another stakeholder. Examples of these included; general staff, suppliers, customers, contractors, the Board,

shareholders etc. At the conclusion of the exercise, the findings and expectations of these pseudo-groups were presented.

B.5.5 Advance Knowledge of the Scenario Event

For most of the case-study organisations the actual event used in the REDS was not known to them until the REDS began. The reason for this was to simulate the urgency and panic that accompanies many emergency situations these organisations are likely to face. In CS7, the nature of the event was such that it required some specialist knowledge from the organisation to ensure the scenario was as realistic as possible. Two of the interviewees were consulted to create the scenario. For CS10, due to significant time constraints for the workshop, the event was made known to the organisation in advance. The reason for this was to give the organisation as much time to actually participate in the exercise. CS10 was sent the briefing document of the event prior to the workshop and participants were asked to ensure that they were familiar with the scenario in advance of the REDS.

B.5.6 Selecting Appropriate Events for REDS

One of the biggest challenges for successful REDS is ensuring that the event/s chosen are appropriate for the organisation. It is important to extend the decision makers in the REDS and therefore it is not recommended that events are chosen that replicate previous events. REDS can however be used to simulate events that the organisation is currently planning for; for example it is a powerful way for organisations to test their planning for avian flu in New Zealand. CS7 was the only organisation where the event selected for the REDS was inappropriate, but only for some of the participants. The REDS event for CS7 was developed in conjunction with two staff members in the organisation. However, the event chosen had actually been previously considered by the two most influential decision makers in the organisation, unbeknown to any of the other staff members or to the researcher. Therefore, the engagement of these decision makers in the REDS was limited, and they proved to be somewhat negative and obstructive based on their preconceptions of the scenario. This was unfortunate, but could not be avoided by the researcher.

APPENDIX C The Case Study Organisations

C.1 Introduction

The information presented in this Appendix details the findings from each case study organisation and supports the discussion in Chapter 5. For each of the organisations the discussion is centred on the key issues to arise in terms of situation awareness, keystone vulnerability and adaptive capacity. Supporting vulnerability matrices for each organisation where applicable are to be found in Appendix E. It should be noted that information pertaining to each case study organisation is relevant to the organisation at the time of the study. Several of the case study organisations have since advanced their resilience beyond what is represented in this study.

C.2 Case-Study Summaries

C.2.1 CS1 - Private Manufacturer

The pilot case-study organisation (CS1) is a large organisation in the manufacturing industry with both domestic and international markets.

C.2.1.1 Resilience Issues for CS1

Situation Awareness

The knowledge of roles and responsibilities of staff in different departments is limited and because of specialised skills for departmental staff, there appears to be little movement of staff between departments. More concerning is that senior management do not see any need to know what is happening in other departments. While each department has a (typically informal) succession plan, this knowledge is not extended to other departments, nor is there an organisation wide understanding of how others are likely or expected to act in a crisis.

CS1 has a perception that from an internal perspective it is a low risk organisation although its perception of its external markets and community of stakeholders is different; the external business environment for CS1 is perceived to be high risk. CS1 sees that its internal systems and procedures are adequate to cope given the perception of low risk. There is also poor understanding of hazard events impacting the organisation; one comment from a senior decision maker about an earthquake affecting the area was that 'everything would turn to liquid anyway and we would be toast'. Typically discussion about the likelihood of events showed significant variation in opinion. Also, some of the most senior decision makers in the organisation perceived that there were some events that were entirely un-manageable but this was not a perception that extended to departmental leaders. The organisation appeared to be very focused on managing the causes of hazards (including natural hazards like earthquakes) and had considerably less focus on managing its own response to events occurring.

From a business continuity perspective, there is a poor understanding of the organisations business interruption insurance policy. CS1 decision makers were largely unaware of what length of cover the organisation had, and at what scale of interruption the insurance would take effect. This can impact on the ability of the organisation to adapt to crisis situations; not knowing when or how to move forward, and what would be contractually appropriate in an emergency.

While CS1 has an excellent understanding of the contracts it currently holds, it does not appear to have a clear perception of prioritising these contracts in a crisis. The organisations relationship with local authorities and emergency services (other than the fire department) is understandably limited as CS1 is neither a critical service provider or has experienced a major disaster. However CS1 has a limited awareness of the potential needs of limitations of these organisations in a crisis, particularly in terms of what specialised skills, machinery or products that CS1 has at its disposal.

External communications are a critical component for CS1. The organisation does not fully appreciate that communication links between existing key stakeholders are not the same during day-to-day business as in a crisis. Nor does CS1 fully appreciate that it may have to communicate and work with organisations in a crisis that it would never deal with in day-to-day business. Further, there is a tendency for decision makers in the organisation to look at potential crisis relationships from the perspective of 'what can we get from this relationship' rather than approaching it from a mutual benefit perspective. The organisation has not clearly identified which of its stakeholders (customers, suppliers, competitors etc) are likely to cause the greatest impact on the organisation if they were to collapse or were significantly impaired by a crisis situation. Currently the organisation looks at its external communications during business as normal conditions and assumes that this will be adequate for any crisis that it may face.

Keystone Vulnerabilities

The loss of electricity was identified as major keystone vulnerability for the organisation. Further, consideration of the loss of electricity prompted thinking about what the impacts would be if CS1 also lost other critical services such as water and telecommunications. While the organisation had looked at the cost/benefits of purchasing a backup generator it had been disregarded. However, management appears to be very internally focused and tended to look at hazards that would only affect CS1, not the organisational network. Hence the perception is that the loss of electricity would cause fewer problems than the loss of machinery and specialised technology. The organisation appears to have a limited awareness of the implications of regional damage to the electricity (and other critical services) network, and the length of time this could potentially affect them. Combined with this, the organisation, as previously mentioned, tend to see such large scale events as entirely unmanageable.

A key resilience issue for CS1 is the perception of what an emergency or crisis plan should look like for the organisation. Several interviewees confirmed that they believe it should be a 'magic box' that contains all the answers; a manual of how to deal with a crisis in a step-by-step format. Other interviewees considered that it should be as minimal as possible, listing names and

contact numbers of key individuals and organisations together with some basis protocols and procedures for how to respond in an emergency. This disagreement between some of the key decision makers in CS1 as to how to plan (in addition to what to plan for) is a major obstacle to forward progress in the planning process. Further, the drivers for the organisation to produce emergency planning were identified and also create some division among decision makers. There are a significant proportion of key people in CS1 who recognise that their current drive to create a crisis and business continuity plan derives from wanting to reduce insurance premiums. However, others believe that this external driver is inappropriate for creating a working emergency management plan and that it should be initiated by internal demands and drivers.

Adaptive Capacity

The senior decision makers display some negative silo-mentality tendencies and there is a suggestion that this extends throughout the organisation. General staff report difficulties in communicating with key decision makers at CS1. These difficulties, combined with the lack of understanding regarding the roles and responsibilities of staff in each department, have the potential to cause problems in gathering and disseminating appropriate information in a crisis. Because the different departments all work independently, and there is little overlap between staff and decision makers between departments, there is the potential for decision makers in these departments to be working against one another in a crisis. In some ways, however this is mitigated by the strong organisational vision at CS1.

Further, the communications with some external organisations, including clients, suppliers and consultants have different redundancy depending on the department that manages them. One department in particular is very proactive in ensuring redundancy in its ability to communicate in a crisis; they have produced a credit card sized list of key contacts names and numbers (internally and externally) that is distributed to all staff in their department. However this is not extended through the organisation to other departments.

Another adaptive capacity issue is the strong organisational vision at CS1. The long history of strong and consistent leadership (by the founder) has resulted in a clear organisational identity that permeates throughout the organisation. However, while this can be a significant advantage to an organisation in times of crisis at CS1 it also impacts on the ability of the organisation to find alternative solutions to emergencies. The vision of the future is so strong at CS1 that some key decision makers have considerable difficulty in seeing any other way forward for the business, particularly in the aftermath of a crisis. This is reflected in the organisations awareness that it is slow to change. Additionally, it is reluctant to change, unless absolutely necessary by which point it may be too late to gain any sort of competitive advantage in the market place.

The problems associated with retaining and transferring information throughout the organisation illustrate a further adaptive capacity issue for CS1. The specialised knowledge held by a few individuals at CS1 is not formally collated, retained or transferred to other staff members in the event that this key individual becomes unavailable. Typically, while the key

decision makers in CS1 considered that senior management knowledge was in need of protection and engaged in succession planning to support this, the knowledge held at lower levels in the organisation was largely not protected at all. From time to time this has already affected CS1 during day to day business when a critical employee retired, for example. It is likely that this will be exacerbated during a crisis and may have significant implications on the ability of the senior management to make critical decisions as the flow of information upwards in the organisation is restricted by the loss of critical knowledge.

C.2.2 CS2 - Local Authority

The researcher was approached by CS2 who expressed a strong interest in taking part in the study after reading the Resilient Organisations website. CS2 is a local authority consisting of less than 40 full time staff. This organisation had in the recent past experienced a significant natural disaster which was the impetus for wanting to participate in this study.

C.2.2.1 Resilience Issues for CS2

Situation Awareness

There is a general lack of understanding and awareness of what skills people bring to their positions and a degree of misunderstanding about what responsibilities individual staff members/departments have during their day to day duties. This includes a limited awareness at an organisational level about what the loss of key individuals and key areas of the business would mean for the organisations ability to meet its stated objectives; both in day-to-day business and in times of crisis. In the recent crisis event this translated to people feeling undervalued and under utilised in their allocated roles during the emergency. Local emergency responders in the organisation felt threatened by outsiders coming in to manage the response and recovery in this event. This suggests a lack of awareness of what all stakeholders have available to address the situation, both from within the organisation and from an external perspective.

CS2 has a heightened awareness of recent crisis events. While there is some awareness of the need to better prepare for a range of hazards, not just a repeat of the previous situation, generally staff have a poor knowledge of regional hazards and their associated risks to this organisation and the community that it serves. This extends to an expectation that CS2 will be able to access supplies and resources (including human resources) from outside the region at will. Awareness is increasing about how isolated the organisation may be in the event of some crises (for example, pandemic).

The organisation does not appear to have an accurate awareness of its place in the wider community. CS2 tends to focus on its role as an infrastructure provider for the community. However, the expectations of the community of CS2 are seemingly somewhat different, both during and following a major emergency. The recent crisis event has bought to light some of these different expectations between CS2 and the community, but this perception does not appear to extend throughout decision makers at CS2. Further, CS2 seems to have a lowered awareness of what other

stakeholder groups and organisations in the community can contribute to the response and recovery efforts in a crisis, particularly from a trauma perspective. There is a suggestion that ongoing trauma of the community is something that the organisation is largely unaware of.

Keystone Vulnerabilities

The organisation does not have great clarity about what emergency planning for CS2 means, what or who are the real drivers behind a push to create emergency planning or what resources are likely to be available to the organisation following crises of different types. There are also widespread assumptions in CS2 regarding the role of Central Government in assisting the organisation from a financial perspective following a major crisis event. These assumptions may not be appropriate for all hazard events that the organisation may face.

The availability of buildings from which to operate an emergency response and recovery are identified as a critical aspect for effective emergency management at CS2. This includes the essential contents of the buildings including telephones and computers etc. Further, the physical computer network is keystone vulnerability from both a communications and business continuity perspective. Critical to this vulnerability is ensuring that there are staff or contractors available to repair and maintain the IT network for the organisation. The loss of all critical services including electricity, water, sewerage and transportation networks have a considerable impact on the ability of CS2 to continue operations. This is particularly true for any emergency response or recovery that occurs while CS2 is also trying to maintain its normal business operations. Therefore, the importance being able to maintain non-infrastructure services for the community to assist a return to normality following a crisis event is also identified as keystone vulnerability for CS2.

Related to the poor situation awareness of the roles and responsibilities of staff at CS2 as well as some external stakeholders, the delegation of critical tasks to appropriate people during a crisis is a keystone vulnerability. There is a perception that this has not previously been adequately addressed in previous crises. Therefore, the ability to communicate with external agencies and organisations during a crisis is also a keystone vulnerability for CS2. Currently the importance of this is not clearly understood or recognised by staff at CS2. Additionally, the management of services provided by external agencies in a crisis is limited. This also relates to a poor external communication strategy in the organisation. Succession planning has not been addressed for the organisation and this relates again to a poor awareness of the roles and responsibilities of staff in the organisation, as well as with external agencies and other local government organisations. For example, there is a lack of an established roster for staff in a crisis situation. This was a major problem for CS2 in the recent crisis event and after one year this had not been addressed.

The expectations of the relationship between CS2 and Central Government during and in the aftermath of a crisis are identified as a keystone vulnerability. This, in part, reflects the lowered priority of human resources for emergency response compared to the physical resources (radios, vehicles etc) is a key vulnerability. There is some assumption that CS2 could never fail (in terms of traditional business failure) and that the reason for this is because of the backing of Central Government. The

organisation has not adequately considered the reputation impacts of its failure to meet the expectations of the community it serves, irrespective of the support assumed to be available through the Central Government.

The organisation has a substantial focus on the physical and material resources required for response and recovery in an emergency. This is related to the nature of crises that it has recently experienced (dominated by physical type emergencies). However there is a need to develop the less tangible, more human resource focused aspects of this recovery and response for crises. In addition, there is a need for CS2 to carefully identify which types of agencies and organisations it may have to deal with for different types of crises. Good relationships should be established with these organisations before the occurrence of any emergency. The organisation has done this with the traditional emergency services (fire, police etc) but its network of linked organisations is limited by the nature of the previous event, and CS2 needs to develop a strategy for other types of emergencies.

Adaptive Capacity

There are significant barriers to improving adaptive capacity at CS2 related to poor communications internally. For example staff feel dissatisfaction about the level of responsibility and accountability they have in a crisis event, partially because the reasons for this are not adequately communicated with staff, and because of poor knowledge of staff roles and responsibilities in the organisation. This relates to problems with the transfer of knowledge in the organisation and people with specialist knowledge being overlooked in times of crisis. It also reflects an apparent problem with internal communications processes that do not allow the effective flow of information through the organisation in times of crisis.

The organisation has limited processes available for the transfer of information in a crisis and is highly reliant on the continuation of the physical communications network. Ensuring that the IT network has an inherent robustness in the face of different types of emergency is a critical component in emergency communications and for effective decision making in a crisis. Additionally, retention of knowledge by key staff members is a major consideration for CS2. At the time of this study the organisation had no processes or systems available to preserve the knowledge of staff members retiring or moving to other positions outside the organisation.

The perception by staff of the organisation's relative importance to the community is a limiting factor for adaptive capacity and overall resilience; both for the organisation and the community. The successful recovery of the community is critically linked to the successful recovery of CS2 following a crisis and this link is poorly understood and appreciated by many in the organisation. The organisation needs to maintain a 'finger on the pulse' of the changes in the community both in day-to-day business and in the aftermath of an emergency. There are questions as to whether CS2 could manage its own strategies to meet to significant changes in the business and local community environments following a crisis. Related to this, the organisational ethos promoted by senior management is not as prevalent through the organisation as key decision makers would like

to believe. This has implications for a strong organisational response based on a shared value system and common vision of the organisational purpose. There is little consensus regarding what constitutes effective management and leadership of the organisation in times of crisis.

C.2.3 CS3 - Private Contractor

CS3 is a large private contracting firm. This organisation has a diverse distribution throughout New Zealand. This organisation has actively pursued the learnings from the 5-Step process and extended the concept of resilience. CS3 are developing an emergency management plan for one of their regions with a view that it may become a template for the rest of the organisation. They have also engaged in additional workshops at a variety of levels in the organisation.

C.2.3.1 Resilience Issues for CS3

Situation Awareness

The awareness of roles and responsibilities of staff, predominantly at a regional scale, is limited. The degree of regional autonomy for individual offices may reduce the awareness of what roles other offices, including the corporate offices, have in the overall operation of the organisation. This is reflected in a limited awareness of what the impacts may be if various offices be unavailable for extended periods of time.

CS3 shows a lowered awareness of what the potential impacts might be on its ability to respond to crises in the event key services are lost; particularly electricity, water, sewerage, telecommunications and the transportation network. Additionally, the organisation needs to carefully consider what its minimum operating requirements are, both nationally and regionally and what to what degree does the corporate office contribute to those requirements. However, CS3 does have a very good awareness of its importance in the emergency response network, particularly with regard to a major physical emergency.

CS3 has a good understanding of its position in relation to its community of stakeholders and its responsibility and obligations to those stakeholders. But there is a need for CS3 to consider its external links more carefully, identify which of these offer the greatest benefits and limitations for an effective response and recovery, and to establish pre-crisis relationships with these organisations.

There is a somewhat limited understanding and appreciation of what staff expectations and fears may be in dealing with stressful situations, particularly in times of crisis. There is a good awareness that typically working conditions for operational staff are often difficult due to weather and locality issues. However, what these conditions may mean in terms of staff expectations, and also for office based staff in times of crisis is largely unknown. While there is an assumption that staff will be 'looked after', the ability to pay wages and provide other financial support in a crisis is generated out of the corporate offices. This has not been considered from an emergency management perspective in CS3.

At a regional scale, CS3 has a very good awareness of the need for enhanced emergency preparedness and is currently in the process of establishing regional protocols for crisis planning that can become a template for other regional offices. CS3 has become aware of significant physical hazard risks over time, and the incidence of small scale weather related events have tested the existing emergency preparedness protocols and this has provided the impetus to improve these systems and procedures.

Keystone Vulnerabilities

The vulnerability of supplies, fuel and operational equipment was highlighted in this study including physical damage to these components as well as the human resources needed to repair, maintain and source these components in a crisis. There is the potential for substantial and extended staffing difficulties for some types of events that will have a serious impact on CS3 in this regard. In addition critical services such as electricity, telecommunications, water, sewerage There is a tendency to expect that when emergencies occur, the organisation will only have to deal with the emergency situation and not be expected to continue its day-to-day business at the same time. However, there are likely to be some crises that will require CS3 to both respond to an emergency situation while maintaining the ability to meet its contractual obligations. Therefore, CS3 needs to ensure that it has a pre-planned strategy for acquiring office space in the event of a crisis. This will be critical to the response (particularly if the organisation decides to operate its communications centre out of this locality) as well as for the recovery period. There is also an expectation among decision makers that there is substantial flexibility at CS3 particularly in terms of the ability to operate emergency response from field positions as well as from office locations. The organisation also believes that the equipment available to field staff is equally as flexible and robust. Transportation networks were all highlighted as being keystone vulnerabilities for the organisational response and recovery in a crisis.

The organisation identified the need for a communications centre for crisis response. The location of that centre was disputed and the organisation must carefully consider both the crisis response and recovery. CS3 is very focused on physical emergencies, and has a lower understanding of its vulnerabilities for other types of crises; for example the issues associated with significant human resource losses such as in a pandemic. There may be a need for the organisation to operate an emergency response while at the same time still meeting its normal contractual obligations. This could place significant pressure on the need for a physical communications centre as well as the need for staff to man it.

The organisation has excellent day-to-day relationships with both competitors and sub- contractors. There is an expectation that this will enable it to gain access to the necessary equipment for an emergency response. There is an assumption that in a crisis the organisation will have priority of access to this equipment and it has not adequately considered the relationships that both competitors and subcontractors may have with emergency response agencies like Civil Defence. Further, CS3 does not have comparable relationships with organisations for access to fuel or material supplies, as for equipment.

There is a very strong dependency on field/operational staff to be able to communicate with both the emergency services and with management in regional offices. There must be appropriate support

measures in place to ensure that this can continue to occur in a number of different crisis types. Currently the organisation has not considered events with consequences larger than the events it has previously experienced. The organisation is the 'eyes and ears' of its client in times of crisis and CS3 must ensure that its strategies will enable it to supply accurate and timely information to those who need it, when they need it. This requires a great deal of inter-organisational co-operations from an emergency management perspective.

The ability of CS3 to effectively and compassionately manage staff welfare issues in a major emergency was highlighted as a weakness. Additionally staff training during a crisis event is highlighted as a keystone vulnerability and this is related to both the ability of the organisation to retain knowledge and knowledge of staff roles and responsibilities. The potential absence of critical individuals in an emergency could lead to a need to train people into new roles during a stressful situation, and therefore there is a need to improve knowledge of a wide range of roles and responsibilities and reduce the need for additional emergency training.

Risk management and business continuity planning are highlighted as keystone vulnerabilities, not just on a regional basis, but also nationwide. There is an identified need for greater integration of these types of strategies across regions, but with greater regional input than just performing these at a corporate level. This is particularly true for the recovery phase of an emergency event. The regulatory environment of Central Government also has the potential to significantly impact the organisation.

Adaptive Capacity

The organisation identified that communications and relationships between regional offices and their emergency staff is a potential weakness in a crisis response. Further, in the recovery phase of an emergency, communications and relationships with general staff becomes a critical element. This is related to both the integrity of the physical communications network and the awareness of various roles and responsibilities in CS3. Similarly, the relationships between CS3 and its external stakeholders (including clients and consultants) is a critical aspect for crisis response and recovery. This is directly related to CS3 needing to have a clear understanding of the expectations of its most important external stakeholders and ensuring that it can meet those expectations. Furthermore, there appears to be a gap in the understanding at CS3 of contractual obligations in a crisis event in the Wellington region.

Typically, staff at CS3 view the organisational culture to be empowering, positive and encouraging. This is supported by the overall organisational ethos. The communications for day-to-day business within a region are excellent based on this organisational culture. But due to the potential difficulties in communicating across regional boundaries in a crisis, there is a problem with ensuring that accurate and relevant information is effectively transferred to those who need it. Regional autonomy has lead to a significant level of resilience for emergencies that do not extend past the organisations regional boundaries. However that same autonomy may reduce resilience in multi-regional events, for example a pandemic event. CS3 therefore identified a need for a regional communications

and relationships protocol as well as a strategy for the wider group. Also, the level of autonomy attributed to each region may actually have negative consequences for the organisation should additional external staff be called into a region during a crisis. Currently there is a poor organisation wide understanding of what protocols and procedures each region uses, and how to integrate new external staff into those to ensure effective management of this resource in a crisis. This is likely to be a significant issue for CS3 in both response and recovery periods.

CS3 displays some differences in how it perceives the general public. From a regional and operational perspective the general public is seen to be a major stakeholder and this reflects a strong day-to-day relationship with this group during business as usual conditions and a 'front-line' position during crises. The corporate level of CS3 however doesn't have the same perception, possibly due to staff at corporate having less to do with the general public. It also further reflects the regional autonomy policy of the organisation and may have an impact on differing opinions of communication priorities in a crisis situation between the regional and corporate decision makers.

While there is an expectation of staff to take on some of the responsibilities for decision making that go with the levels of autonomy given to the regions, there is also an expectation of the organisation by staff. CS3 has a limited understanding of what staff may require in different types of events, and also what the implications may be of not meeting those expectations in a crisis in terms of staff loyalty. Given the level of autonomy granted to regional offices throughout the organisation, there is a potential for some discontinuity of decision making in the organisation, primarily for events that cross regional boundaries for CS3. While there is an expectation that the current leadership in the organisation reflects the overall ethos and vision at all levels of the organisation, previous events may indicate that this is not true.

C.2.4 CS4 - Public Utility Provider

CS4 is a moderately sized public utility organisation with regional offices in numerous centres throughout New Zealand. CS4 was one of two organisations that did not take part in the workshop phase of this research. However the researcher was able to observe CS4 in an external emergency exercise. No vulnerability self assessments were completed by CS4.

C.2.4.1Resilience Issues for CS4

Situation Awareness

At CS4 there is an observable need for greater clarity of roles and responsibilities throughout the organisation from a crisis management perspective. At a head office level, emergency roles and responsibilities are reasonably well understood, but this was not observed from a regional office level. During the crisis exercise at the regional office, the level of responsibility and the mandate to make decisions for some staff was not in alignment, and this caused significant frustration. Both from interviews and from crisis exercise observation decision makers at a regional level are unclear about what the designated roles and responsibilities are of other regional offices in

an emergency response (that extends across regional boundaries). The role of the head office in a regional response is also unclear and the national office was seen to have a 'finger in the pie' when it came to prioritisation of resources and decision making in the exercise. Furthermore, the roles and responsibilities of both critically linked organisations in an emergency response are unclear. During an the exercise at the regional level the individual selected to run the emergency management office and who was the media spokesman for CS4 was actually an employee of a linked organisation. The roles and responsibilities of other externally linked organisations are similarly unclear and poorly understood, particularly in relation to large scale events as opposed to the smaller 'business-as-usual' crisis types.

Keystone Vulnerabilities

CS4 has not adequately considered the importance of the location of the emergency management office (EMO), and the impact that this may have on the resilience of the organisation during a crisis event. The level of equipment in the EMO is also minimal, and these rooms do not currently have a well stocked Civil Defence kit. The regional office of CS4 does have a very well stocked cabinet, but this is physically distant from the EMO (on another floor) and there are no resources (water, food etc) in the EMO.

The value of strategic planning was somewhat lost at a regional level in favour of a dominantly operational approach to crisis management. From a resilience perspective, the inability to include strategic planning into an emergency response will have significant implications on the organisations recovery. CS4 was very involved with 'fire- fighting' and addressing each issue as it came to light rather than being strategic about these issues, prioritising them and ensuring that addressing issues was in line with an established longer term recovery strategy.

Both the fragility of the communications network and the ability to send appropriately formatted information were identified as keystone vulnerabilities for CS4. The day-to- day ability to communicate using visual tools including maps and plans, together with being able to effectively transfer this information throughout the organisation (into different regional offices) is important. This is a primary communication method for this organisation and adequate alternatives are currently not available should CS4 loose the use of the communications network. Further, this extends to the reporting structures and protocols that CS4 currently uses and the appropriateness of these in a large scale emergency as an effective internal and external communications tool.

Adaptive Capacity

One of the most critical issues for CS4 is in terms of governance. The issue of who should be running the organisations emergency response (and the impacts of this decision on the recovery of the organisation) is a key concern. CS4 does not appear to have considered the potential impacts on its reputation of having a non-employee actually controlling the regional emergency response. This extends to who should speak to the media, and what the implications may be of having a non-employee as a

spokesperson for the organisation. Currently there are strict rules at CS4 for engagement with the media and the general public, but these were not adhered to in the simulated crisis.

The communication difficulties internally and externally are also keystone vulnerabilities for CS4. As highlighted in the previous section, there is a limited awareness of the roles and responsibilities of key individuals and groups both internally and externally. This extends to a lack of handover protocols in a crisis response (this was observed in both the regional and national offices) and clear guidelines for communicating and succession during a crisis. CS4 does not currently have clear guidelines for either succession or the transfer of information during a handover in a large scale crisis.

The transfer of information is critical to developing advanced adaptive capacity and this is an issue for CS4. The flow of information between offices and staff within CS4 together with transferring information between CS4 and external organisation is difficult due to technological problems and a poor understanding of who needs what information and when. Further, in some cases critical information resides in a small number of individuals in the organisation and there is a potential problem should some of these people become unavailable to the organisation.

C.2.5 CS5 - Educational Organisation

CS5 is an education provider in New Zealand which is a large employer for the local community and has an established reputation both within the New Zealand and internationally. The organisation did follow up on some of the recommendations in the report and is currently engaged in writing and implementing a disaster response and recovery plan.

C.2.5.1 Resilience Issues for CS5

Situation Awareness

CS5 has a distinct silo mentality culture and this is reflected strongly in a lack of understanding and awareness of the roles and responsibilities of staff members throughout the organisation. There is very little cross over of staff and knowledge between different parts of the organisation. There is also a perception that some groups of employees have little or no allegiance to the organisation and would be working for their own gain in the event of a major crisis. For example, some parts of the organisation have well established protocols and strategies for business continuity as it pertains to them but there is little in the way of an organisation wide approach to business continuity that incorporates all of this existing information and knowledge. In-fact many key decision makers in the organisation are not aware of these individual plans at all. Roles and responsibilities at CS5 appear to be very well defined within individual groups. However there is very little motivation or opportunity for employees to cross the boundaries that define their roles in the organisation. This is a significant barrier to staff expanding their understanding of what skills others bring to the organisation and appears to further foster the negative elements of silo mentality at CS5.

There is a distinct lack of awareness of some key external stakeholder groups that the organisation deals with. This is in both day-to-day operations and also from an emergency perspective.

The expectations of external stakeholders and what the organisation believes those expectations to be are often two very different things. Some of these stakeholders include the clients (or students), investors into the organisation and the wider community. For example, CS5 was, until recent times, a sector post for Civil Defence. Many in the community are likely to be unaware of the organisations changed role, and have a certain expectation of CS5 in the event of a crisis. Some within the organisation feel a responsibility to the community to provide some assistance, but there is division as to the extent of that assistance.

There is a strong indication that knowledge pathways (the flow of information in the organisation) are limited and that most staff don't fully realise what is likely to be required of the organisation in a crisis. Similarly, they are unaware of what may be required of them as staff to assist the organisation in a crisis, or the wider community. This is exacerbated by the prevalent silo mentality in CS5.

CS5 has an excellent awareness of the implications of the loss of information regarding clients and investors, and therefore backup of this information is a priority issue. However, privacy and protection of information that doesn't involve client or investor information is a critical issue that the organisation largely appears to be unaware of. The impacts of loss of key information, access to critical information and equipment following a crisis and the potential loss of reputation in the eyes of key investors is a vital part of CS5's developing situation awareness.

Keystone Vulnerabilities

Buildings and contents are keystone vulnerabilities for CS5. This is principally due to the impacts on the organisation should some of those buildings become unavailable, or contents damaged/destroyed and what this means for the continued operations of the organisation and its reputation. Also, building security onsite was not widely identified as keystone vulnerability until the REDS. Certainly, from a reputation perspective, the organisation needs to ensure that it protects certain equipment and information during or following a crisis. Again, from a reputation perspective, specialist equipment and supplies are identified as highly vulnerable, particularly in the recovery phase of a crisis. CS5 also recognised that its image and reputation is potentially highly vulnerable and that it must have robust systems in place to mitigate any future problems in this area. Further, the ability of the organisation to source additional key supplies is keystone vulnerability for CS5. Finally, essential services including electricity, water, sewerage, transportation and IT networks were all identified as being keystone vulnerabilities for CS5.

CS5 has a clear awareness of which of its buildings present the greatest risk to life in the event of a physical emergency including a fire or explosion. Recent small events highlight the consequences associated with the loss of electricity and telecommunication services and therefore CS5 has a heightened awareness of these issues. However, CS5 tends to focus on those recently impacted services and somewhat neglects to consider the impacts of the loss of other services such as the transportation network, particularly from a communications perspective.

In parts CS5 has clearly identified its operational priorities but this is not integrated across the organisation. For example, while the organisation does have a clear awareness of which structures are most vulnerable, it does not have any organisation wide planning in place to find alternative sites/buildings/structures should key facilities be lost, or for the re-allocation of buildings/structures for purposes they are not currently being used for following a crisis. Individual groups in the organisation, however, do have isolated planning in place, but this is not communicated throughout the organisation. Additionally, the organisation potentially has specialist equipment and skills available internally that it currently has not identified from an emergency management perspective.

Staff succession in the aftermath of a crisis was considered to be a high vulnerability and there is little planning around this issue from an organisation wide perspective. Some parts of the organisation have comprehensive succession planning, however this has not been integrated across CS5. Staff generally, have a poor understanding of the level of business interruption insurance that the organisation holds and this may be a keystone vulnerability for CS5 in some types of crises.

The organisation identified that it is highly vulnerable to changes in central government regulations and it may have a reduced ability to adapt to any changes in a way that offers opportunities for the whole organisation.

From a planning perspective CS5 has few preferential supply arrangements set up that will serve it in times of crisis. Nor has the organisation identified what are its critical supplies, suppliers and if there are in-fact any alternatives in the marketplace for these suppliers. Additionally, there is also the potential for CS5 to offer other organisations in the wider community resources and skilled people in the event of some crisis situations. The organisation has presently not considered this two-way movement of supporting resources following a crisis. Nor has the organisation considered what these sorts of arrangements might mean for its public image in the community in the face of an emergency.

There are limited processes and protocols in place around staff welfare issues, particularly ongoing payment, leave entitlement, or even ongoing employment in the event of a major disaster. While health and safety is typically well thought out, this does not extend to an emergency management context at all. There is a perception that staff welfare is only about day-to-day health and safety, and not the ongoing trauma associated with a significant crisis. This highlights an ongoing communication issue internally at CS5. For example, the organisation currently does not engage with staff to better understand their expectations and fears in the event of particular crisis situations. Similarly, very few staff at CS5 have any knowledge of what is likely to be expected of them in the face of a crisis situation. This lack of knowledge will further foster the negative elements of the organisational culture that contributes to a lowered resilience.

Ongoing access to financial resources, particularly cash, to meet minimum operating functions in a crisis is a problem for CS5. Additionally, the inconsistency of the organisational vision across CS5 leads to some staff feeling disregarded in the decision making process and further perpetuating the negative effects of the silo mentality.

Adaptive Capacity

The ability of CS5 to engage in respectful and appropriate communications internally is a significant issue. The influence of silo mentality is a major obstacle to this communication working effectively between (and sometimes within) different groups of employees at CS5. In particular there are problems associated with communications between the senior management team and other groups of employees. From an external perspective, while communications and relationships with some emergency services are strong and ongoing (for example the Fire Brigade), this does not extend to other emergency service organisations, for example the ambulance service, civil defence and even the police. Also highlighted were the organisations communications and relationships protocols with external stakeholders. The organisation has a poor ability to contact these stakeholders during a major emergency and inform them of the current situation. This is directly related to the organisational vision and how different groups of employees perceive the purpose of the organisation and how communications with different external stakeholders should be prioritised.

The vision that the organisation has for its future path is not consistent among all staff. Further, the current perception of what the organisation is and what it represents (and what should be forthcoming in terms of resources and image) is divided. Further, there is still a degree of uncertainty about the status of the organisation following previous crises; is CS5 still responding to the impacts of that event, or is it well into the recovery process? The answers to these questions have significant effects on the leadership and decision making protocols in the organisation and are impacted by the organisational vision and strategy for future development. Further, although there is good knowledge about the key strategic risks that the organisation faces, there is very little consensus on how CS5 intends to address these risks.

Communication channels between the senior decision makers in the organisation and other employees are not clearly defined; this fosters confusion and some distrust about the ability of all staff to contribute to the decision making processes and have their views aired at the organisation. There is a perception at some levels in the organisation that communications with senior decision makers are not appropriate and that decisions are not as transparent as they could or should be. This has the potential to set up a culture of distrust in the organisation, leading to greater negative impacts from silo mentality and fostering the disloyalty that many in the organisation fear is occurring. A key resilience issue to arise from this study is that of the mandate to make decisions in the absence of senior management. The decision making process is seen to lack transparency at CS5 and this appears to foster a great deal of uncertainty about the succession of decision making for the organisation.

Management systems at CS5 were highlighted as a problem and this is intrinsically related to leadership styles and governance in the organisation together with the situation awareness of various groups within the organisation. There are issues here that involve silo mentality, limited levels of trust in management structures and a perception that people at all levels in the organisation are working for their own gain, not the organisations. This also leads to perceptions of a

disparity between the level of responsibility expected of staff for decisions versus the input these same employees have into that decision making process.

Additionally there are issues identified with the ability to acquire, transfer and retain information throughout the organisation both in day-to-day business and in crisis situations. Previous minor incidents that resulted in closure of the organisation highlighted the problems associated with obtaining accurate and timely information about the reasons for closure. This has implications on the ability of decision makers in the organisation to transfer information to external stakeholders as well.

C.2.6 CS6 - Private Wholesale Distributor

C.2.6.1 Resilience Issues for CS6

Situation Awareness

Overall CS6 has a very good awareness of its position in its industry, the nature of the business that it offers its key stakeholders and largely who those key stakeholders are. Where CS6 shows some limitations is the level of awareness around the expectations of those stakeholders, particularly in crisis situations.

There is a good awareness of roles and responsibilities of staff at CS6. This is because of a policy to move staff (especially in management and supervisory positions) into new areas in the business. The general staff have an awareness that they can progress through the organisation because several members of the executive management team began their careers in the organisation at the bottom levels. However, senior managers and key decision makers have a limited awareness of the expectations of general staff. There is also a perception that, with regard to any emergency planning, the messages to staff must be somewhat filtered; general staff are typically adverse to too much information and there is a danger of evoking too much fear with the wrong messages to this group.

CS6 has a good awareness of who its key stakeholders are and effective day-to-day communications with them exists. However, again, the expectations of these stakeholders are not clearly understood, particularly the clients, and therefore it will be difficult for CS6 to meet these expectations in any type of crisis. This has the potential to destabilise an otherwise effective network. In addition, the organisation has not made all of its most critical stakeholders aware of CS6's expectations in an emergency situation.

The longevity of key employees at CS6 is both an observable strength and also a weakness. A key weakness is an attitude that CS6 and the executive team will be able to cope regardless of the crisis. Communications and relationships have been built up over a number of years and there is an assumption that team members understand what each other brings to the business and the limitations of their position in the organisation. However, there is a suggestion that this level of awareness is somewhat more limited than the executive team realises. For more regularly occurring crises CS6's executive team has an excellent understanding of what makes the business tick and

how to resolve the issues that arise. However, CS6 also must raise its awareness of what situations it is likely to face in a larger scale crisis; these are fundamentally different to the types of events CS6 is dealing with in normal business.

CS6 is also aware that both it and its clients are potentially a significant resource from a civil defence perspective in some types of crises. The organisation has made initial contacts with Civil Defence to attempt some sort of constructive dialogue between the two organisations but as yet this is in its infancy.

Keystone Vulnerabilities

CS6 has engaged in some comprehensive risk identification and management processes. However, the organisations awareness of the impacts and consequences of some of these events is surprisingly limited. For example, in the REDS, the impact of an earthquake on both telecommunications and transportation networks were misunderstood. The organisation displays a lowered awareness of its own communications effectiveness in this type of situation.

Buildings and structures have been highlighted as keystone vulnerabilities for CS6. This is not only from the perspective of building integrity (for example structural damage and contents damage following an earthquake/flood event) but also in terms of access to buildings and stock, loss of critical services such as electricity, and from a security viewpoint. Furthermore, the organisation does not have an alternative site identified for emergency operations should the primary site be lost or unusable. CS6 has recognised electricity services as a key vulnerability and has access to some generators. However both generators and fuel supplies were also identified as keystone vulnerabilities. The vulnerability of the generators themselves is low, but access to fuel supplies following some types of crises may be a significant problem. The organisation identified that it was likely to approach this issue from an 'as needed' basis rather than actually planning for additional supply sources and creating preferential supply agreements. CS6 also has a responsibility to its clients in terms of damage to their buildings and inventory. This may be significant keystone vulnerability in terms of the availability of damage assessors, insurance representatives, builders and the supply of building materials. Again, CS6 has not engaged in significant preplanning for this vulnerability.

Telecommunications networks were highlighted as a keystone vulnerability for CS6. Several senior staff had made the assumption that should the organisation experience the loss of this network, staff would 'just communicate' with one another with little consideration as to how this would actually occur. The organisation has recently identified a keystone vulnerability itself; the lack of backup for a key software communications package between its principal localities. This was duplicated shortly prior to this research project. However the project highlighted the ongoing vulnerability of the backup and its communication requirements to loss of the physical telecommunications network; vulnerability previously unidentified by CS6. The further loss of water and sewerage network supply would mean that the organisation would only be able to support limited numbers of staff at any one site within the affected area of the crisis. This may have a significant impact on CS6's ability to respond as effectively as expected following some types of emergency.

Internal communications at the site supervisor/manager level was highlighted as being a significant vulnerability based on the importance of this group in communicating effectively with general staff. Similarly this group is likely to be an important vehicle in supporting knowledge of staff welfare issues in the executive management team, and for general staff to air their concerns, expectations and fears to the top decision makers in the organisation. This also highlights vulnerabilities associated with training and recruitment. The organisation has a high turnover of general staff, and it is these staff that CS6 would need to retain in the event of some types of crisis. Better understanding of staffing issues, communications with general staff and better understanding of the expectations of this group would assist in reducing this vulnerability for CS6 and improving any negative impacts of silo mentality.

The expectations of principal stakeholders, including clients are not clearly understood in the organisation and this highlighted another significant vulnerability for CS6. While there is a recognised amount of trust evident in the relationships between CS6 and clients, poor decision making based on a reduced knowledge of stakeholder expectations and limitations could potentially cause a problematic loss of reputation for CS6. In contrast, however, CS6 has started a process of determining what essential supplies would be required and made steps to create effective preferential relationships with suppliers in the event of a crisis; predominantly focused on a pandemic but certainly applicable to other types of event. This is also related to the organisations sense of corporate responsibility to the community at large. The organisation also employs the services of a communications consultancy to handle its media profile and its overall external image, particularly in terms of emergency situations.

Adaptive Capacity

The broad knowledge of roles and responsibilities of staff at most levels in the organisation is a key strength in terms of adaptive capacity. It encourages a reduced silo mentality and helps to support the acquisition and dissemination of information in the organisation during crises. However, at CS6 there are some issues within the executive team regarding how to gather information and how to disseminate that information through the organisation in a crisis. The governance structure of the organisation gives it a unique advantage in accessing information throughout its network. However CS6 appears to be poorly adapted to use that information from a crisis management perspective at the highest levels.

In the REDS, the executive team were unable to brainstorm ideas collectively and had difficulty in producing strategic action plans in a simulated situation that reflected the issues to arise in the discussions. A keystone vulnerability identified during the REDS for this organisation was the surprising degree of negative silo mentality behaviour exhibited by the executive management team. Despite all the assertions of effective communications and relationships at this level in the organisation during the interviews, the REDS highlighted that for some large scale crises, this effectiveness may be reduced. The group did not display a clear and unified understanding of the roles and responsibilities of others in the group, particularly those who were not represented in the REDS (some members of the executive team were unable to attend the REDS and their responsibilities in the business were not adequately considered by the rest of the team). Nor did the

team show an ability to gather information effectively without 'fire-fighting'. This potentially reflects a lack of broad strategy for emergency management within the organisation.

The attitude of CS6 towards staff being part of the 'family' is a significant strength for the organisation. CS6 recognises that, as an employer, it is not able to offer top wages to all staff, it believes that the package it offers staff is appreciated and well supported. From a cultural viewpoint CS6 believes that staff loyalty in a crisis goes hand in hand with work conditions, wages and support structures on a day-to-day basis.

The most significant adaptive capacity strength of CS6 lies in its client relationships. CS6 understands this very well and continues to build on this strength for the benefit of clients. However the organisation cannot rely on the strength of its clients alone in how it manages crises, as these clients are likely to have high expectations of CS6 in an emergency; expectations that CS6 current is not entirely aware of.

C.2.7 CS7 - Private Utility

CS7 is a discrete business unit of a larger parent organisation that is a large private utility organisation. CS7 has a widespread distribution of offices throughout New Zealand.

C.2.7.1 Resilience Issues for CS7

Situation Awareness

CS7 displays a limited awareness of the potential impacts of some of its identified risks. It also shows a reduced awareness of the range of hazards that it could be exposed to. Further, the organisation has a limited awareness internally about the ability of the organisation to manage some identified risks. These issues were made very clear in the REDS when the scenario was first proposed. The scenario was developed in consultation with a key member of the leadership team at CS7. Some staff members expectations regarding how to deal with some of the identified hazards has shown poor awareness of the reality of these situations. For example, the expectation that staff would and could operate from home in an influenza pandemic is assumed without any planning, let alone trialling of a plan for such an event.

Keystone Vulnerabilities

Leadership succession was identified as a key vulnerability for the organisation. At best the organisation had engaged in formal succession planning for the general manager only. Additionally, the groups in the REDS did have representatives of all business units at CS7 but the REDS groups did not identify these absences or their impact on the decision making process. The organisation displays a limited understanding of which business units, and which specialised skills would be needed in different types of crises.

While CS7 has some good policies around staff welfare issues for day-to-day business, there is little consideration of how to extend this into an emergency management environment. The level of understanding of staff expectations is limited, strategies to mitigate the negative effects of rumours in the organisation are non-existent and there is a negative approach by some senior staff towards general staff; during the REDS these individuals considered some groups of employees as dispensable. Again, this is a feature of the negative silo mentality prevalent through the organisation.

Senior members of the organisation appear to have difficulty in communications and relationships with general staff members. This has the potential to critically destabilise the organisation in a crisis where the most important resource is that of people. Human resources therefore at CS7 are a keystone vulnerability in terms of the capability and capacity of the organisation in a competitive market and in terms of the reputation damage that can be caused by not adequately engaging with general staff members, particularly in a crisis. Finally, other groups that were identified as being keystone vulnerabilities from the perspective of communications and relationships were customers, contractors, suppliers, local and national authorities as well as the media and the wider community.

An important issue for CS7 is the importance of buildings, equipment and services. The leadership team indicated that staff would be able to work remotely if necessary and that there was no need to plan for an alternative site for continued operations. However, this ability to operate remotely has not been tested or detailed in any way; it was simply an assumption based principally on the portability of appropriate technology. There is little consideration about the consequences should telecommunications also be restricted in a crisis that forced the organisation to operate remotely, nor is there any consideration of potential legal, security and reputation issues in this regard. Essential services such as electricity, water, sewerage as well as telecommunications were all highlighted as critical vulnerabilities. Additionally computer hardware and software/intellectual property were identified as keystone vulnerabilities. In addition, intellectual property, computer hardware and software were all identified as being keystone vulnerability components. All of these also relate to the ability of the organisation to operate remotely and the legalities and reputation issues that arise if staff are expected to operate from home.

Planning, including for example, emergency management, business continuity and risk management planning together with media and external communications planning, has the potential to impact CS7 significantly. The organisation appears to be either unaware or unwilling to leverage off some of the planning and resources that its parent company already has in place. This relates back to negative impacts of silo mentality and reduced situation awareness about the type of events that may have negative consequences on the organisation. However, many of the direct planning issues are improving because of ongoing planning strategies currently being initiated within CS7.

CS7 has identified that some of its existing contractual relationships have the potential to be keystone vulnerabilities; both those contracts that CS7 has with customers and also contracts with other organisations to supply goods/services/expertise for CS7.

Adaptive Capacity

Silo mentality is well recognised by the senior decision makers at CS7 and they have made significant inroads to counteracting this issue within their leadership team with the improved structure, transparency and visibility of the senior decision makers to the rest of the organisation. But silo mentality is more pervasive than it first appears at CS7. It is recognised between departments at CS7 but also between CS7 and its parent organisation. During the REDS for this organisation there were representatives/observers from the parent organisation present, prepared to offer advice and assistance in the simulated response to the crisis. However, CS7 did not use their expertise at all, preferring to keep the decision making and the information gathering in-house. While CS7 claims that it is willing to leverage off the resources that its parent company has to offer without feeling like it is compromising its inherent autonomy, there was no evidence of this during the workshop, or evidence that staff will even know how to do this if it is required.

Closely related to the issue of roles and responsibilities in CS7 is the vulnerability of the acquisition, retention and transfer of information in the organisation from a crisis perspective. These vulnerabilities involve the negative aspects of silo mentality, an unwillingness to share information around the organisation, poor understanding of what other groups and individuals expect and require in terms of information, both in day-to- day business and in potential crisis situations.

Leadership was observed to be a key resilience issue for CS7 and reflected the negative silo mentality that is present throughout the organisation. In both groups assembled for the REDS, individuals took over leadership roles without much active participation in the group discussion about the crisis. These individual also came up with ideas that were not discussed by the group as a whole and which were subsequently offered by these individuals as solutions to the crisis issues. This was most prevalent in the Leadership Team group.

The organisation does not display a detailed knowledge of how to engage with its key stakeholders, most at risk customers or even its employees in a crisis. The expectations of these groups were apparent to staff in the workshop, however the ability of these decision makers to meet those expectations is limited. CS7 considers the backing of its parent company a significant advantage in a very competitive market place, both in terms of its financial position and the human and technical resources available. Overall, staff at CS7 support closer ties with the parent company in terms of adopting more standardised systems and procedures. While there may be some concern about the effects of this on CS7's ability to act autonomously in the short term, the majority of staff support this move for improvements in the medium to long term. The parent company is limited in its ability to make changes quickly due to its size and its organisational hierarchy and decision making processes. However, staff at CS7 do not consider this to hamper CS7's ability to adapt to change or move forward. CS7 generally believe the ability to make decisions in a timely manner is strengthened by the association with the parent company. However CS7 does not display the ability to collect information that would enable it to make accurate and appropriate decisions in a crisis. This is because it does not currently have the systems in place to identify, map and track its most critical stakeholders, including its customers or competitors. If these types of tools are available to the

organisation through the parent company, then CS7 is unaware of them and may suggest further entrenchment of the negative aspects of silo mentality identified earlier.

Adaptive capacity is also potentially critically affected by an unclear understanding regarding the capability and capacity of the organisation in certain types of situation. The interviews highlighted this issue and it was confirmed in the REDS. There are two schools of thought at CS7. One group believes that the organisation is severely restricted in its ability to meet customer demands as well as respond to market changes appropriately and remain competitive. Another group believes that the organisation has no significant issue in dealing with any challenge it faces and being able to retain a competitive advantage. This debate centres on the capability of existing staff and contractors/consultants as well as the capability of the organisation and linked organisations to meet market demands.

C.2.8 CS8 - Private Retailer

CS8 is a medium sized retail operation that services a rural community in New Zealand. CS8 is also part of a group of other branded organisations throughout New Zealand. CS8 is serviced by a wide range of organisations and is a significant social and information hub for the local community.

C.2.8.1 Resilience Issues for CS8

Situation Awareness

Although the organisation has a good awareness of the positive side of its relationship with its community, there is a significantly more limited understanding of how great the negative impact may be from this relationship, particularly in the event of a crisis where CS8's reputation is under threat. This negativity may arise from rumour, insinuation and the media, for example.

There is a general lack of awareness of the potential consequences of some relatively common events, and what might happen if these were to escalate. There is also a limited awareness of the damage that might be caused by the media if there are not strict guidelines for staff in dealing with the media outside of the work environment. There is also an assumption that other organisations in the branded group of organisations will take charge of media relationships and dealing to a large extent in a crisis. Also CS8 believes that in a crisis, other critical organisations would provide leadership and be the first to make contact; this organisation would be more likely to wait for that contact than to initiate it themselves.

There are also awareness issues in CS8 regarding knowledge about the organisations actual operations. During the workshop it became apparent that not all participants had a good understanding of what role some components actually played in the running of the business. For example for the REDS (which involved an organisation specific health and safety incident), more than half of respondents considered that health and safety was not of immediate criticality to the organisation in this event. Similarly, connectivity with other organisations and stakeholders was considered critical to this situation by

less than half of the participants. While the organisation has a good awareness of some of its internal operations and selected external stakeholders, this could be critically limiting in an emergency. This highlighted a need for the organisation to broaden its awareness of potentially crucial stakeholders before any event occurs, as well as the expectations and perceptions of and from these stakeholders in a crisis.

Keystone Vulnerabilities

The interconnectedness of other organisations is identified as potential keystone vulnerability; particularly where CS8 has an expectation of the standards and procedures of these linked organisations in a crisis. This is highlighted particularly with health and safety issues, whereby CS8's reputation could be damaged significantly through no fault of its own, but through the neglect and poor management of other critically linked organisations.

The organisation has access to some very well developed incident management plans, developed through the wider branded group. The staff at CS8 have a good knowledge of where to access these plans and which part of the plan to refer to. However the actual working of the plan and the application of the plan to any particular crisis was more of a problem for CS8.

The group of branded organisations that CS8 is part of is another major advantage for the organisation in terms of its adaptive capacity. Compared to other similar organisations in rural communities, the resources available to CS8 through the group are potentially substantial. These range from human resources, physical and mechanical resources, access to stock and equipment, building materials and even the pooling of resources in several other branded organisations to enable the continuation of service to a wider community.

CS8's position in the community, together with the local staff base is often a strength in times of crisis. Staff have a vested interest in the organisation continuing to operate from both a personal and community perspective.

Adaptive Capacity

Silo mentality is a significant issue for CS8 and this was identified in the interviews and also during the REDS. Staff have a level of autonomy that is supported by a high degree of accountability and responsibility for day-to-day business. Typically this represents a strength for CS8 but there are awareness problems with escalating potential events upwards to management. This also highlights situation awareness problems regarding the upwards communication within the organisation. For CS8, silo mentality presents no problems during day-to-day business from a departmental view point; staff in each department have a very good understanding of their own areas of influence. However this does not extend beyond department level for most staff, other than the owners.

Internal communications and relationship issues are highlighted in this study as being keystone vulnerabilities for CS8; between CS8 and the other branded organisations, department managers and with general staff, particularly during an emergency response phase. This is directly related to

the problems associated with silo mentality as discussed earlier. It is also related to expectations of these other internally connected groups and organisations and CS8's knowledge of these expectations. The communications pathways between CS8 and other branded organisations are effective and well established for day-to-day events. However, there is a very significant chance that these could breakdown in a crisis, particularly due to the availability of key staff within these groups and other organisations within the group. This has the potential to impact on the brand of CS8 as well as that of the entire group.

External communications and relationships were observed to have the greatest influence between CS8 and its competitors, customers and the media. There are also very close links with the wider community and therefore the vulnerability is significantly related to the ongoing relationships that CS8 has with the community and how to maintain these during a crisis.

Knowledge acquisition and transfer are identified as keystone vulnerabilities. While this organisation has some very good systems and protocols for what information to gather about a particular situation and in a standardised manner, there is poor understanding about actually how to gather that information. Further there is poor awareness regarding how difficult and time consuming it may be to gather all the information that decision makers believe they can acquire, particularly in a major crisis situation. Additionally, staff at CS8 have little understanding as to how to conduct information gathering and transfer so as to ensure the media and the community did not perceive it as an admission of guilt or neglect in the face of particular crises.

The current owner/operator leadership structure of CS8 was observed to be a significant strength for the organisation in terms of decision making in day-to-day operations and also in a crisis. However, there is a potential that this strength may be come a weakness, and leadership keystone vulnerability, should the current decision makers be unavailable or impaired in a crisis. Furthermore, the current decision making team, comprised of the two owners/operators, have different leadership styles. The organisation has a limited awareness of the vulnerability of the leadership should one of these two be absent in a crisis. This may result in a significantly different outcome than planned for, and it is important that the organisation takes into consideration these differences when training or exercising for crises. CS8 has the ability to make decisions very quickly and at a local level in a crisis without having to defer to any other organisation. The owner/operator structure of the organisation is very supportive of this ability to quickly make decisions. The ability to access the necessary information to make appropriate decisions, and the ability to communicate these decisions and this information through the organisation is more limited however.

C.2.9 CS9 - Private Primary Producer

CS9 is a large privately owned primary producer that has offices and sites throughout New Zealand. CS9 also has an international influence through its parent company. The researcher was invited to observe the organisation during one of its own crisis exercises. The nature of this exercise was that of a fire in the server room at head office, resulting in an injury to one staff member, and

the subsequent operational and reputation impacts. Despite repeated attempts to engage the organisation to take part in a workshop, the principal decision makers were initially unwilling to commit time or resources. The researcher was invited to give a presentation to the Executive Committee with the original intention being to sell the workshop idea to the executive group. A workshop is proposed for a later date but the information regarding resilience issues in CS9 is derived from the interviews and observations during an internal emergency exercise.

C.2.9.1 Resilience Issues for CS9

Situation Awareness

Typically, staff at CS9 in middle to senior management positions have a very good understanding of the roles and responsibilities of others in the organisation. This is largely due to an organisational policy of encouraging staff to move into new roles and into new areas of the business for a time. Further, the organisation perceives that it actively promotes empowerment as a key leadership skill. There is a perception that CS9 intuitively recruits key people who are intelligent, relaxed and who can freely communicate innovative ideas, people who like their job and who are forward looking.

While CS9 has a very good awareness of its own industry and its own business, its awareness of other linked organisations is much more limited, particularly in terms of network service providers and emergency responders. The organisation also has a limited awareness of the potential expectations other organisations may have of it, as a primary producer, in a crisis.

Keystone Vulnerabilities

There is some evidence that the current crisis management plan does not adequately outline key roles and responsibilities, nor does it encourage staff to devolve responsibility to others in the organisation. This was observed in the exercise whereby the key decision makers were very involved in the operational aspects of the crisis, resulting in a 'fighting- fires' approach to crisis management. A more strategic, over-view decision making role was not adequately adopted by the key employees in this situation. This resulted in some issues getting lost as the information coming in increased, and some strategic issues being poorly identified because of more pressing operational issues at the time. Currently the focus for crisis planning at CS9 is on crisis communications.

CS9 believes that, although there is a desire to return to 'normal' following a crisis event, the organisation generally looks carefully at what went wrong and acts quickly to ensure the same thing would not happen again. The organisation however seems to have somewhat of a 'fire-fighting' mentality when it comes to crisis response. The size of the organisation, the backup of the parent organisation and the financial resources available enable CS9 to make decisions in a crisis that other organisations would not be able to make. The organisation recognises that this approach may not necessarily be the most efficient or cost effective solution to a problem.

The risk identification and management protocols are potentially limiting for CS9 as they are developed by the parent organisation and designed to represent the most significant risks from a global perspective. This highlights a potential problem with some systems and protocols being developed for a more generic purpose, and which do not adequately represent the unique nature and size of the New Zealand operating environment.

Technology failure is keystone vulnerability for CS9 in terms of its IT networks, energy concerns and communications for the geographic diversity of offices. While CS9 has thought about managing some of these risks from an internal perspective (duplicating the server at a secondary location) there is little thought given to how to manage the loss of services by external organisations.

CS9 is currently limited by its capacity in the industry in New Zealand. This is likely to be related to the organisations adaptive capacity; the size and structure of the organisation may limit its ability to react to market forces as quickly as some of its competitors. This may also be related to the vulnerability of CS9 to changes in the New Zealand regulatory environment, and an inability to react to these in a timely manner.

The reputation of the organisation is also a keystone, if well managed, vulnerability for CS9. While the organisation recognised that it is susceptible to reputation impacts outside of its control due to the international footprint of the business, it chooses to actively manage its reputation in the New Zealand market.

Human resources are also keystone vulnerability for CS9. It is difficult in some areas of the business to recruit appropriate staff members, and the organisation is facing an upcoming crisis with the impending retirement of several key operational staff members within a short period of time. However, CS9 is well aware of these issues and actively manages them on a day-to-day basis.

The systems and procedures that are in place at CS9 seem to provide an important unifying structure for the employees and there is confidence in them. Typically the systems and procedures are processed centrally at head office but the decision making around these systems is largely the responsibility of the individuals at each regional operation. Furthermore, the systems and procedures in place at CS9 have a significant degree of redundancy, with staff able to continue with paper backup systems in many instances.

Adaptive Capacity

The structure of this organisation supports several largely autonomous regional centres that have their own management and operational systems. While they follow the protocols and reporting systems of the parent organisation, facilitated through head office, they largely operate as individual ventures. While the top management levels in CS9 believe that there is no silo mentality between head office and the regions, there is certainly perceived to be silo mentality at a regional level. There is also some suggestion that the real barrier to communication lies with lower levels of management, and that it is very difficult to get complicated messages out to all staff or that these

messages become distorted. This is thought to be due to some staff being resistant to changes in the organisation and in the industry.

Communications between head offices and the regional operations are identified as keystone vulnerabilities for CS9. While one-on-one communications throughout the organisation are generally seen to be constructive and well managed, communications from head office to the regional offices does not always work as well. This appears to be exacerbated in those regional offices where the general manager of the division is not located onsite, but rather is based in head office. CS9 appears to be aware of this, certainly from a regional perspective, and there is some effort going into ensuring key staff members do not remain at head office, but travel frequently to site. In addition, from a communications perspective, the use of email as a means of communicating important information is being somewhat rejected at CS9. The key decision makers suggest that they suffer from email-overload and actively choose not to communicate using this method.

Generally CS9 is seen to be a flexible and supportive work environment and staff are typically loyal to the organisation. CS9 would seek to draw upon this loyalty in a crisis if needed. However, the size of the organisation and the time delay in dealing with decision makers in the parent company mean that CS9 is sometime not able to make decisions in a manner entirely appropriate with a given situation. This is dependent on the scale and nature of the event, and whether the New Zealand operations are expected to handle the crisis independently, or call upon support from the parent organisation.

C.2.10 CS10 - Private Technology Provider

CS10 is the smallest organisation involved in this study with just eight full time employees. The organisation is a private business that operates in the supply of technological services to clients.

C.2.10.1 Resilience Issues for CS10

Situation Awareness

A key awareness issue for CS10 is in terms of its customers and the importance of CS10 services to those organisations. From a resilience perspective, CS10 has no knowledge of which of its customers it should prioritise services to, and which can cope with a loss of services for extended periods. Given that much of CS10's current customer base has arisen by word of mouth, it is an important issue to clarify. The organisation also has a lowered awareness of what the negative impact of this network and how it could damage CS10's reputation.

The organisation overall, has a very good understanding of its industry, its operating environment and actively looks for new business opportunities. In-fact, during the workshop, the owner of the business identified the potential competitive advantages of engaging in resilience planning over other organisations in the industry.

CS10 believes that much of its operations can be conducted remotely. While the organisation has yet to test this assumption, the nature of the business, the size of the organisation

and the expertise and equipment available to CS10 all suggest that it can successfully operate from a remote location. There are some significant assumptions made about the ability of individuals to work in isolation and yet perform in a consolidated and uniform manner, but these can be addressed with adequate training and testing of systems and procedures.

Keystone Vulnerabilities

A lack of formal strategic planning is considered to be keystone vulnerability for CS10. The reasons for this are described above, but involve developing a more long-term approach to crisis management and resilience rather than a near-focused operational approach.

The reliance on external service providers, particularly telecommunications and electricity providers, was highlighted as a keystone vulnerability for CS10. The decision makers had some difficulty in seeing how they might manage service outages when the responsibility for these outages fell to other organisations. However, with some coaching, the decision makers at CS10 recognised that they could manage their response to any outages to protect their reputation, irrespective of the actions of service providers.

Although CS10 has invested in a backup generator to protect its services to customers, the organisation has not adequately thought through the issue of fuel for the generator.

Significant keystone vulnerability for CS10 is the lack of knowledge about its customers. As mentioned in the previous section, it is important for CS10 to be able to prioritise its customers in terms of service recovery, and therefore the organisation must better understand the relative importance of its services to the customer. This will require greater communications with customers.

The organisation has been created and developed without any debt. Business investment has come about from existing funds from the owners. This allows the organisation some flexibility in making decisions during a crisis and the family structure of the business means that key decision makers are typically close by and can make decisions quickly.

Adaptive Capacity

The organisation is very operational in its approach to business, and strategic, longer term planning is limited. This has implications for staff who do not necessarily understand where the organisation is going or why. While this is somewhat tempered by some good communications at CS10, there are further implications for how the organisation deals with crisis. The exercise conducted with CS10 illustrated this point. When faced with a simulated earthquake crisis and the loss of all telecommunications, the first impulse of key decision makers in the organisation was to shut up shop and go home. When prompted by the researcher to consider what they would do once these services were restored, the decision makers became more strategic in their approach. However, this did not appear to be an instinctual approach for CS10.

Overall, CS10 has a good adaptive capacity built on a small family based business model, a lack of significant cash flow difficulties and excellent internal communications. Staff are selected on the basis of their ability to fit in with the culture of the organisation as much as for their traditional job skills. The family ownership structure of the organisation does have some potential issues (conflict of interest, mitigating negative rumours from non-family staff members, taking liberties when communicating with family-based staff) but typically this structure improves the adaptive capacity of the organisation. The family atmosphere/culture extends to non-family staff, and the owner considers these employees to be part of the extended family.

CS10 considers that it has both robust and transparent communications structures internally. Communications in CS10 represent the flat management structure of the organisation, and are not intended to be hierarchical in nature. This is also how the organisation was observed to communicate in the simulated crisis; participants generally appeared to have equal voice and although the owner had the final say, decisions were reached in a strongly consensus focused manner. Additionally, staff are expected to make decisions about the business as long as they do not involve significant capital expenditure and all staff have the opportunity to have input into decisions and to be proactive in problem solving and looking for new business opportunities. There are some problems at CS10 regarding the degree of transparency and clarity around strategic decision making however; staff below the key decision makers often feel that they do not know the direction of the business or the business priorities. This is a key resilience issue from a crisis perspective as people may not make decisions appropriate for the strategic direction of the business should a crisis occur and the leadership team/key decision makers be absent for a time.

Providing that the financial position and the leadership of the organisation are relatively robust, the size of CS10 can be considered an advantage, and improves the organisations adaptive capacity. There are relatively few issues with silo mentality having a negative impact on the organisation. With a total of 8 staff members, each employee has daily interaction with most others in the business and there is a broad understanding by all staff about what each employee does on a day-to-day basis; even if the technical skills of some staff members are very specific to their individual tasks.

APPENDIX D Organisational Components

D.1 Overview

The information contained in this appendix presents the organisational components that have been used with the case-study organisations in this study. The following information is divided up into internal organisational components (those that the organisation has the direct ability to manage and change) and external organisational components (those that the organisation may have influence over, but cannot directly change).

D.2 Internal Organisational Components

Below is Table D1 which shows the Internal Organisational Components developed in this study, and shows how these have changed and expanded as the study progressed from CS1 to CS10.

Internal Organisational Components			CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9	CS10
Physical	Buildings	Head office/buildings	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Other offices				♦		♦	♦	♦	♦	
		Other sites/supplies			♦		♦	♦		♦	♦	♦
		Security systems	♦									
		Computers/IT hardware/contents	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Software/IP				♦			♦	♦	♦	♦
	Services & Equip	Vehicles			♦		♦	♦		♦	♦	
		Fuel/energy sources			♦		♦	♦			♦	♦
		Generators/other equipment					♦	♦				♦
		IT (internal networks)									♦	♦
Human	Communications and relationships	Parent org/branded Orgs						♦		♦	♦	
		The board				♦	♦	♦	♦	♦	♦	♦
		Managing director/owner								♦	♦	
		Executive committee				♦	♦	♦	♦			
		Between regional offices			♦	♦	♦		♦			
		Between internal units/depts				♦	♦		♦		♦	♦
		Senior managers	♦	♦	♦		♦	♦	♦		♦	♦
		Site managers						♦		♦		
		Emergency staff		♦	♦	♦					♦	♦
		General staff	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Mgmt.	Leadership	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Governance			♦	♦	♦	♦	♦	♦	♦	♦
		Recruitment/promotion			♦	♦	♦	♦	♦	♦	♦	♦
		Succession	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Information & Knowledge	Staff welfare			♦	♦	♦	♦	♦	♦	♦	♦
		Backup of information		♦	♦	♦	♦	♦	♦	♦	♦	♦
		Privacy and protection		♦	♦	♦	♦	♦	♦	♦	♦	♦
		Knowledge acquisition			♦	♦	♦	♦	♦	♦	♦	♦
		Knowledge retention		♦		♦	♦	♦	♦	♦	♦	♦
		Knowledge transfer	♦		♦	♦	♦	♦	♦	♦	♦	♦
		Training and review			♦	♦	♦	♦	♦	♦	♦	♦
Process	Direct planning	Strategic planning				♦	♦	♦	♦		♦	♦
		Risk management			♦	♦	♦	♦	♦	♦	♦	♦
		Continuity planning			♦	♦	♦	♦	♦	♦	♦	♦
		Crisis planning			♦	♦	♦	♦	♦	♦	♦	♦
		Health and safety				♦		♦	♦	♦	♦	♦
		Cashflow/wages/super etc.	♦		♦	♦	♦	♦	♦	♦	♦	♦
		Market/brand knowledge	♦		♦	♦	♦	♦	♦	♦	♦	♦
		Insurance	♦	♦	♦		♦	♦	♦	♦	♦	♦
		Internal contracts								♦	♦	♦

* Indicates the inclusion of this particular component in the study for each organisation.

D.3 External Organisational Components

Below is Table D2 which shows the development of External Organisational Components from CS1 to CS10 in this study.

External Organisational Components			CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9	CS10
Physical	Services	Electricity	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Water	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Sewerage	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Telecommunications	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Transportation	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
		Information Technology			♦	♦	♦	♦	♦	♦	♦	♦
Human	Communications and Relationships	Emergency Services		♦	♦	♦	♦	♦	♦	♦	♦	♦
		Local/National Authorities		♦	♦	♦	♦	♦	♦	♦	♦	♦
		National Government				♦	♦		♦	♦	♦	♦
		Customers/clients	♦		♦		♦	♦	♦	♦	♦	♦
		Contractors		♦	♦	♦	♦	♦	♦	♦	♦	♦
		Suppliers	♦		♦	♦	♦	♦	♦	♦	♦	♦
		Competitors	♦		♦		♦	♦	♦	♦	♦	♦
		Community/general public		♦	♦	♦	♦	♦	♦	♦	♦	♦
		Media				♦	♦	♦	♦	♦	♦	♦
Process	Indirect planning	Organisational connectivity			♦	♦	♦	♦	♦	♦	♦	♦
		Central govt regulations			♦	♦		♦	♦	♦	♦	♦
		Legal/contractual arrangements			♦	♦	♦	♦	♦	♦	♦	♦
		Public reputation/image			♦	♦	♦	♦	♦	♦	♦	♦

* Indicates the inclusion of this particular component in the study for each organisation.

APPENDIX E Vulnerability Matrices

E.1 Overview

This appendix presents the vulnerability matrices created with each of the case-study organisations. Vulnerability matrices were not produced by CS4 or CS9. The matrices, other than for CS1, represent both the response and recovery phases for an emergency, and the tables following each matrix present the organisational components for each organisation. The information from the vulnerability matrices was used as part of the integrated analysis in Chapter 5. The matrices are presented on separate pages in this appendix together with the table of organisational components for each organisation.

E.2 CS1: Private Manufacturer

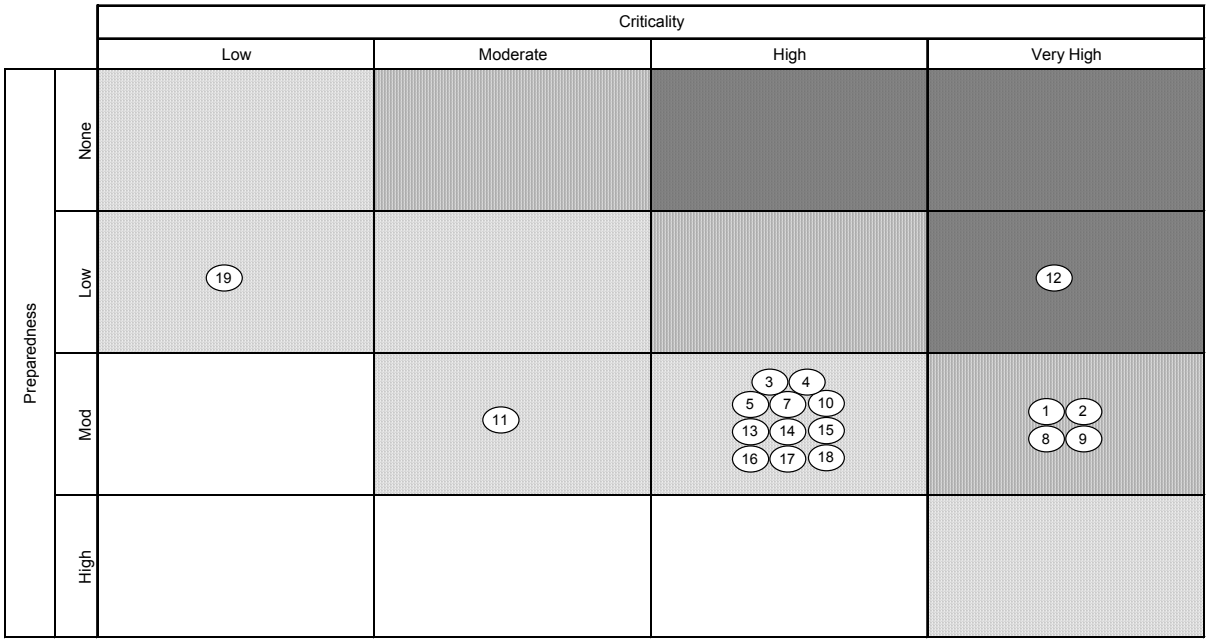

Figure E1. Vulnerability Matrix for the Response Phase for CS1.

Internal Organisational Components (CS1)			#	External Organisational Components (CS1)			#
Physical	Buildings/Structures	Structure	1	Physical	Services	Electricity	12
		Contents	2			Water	13
		Security	3			Sewerage	14
Human	Communications	General Staff	4			Telecoms	15
	And relationships	Senior Mgmt	5			Transport	16
	Info and knowledge	Transfer/retention	6	Human	Communications	Suppliers	17
Processes	Management	Markets	7		And relationships	Customers	18
		Cash Flow	8			Competitors	19
		Insurance	9				
		Management	10				
		Succession	11				

Table E1. Table showing the organisational components for the vulnerability matrix for CS1.

E.3 CS2: The Local Authority

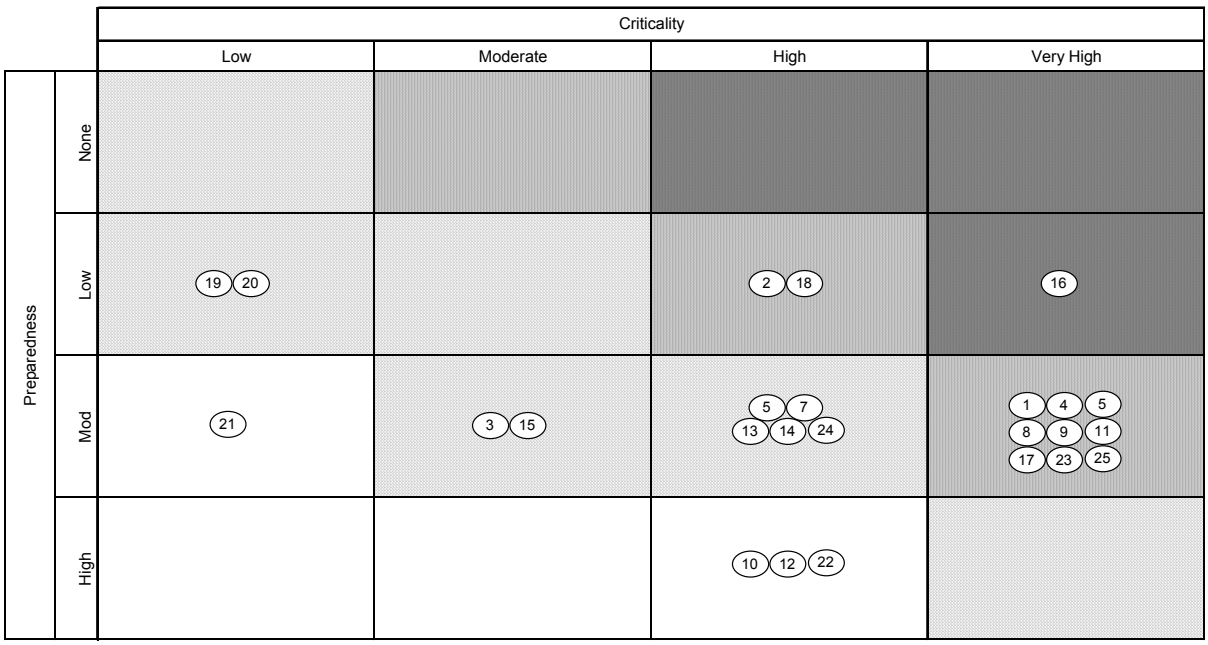

Figure E2(a). Response Matrix for CS2

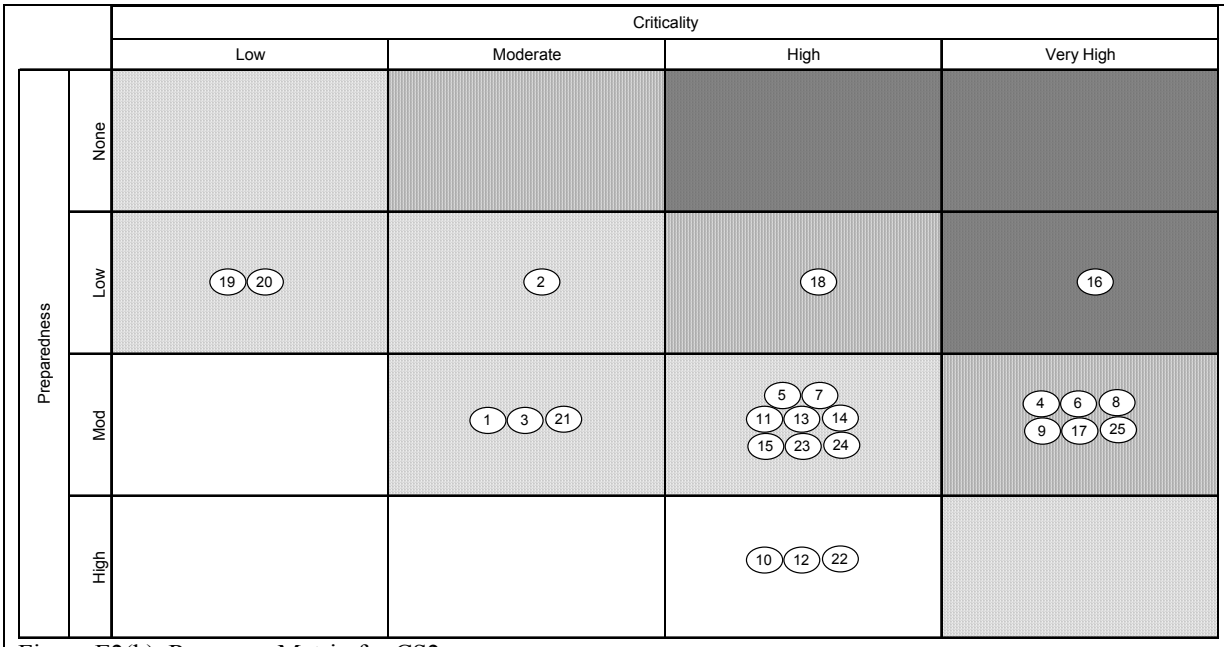

Figure E2(b) Recovery Matrix for CS2

Internal Organisational Components (CS2)			#	External Organisational Components (CS2)			#
Physical	Buildings/Structures	Structure	1	Physical	Services	Electricity	16
		Contents	2			Telecoms	17
		Security	3			Transport	18
	Infrastructure	Water supply	4		Community Services	Maintenance	19
		Waste disposal	5			Event Mgmt	20
		Sewerage	6			Licensing/permits	21
Human	Communications And relationships	General Staff	7	Human	Communications And relationships	Local authorities	22
		Senior Staff	8			Emerg Services	23
		Emergency Staff	9			Contractors	24
Processes	Governance	Insurance	10			Community	25
		Management	11				
		Succession	12				
	Info and knowledge	Info backup	13				
		Knowledge retention	14				
		Privacy/protection	15				

Table E2. Organisational components for CS2 Vulnerability Matrices

E.4 CS3: Private Contractor

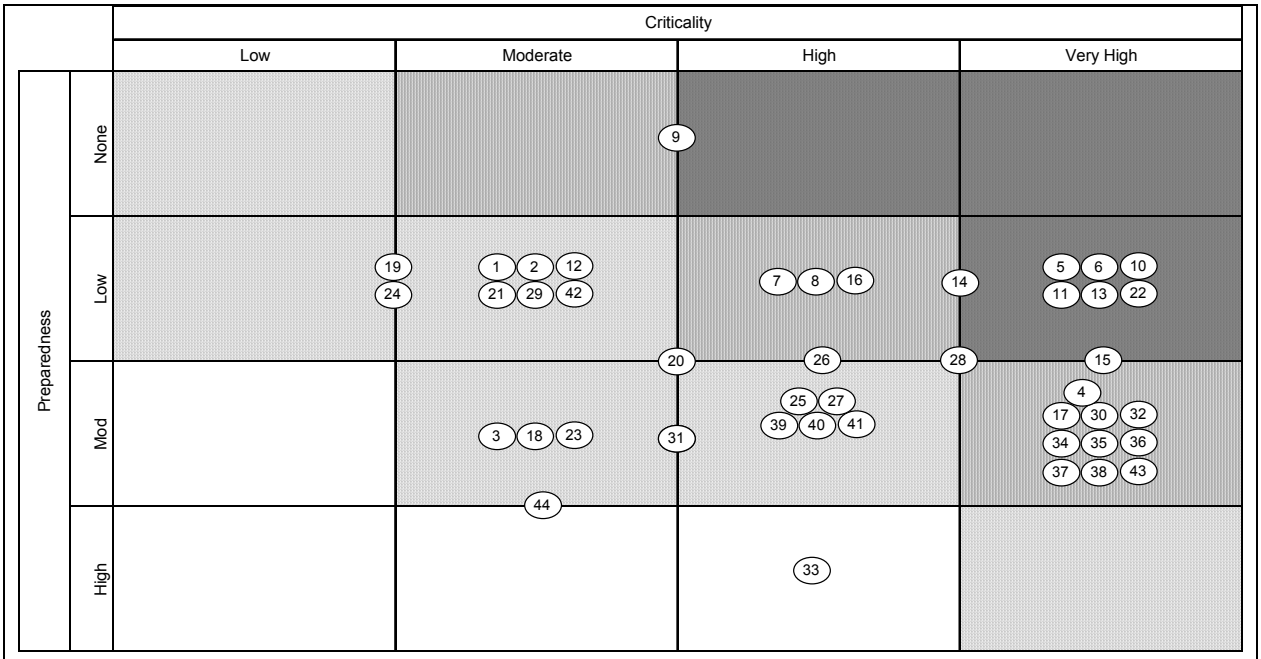

Figure E3(a). Response Matrix for CS3

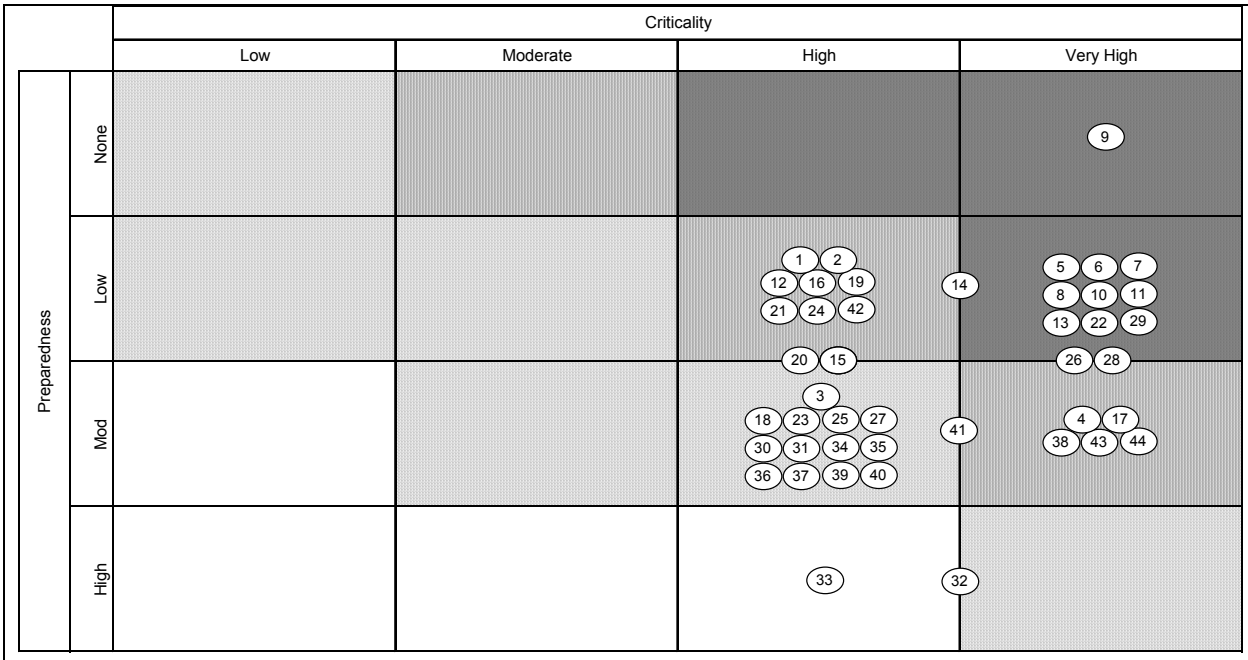

Figure E4(b). Recovery Matrix for CS3

Internal Organisational Components (CS3)			#	External Organisational Components (CS3)			#
Physical	Buildings/Structures	Structure	1	Physical	Services	Electricity	27
		Contents	2			Water	28
		Security	3			Sewerage	29
	Equipment	Vehicles	4			Telecoms	30
		Supplies	5			Transport	31
		Fuel	6			Info technology	32
Human	Communications And relationships	General Staff	7	Human	Communications And relationships	Emerg. services	33
		Senior Staff	8			Local authorities	34
		Emergency Staff	9			Contractors	35
Processes	Management	Leadership	10			Competitors	36
		Governance	11			Suppliers	37
		Recruitment	12			Customers/clients	38
		Training	13			Community	39
		Succession	14	Processes	Indirect planning	Client position	40
		Staff Welfare	15			Central Govt	41
	Info/knowledge	Info Backup	16			Public reputation	42
		Privacy/protection	17			Legal/contracts	43
		Info acquisition	18				
		Info retention	19				
		Info transfer	20				
	Direct Planning	Risk Analysis	21				
		Continuity planning	22				
		Emergency mgnt	23				
		Cash flow	24				
		Market knowledge	25				
		insurance	26				

Table E3. Organisational Components for CS3

E.5 CS5: Education Provider

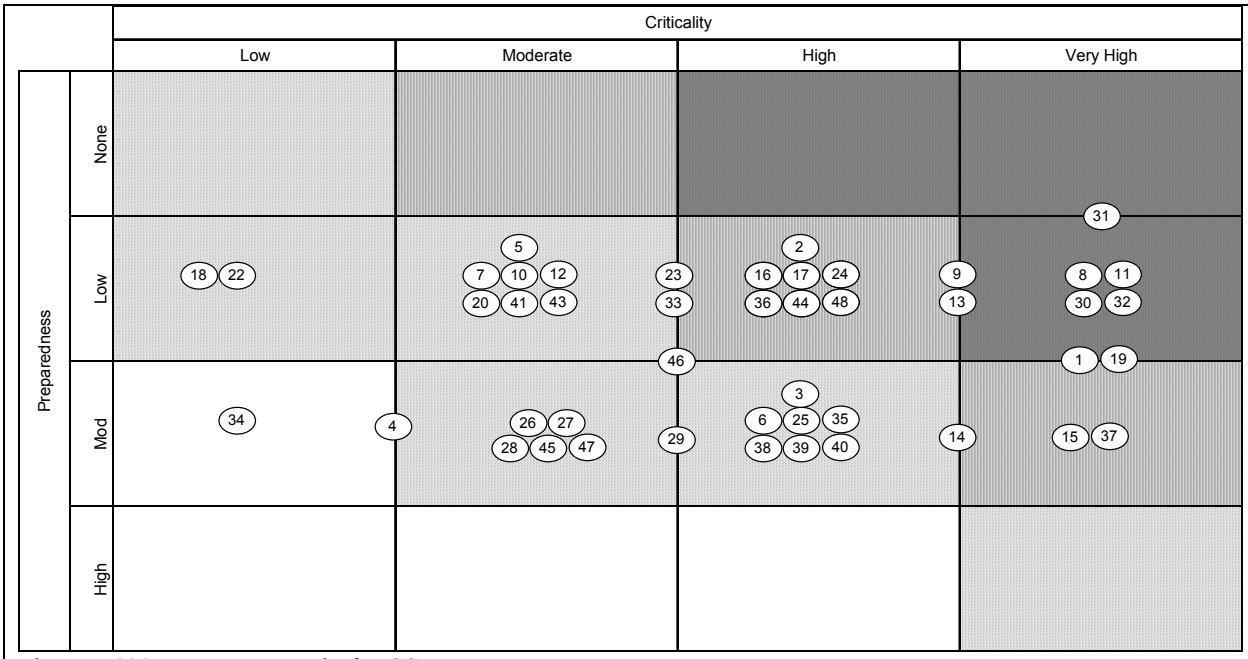

Figure E4(a) Response Matrix for CS5

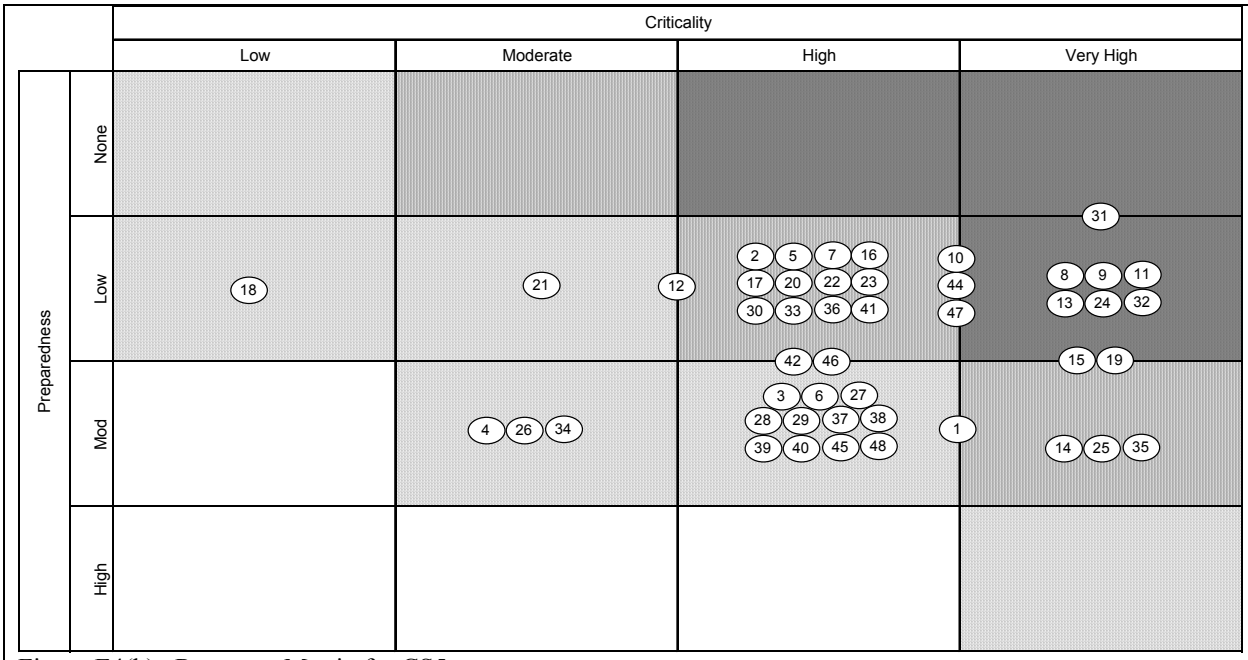

Figure E4(b). Recovery Matrix for CS5

Internal Organisational Components (CS5)			#	External Organisational Components (CS5)			#
Physical	Buildings/Structures	Structure	1	Physical	Services	Electricity	8
		Contents	2			Water	9
		Security	3			Sewerage	10
	Equipment	Vehicles	4			Telecoms	11
		Supplies	5			Transport	12
		Fuel	6			Info technology	13
		Other Equip	7	Human	Communications And Relationships	Emerg. services	37
Human	Communications And Relationships	Within Groups	14			Local authorities	38
		Between Groups	15			Contractors	39
		Board/Others	16			Competitors	40
		Senior Managers	17			Suppliers	41
		Advisory Groups	18			Customers/clients	42
Process	Management	Leadership	19			Community	43
		Governance	20			Media	44
		Recruitment	21	Processes	Indirect Planning	Client Position	45
		Training	22			Central Govt	46
		Succession	23			Legal/contracts	47
		Staff Welfare	24			Public reputation	48
	Info/knowledge	Info backup	25				
		Privacy/protection	26				
		Info acquisition	27				
		Info retention	28				
		Info transfer	29				
	Direct planning	Risk analysis	30				
		Continuity planning	31				
		Emergency mgmt	32				
		Cash Flow	33				
		Market Knowledge	34				
		Insurance	35				
		Strategic Planning	36				

Table E4. Organisational Components for CS5

E.6 CS6: Private Wholesale Distributor

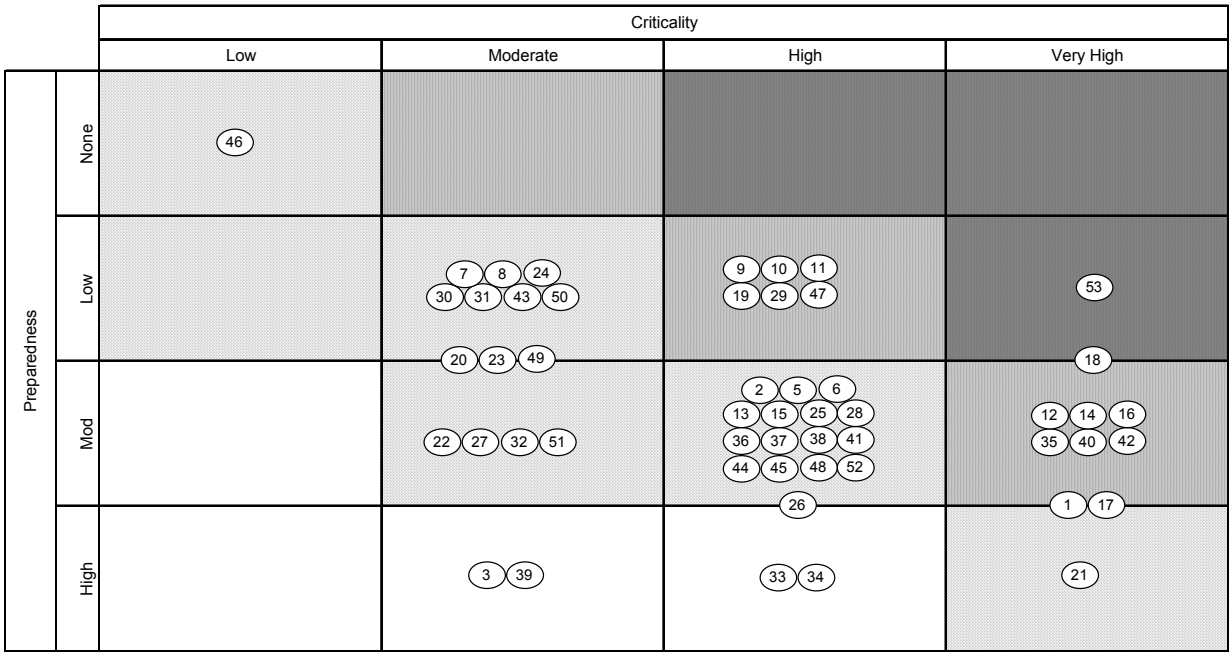

Figure E5(a) Response Matrix for CS6

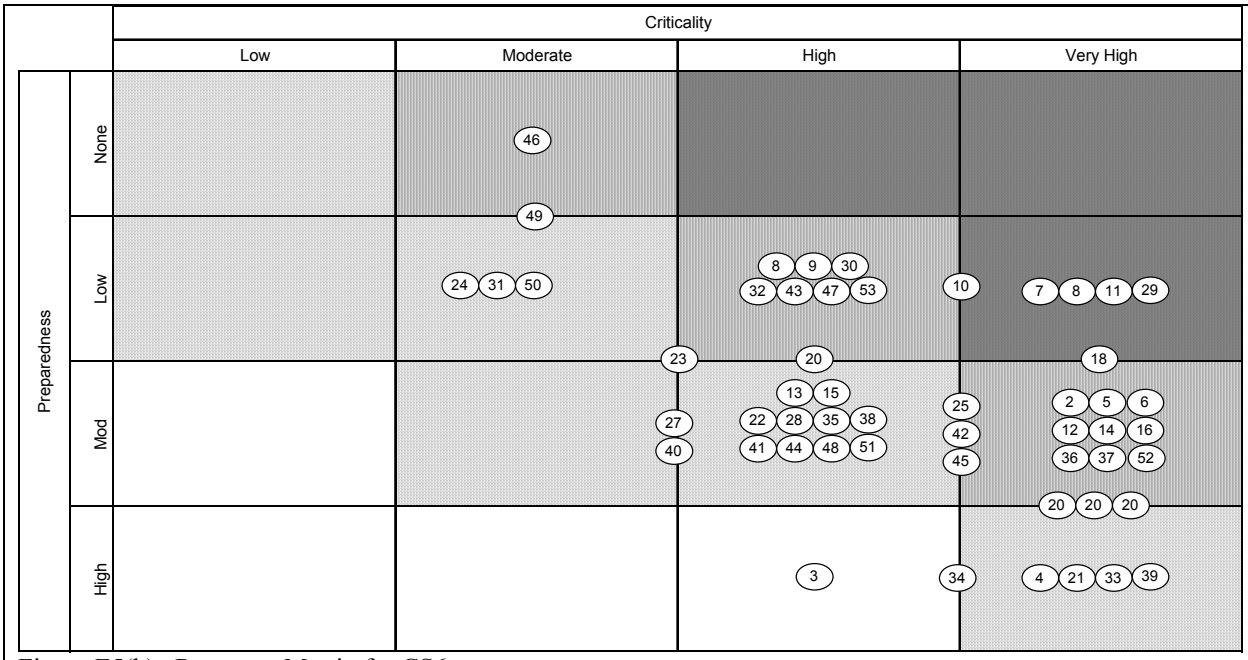

Figure E5(b). Recovery Matrix for CS6

Internal Organisational Components (CS6)			#	External Organisational Components (CS6)			#
Physical	Buildings/Structures	Structure	1	Physical	Services	Electricity	34
		Contents	2			Water	35
		Security	3			Sewerage	36
		Computers/hardware	4			Telecoms	37
		Contents	5			Transport	38
	Equipment	Vehicles	6			Info technology	39
		Fuel	7	Human	Communications And Relationships	Emerg. services	40
		Generators	8			Local authorities	41
Human	Communications And Relationships	Board	9			Keystone clients	42
		Exec Managers	10			Other customers	43
		Senior Managers	11			Contractors	44
		Managers/supervisors	12			Suppliers	45
		General Staff	13			Competitors	46
		Parent/other orgs	14			Community	47
Process	Management	Leadership	15			Media	48
		Governance	16	Processes	Indirect Planning	Connectivity	49
		Recruitment/promotion	17			Central Govt	50
		Succession	18			Public reputation	51
		Staff Welfare	19			Legal/contracts	52
	Info/knowledge	Info backup	20			Civil Defence	53
		Privacy/protection	21				
		Info acquisition	22				
		Info retention	23				
		Info transfer	24				
		Training/review	25				
	Direct planning	Strategic planning	26				
		Risk analysis	27				
		Continuity planning	28				
		Emergency mgmt	29				
		Health/Safety	30				
		Cash flow	31				
		Market knowledge	32				
		Insurance	33				

Table E5. Organisational Components for CS6

E.7 CS7: Private Utility Provider

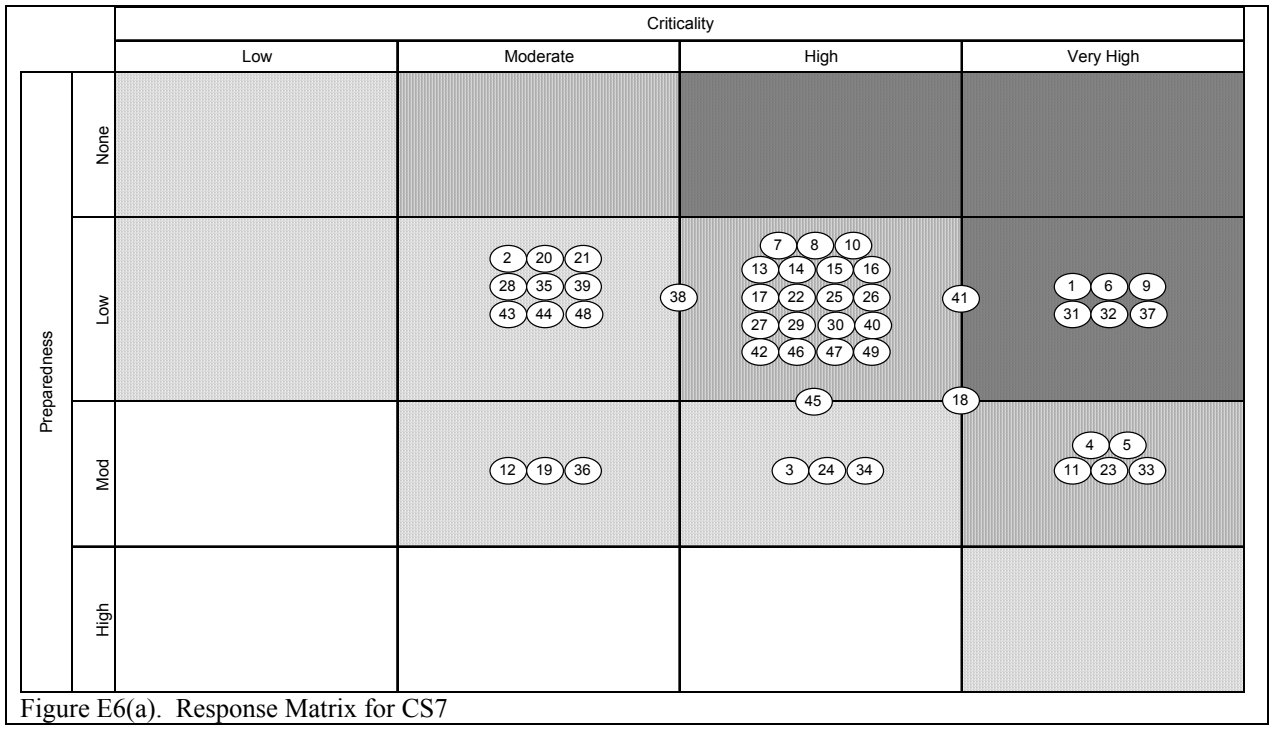

Figure E6(a). Response Matrix for CS7

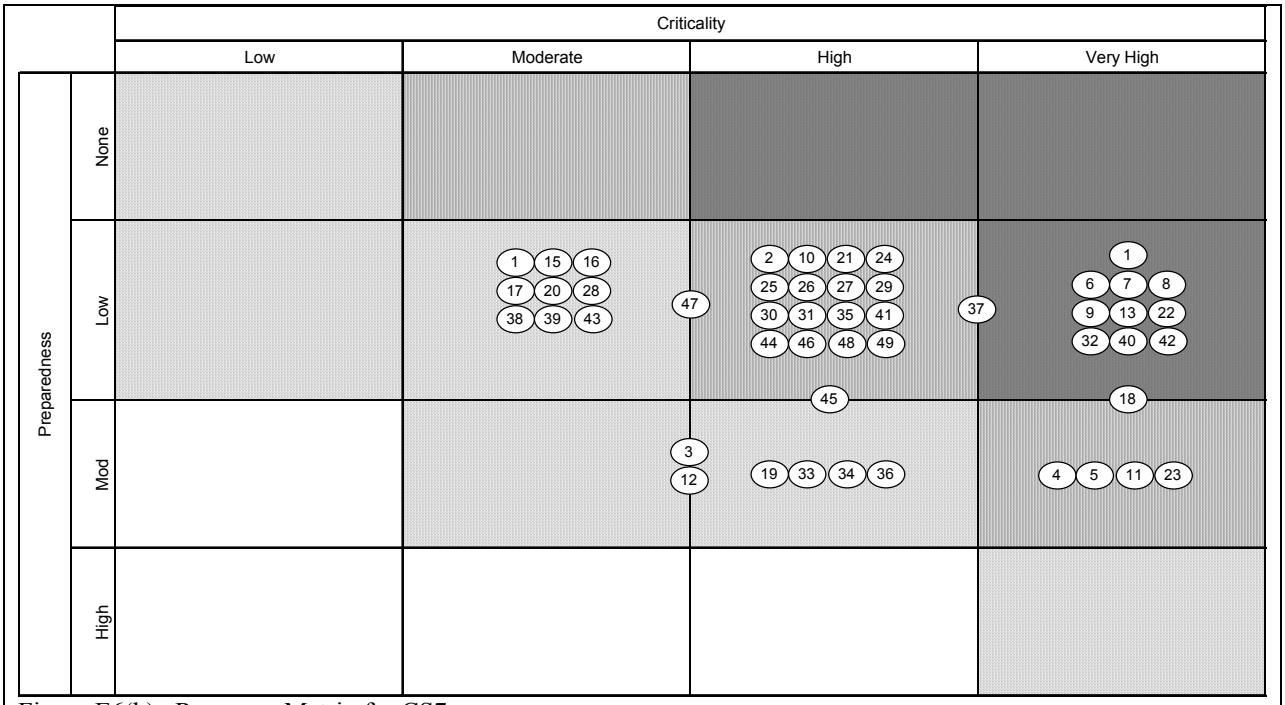

Figure E6(b). Recovery Matrix for CS7

Internal Organisational Components (CS7)			#
Physical	Buildings/Structures	Head office	1
		Regional offices	2
		Security	3
		Computers/hardware	4
		Software/IP	5
Human	Communications And Relationships	Board	6
		Leadership Team	7
		Senior Managers	8
		Managers/supervisors	9
		General Staff	10
		Other regional offices	11
Process	Management	Leadership	12
		Governance	13
		Recruitment/promotion	14
		Succession	15
		Staff Welfare	16
	Info/knowledge	Info backup	17
		Privacy/protection	18
		Info acquisition	19
		Info retention	20
		Info transfer	21
		Training/review	22
	Direct planning	Strategic planning	23
		Risk analysis	24
		Continuity planning	25
		Emergency mgmt	26
		Health/Safety	27
		Cash flow	28
		Market knowledge	29
		Insurance	30

External Organisational Components (CS7)			#
Physical	Services	Electricity	31
		Water	32
		Sewerage	33
		Telecoms	34
		Transport	35
		Info technology	36
Human	Communications And Relationships	Emerg. services	37
		Local authorities	38
		Government	39
		Customers	40
		Contractors	41
		Suppliers	42
		Competitors	43
		Community	44
		Media	45
Processes	Indirect Planning	Connectivity	46
		Central Govt	47
		Legal/contracts	48
		Public reputation	49

Table E6. Organisational Components for CS7

E.8 CS8: Private Retailer

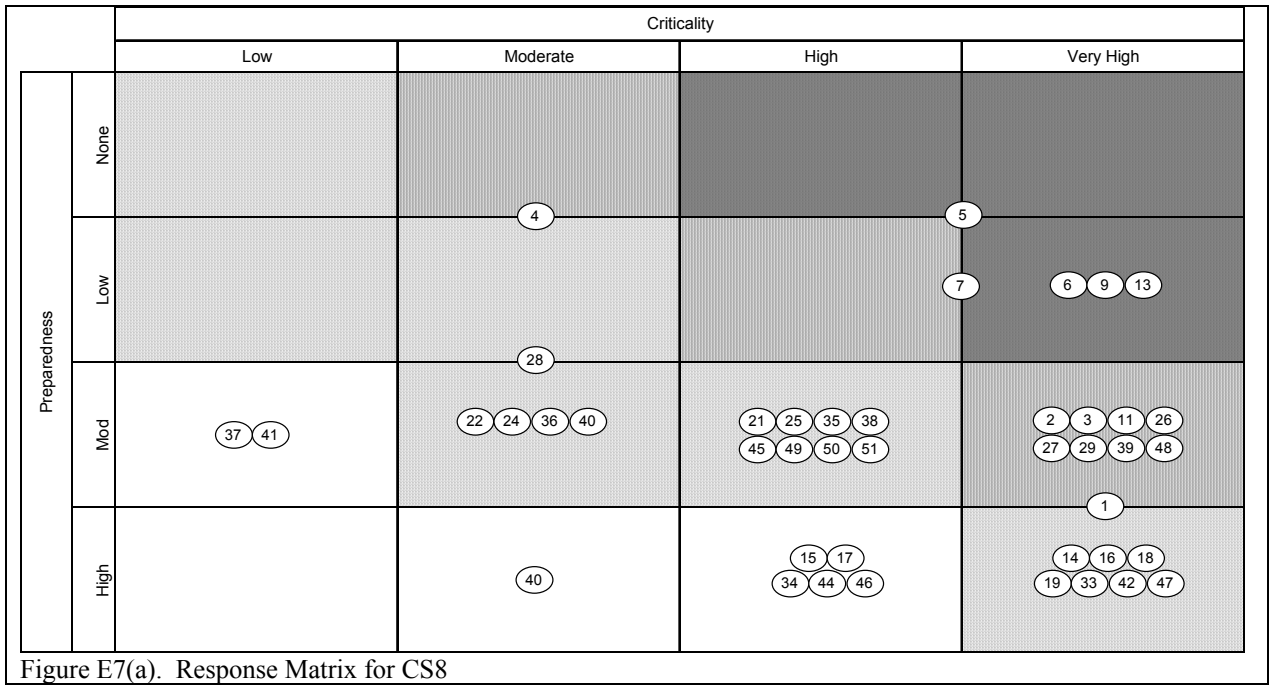

Figure E7(a). Response Matrix for CS8

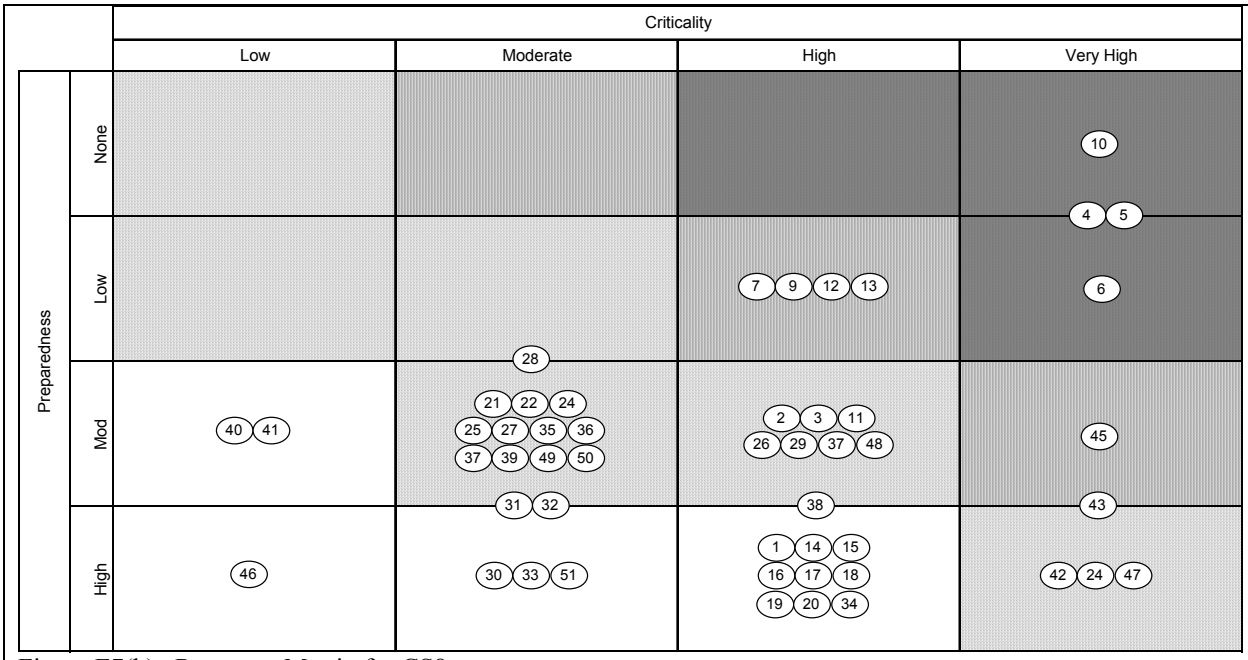

Figure E7(b). Recovery Matrix for CS8

Internal Organisational Components (CS8)			#	External Organisational Components (CS8)			#
Physical	Buildings/Structures	Retail Store	1	Physical	Services	Electricity	34
		Storage	2			Water	35
		Other Buildings	3			Sewerage	36
		Vehicles	4			Telecoms	37
		Security	5			Transport	38
		Computers/hardware	6			Info technology	39
		Software/IP	7	Human	Communications And Relationships	Emerg. services	40
Human	Communications And Relationships	Branded Orgs	8			Local authorities	41
		Board	9			Government	42
		Executive	10			Customers	43
		Other branches	11			Contractors	44
		Dept Managers	12			Suppliers	45
		General Staff	13			Competitors	46
Process	Management	Leadership	14			Community	47
		Governance	15			Media	48
		Recruitment/promotion	16	Processes	Indirect Planning	Connectivity	49
		Succession	17			Central Govt	50
		Staff Welfare	18			Legal/contracts	51
	Info/knowledge	Info backup	19			Public reputation	52
		Privacy/protection	20				
		Info acquisition	21				
		Info retention	22				
		Info transfer	23				
		Training/review	24				
	Direct planning	Strategic planning	25				
		Risk analysis	26				
		Continuity planning	27				
		Emergency mgmt	28				
		Health/Safety	29				
		Cash flow	30				
		Market knowledge	31				
		Insurance	32				
		Loss prevention	33				

Table E7. Organisational Components for CS8

E.9 CS10: Private Technology Provider

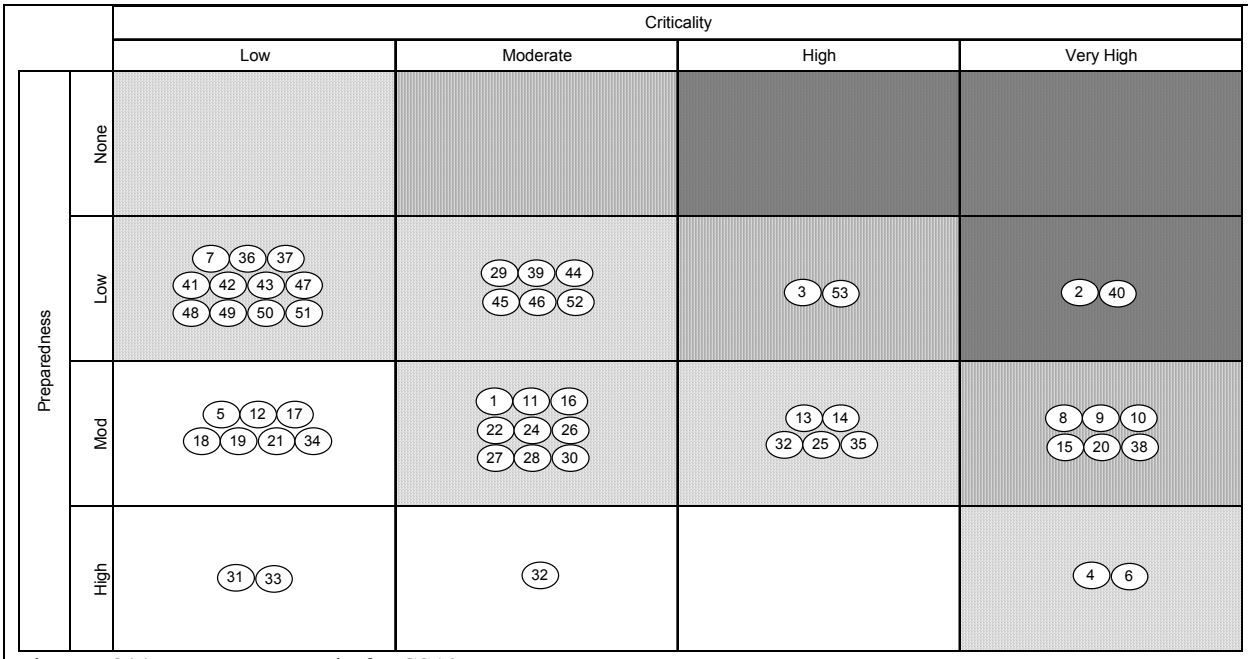

Figure E8(a). Response Matrix for CS10

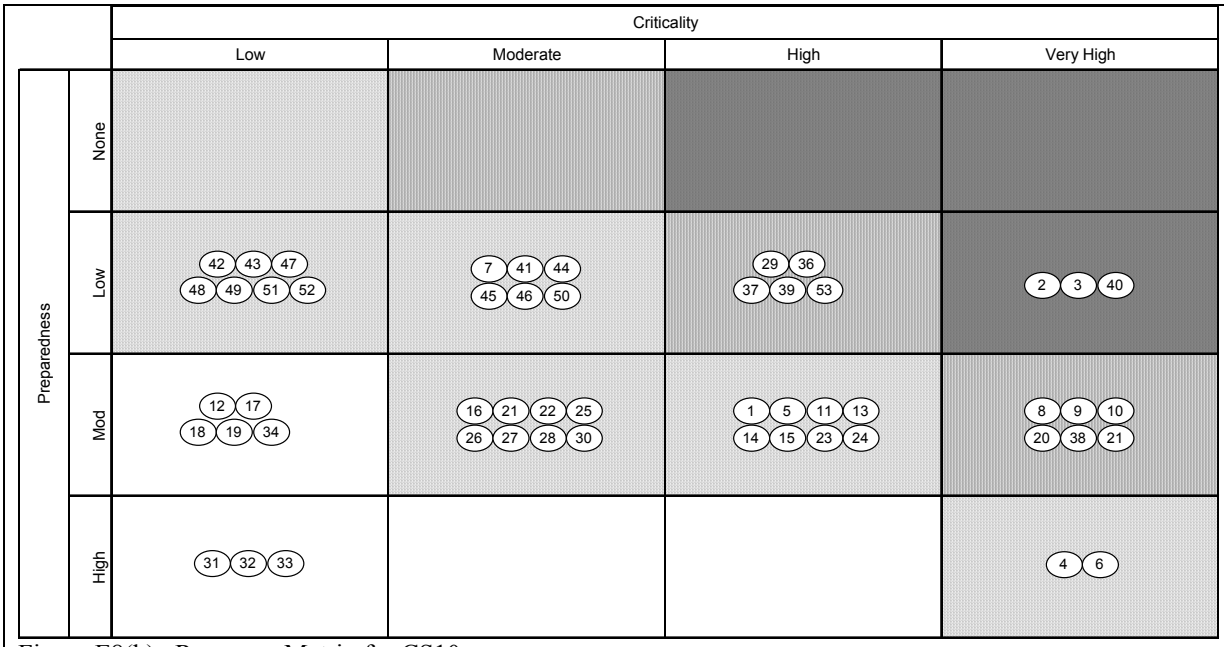

Figure E8(b). Recovery Matrix for CS10

Internal Organisational Components (CS10)			#	External Organisational Components (CS10)			#
Physical	Buildings/Structures	Office	1	Physical	Services	Electricity	33
		Specialist Equip	2			Water	34
		Storage	3			Sewerage	35
		General Equip	4			Telecoms	36
		Security	5			Transport	37
		Computers/hardware	6			Info technology	38
		Software/IP	7	Human	Communications And Relationships	Emerg. services	39
		Generator	8			Local authorities	40
		Fuel	9			Government	41
		IT networks internal	10			Customers	42
Human	Communications And Relationships	Owner	11			Contractors	43
		General manager	12			Suppliers	44
		Senior managers	13			Competitors	45
		General Staff	14			Community	46
Process	Management	Leadership	15			Media	47
		Governance	16	Processes	Indirect Planning	Connectivity	48
		Recruitment/promotion	17			Central Govt	49
		Succession	18			Legal/contracts	50
		Staff Welfare	19			Public reputation	51
	Info/knowledge	Info backup	20				
		Privacy/protection	21				
		Info acquisition	22				
		Info retention	23				
		Training/review	24				
	Direct planning	Strategic planning	25				
		Risk analysis	26				
		Continuity planning	27				
		Emergency mgmt	28				
		Health/Safety	29				
		Cash flow	30				
		Market knowledge	31				
		Insurance	32				

Table E8. Organisational Components for CS10

APPENDIX F Comparative Tables

F.1 Introduction

The following tables were created to analyse the resilience scores for each organisation in this study. They look at any emerging patterns that may link resilience with different identifying features of the organisations. The results are discussed in Chapter 6.

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS3	High	Very High	High	High
1	CS9	Very High	Very High	Very High	Very High
2	CS4	High	Very High	Moderate	High
2	CS6	Moderate	High	Very High	High
2	CS10	High	Moderate	Very High	High
2	CS8	Moderate	Moderate	High	High
3	CS1	Moderate	Moderate	Moderate	Moderate
3	CS2	Low	High	Moderate	Moderate
3	CS7	Low	Low	Moderate	Moderate
4	CS5	Low	Low	Low	Low

1 – Very High
2 – High
3 – Moderate
4 – Low
Table F1. Category: Total Resilience Ranking

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS1	Moderate	Moderate	Moderate	Moderate
1	CS3	High	Very High	High	High
1	CS4	High	Very High	Moderate	High
1	CS5	Low	Low	Low	Low
1	CS6	Moderate	High	Very High	High
1	CS7	Low	Low	Moderate	Moderate
1	CS9	Very High	Very High	Very High	Very High
2	CS8	Moderate	Moderate	High	High
3	CS2	Low	High	Moderate	Moderate
3	CS10	High	Moderate	Very High	High

1 – Large (150+)
2 – Med (40-150)
3 – Small (<40)
Table F2. Category: Organisation Size (based on the number of full time employees)

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS2	Low	High	Moderate	Moderate
1	CS3	High	Very High	High	High
1	CS5	Low	Low	Low	Low
1	CS8	Moderate	Moderate	High	High
1	CS10	High	Moderate	Very High	High
2	CS4	High	Very High	Moderate	High
2	CS6	Moderate	High	Very High	High
2	CS7	Low	Low	Moderate	Moderate
3	CS1	Moderate	Moderate	Moderate	Moderate
3	CS9	Very High	Very High	Very High	Very High

1 – Local
2 – National
3 – International
Table F3. Category: Distribution of Offices

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS2	Low	High	Moderate	Moderate
1	CS8	Moderate	Moderate	High	High
2	CS3	High	Very High	High	High
2	CS4	High	Very High	Moderate	High
2	CS6	Moderate	High	Very High	High
2	CS7	Low	Low	Moderate	Moderate
3	CS1	Moderate	Moderate	Moderate	Moderate
3	CS5	Low	Low	Low	Low
3	CS9	Very High	Very High	Very High	Very High
3	CS10	High	Moderate	Very High	High

1 – Local
2 – National
3 – International
Table F4. Category: Market Distribution

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS1	Moderate	Moderate	Moderate	Moderate
1	CS3	High	Very High	High	High
1	CS6	Moderate	High	Very High	High
1	CS7	Low	Low	Moderate	Moderate
1	CS8	Moderate	Moderate	High	High
1	CS9	Very High	Very High	Very High	Very High
1	CS10	High	Moderate	Very High	High
2	CS5	Low	Low	Low	Low
2*	CS2	Low	High	Moderate	Moderate
2*	CS4	High	Very High	Moderate	High

1 – Private
2 – Public
2- Public Lifeline*
Table F5. Category: Organisation Type

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS1	Moderate	Moderate	Moderate	Moderate
1	CS2	Low	High	Moderate	Moderate
1	CS3	High	Very High	High	High
1	CS4	High	Very High	Moderate	High
1	CS5	Low	Low	Low	Low
1	CS6	Moderate	High	Very High	High
1	CS8	Moderate	Moderate	High	High
1	CS9	Very High	Very High	Very High	Very High
2	CS7	Low	Low	Moderate	Moderate
2	CS10	High	Moderate	Very High	High

1 – High
2 – Medium
Table F6. Category: Expected Relative Dependence on Human Resources

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS1	Moderate	Moderate	Moderate	Moderate
1	CS3	High	Very High	High	High
1	CS7	Low	Low	Moderate	Moderate
1	CS8	Moderate	Moderate	High	High
1	CS9	Very High	Very High	Very High	Very High
1	CS10	High	Moderate	Very High	High
2	CS2	Low	High	Moderate	Moderate
2	CS6	Moderate	High	Very High	High
3	CS4	High	Very High	Moderate	High
3	CS5	Low	Low	Low	Low

1 – High
2 – Medium
3 – Low
Table F7. Category: Expected Dependence on Physical Resources/Inventory etc.

Category	Case-Study Organisation	Level of Situation Awareness	Mgmt of Keystone Vulnerabilities	Degree of Adaptive Capacity	Total Resilience
1	CS3	High	Very High	High	High
1	CS9	Very High	Very High	Very High	Very High
2	CS1	Moderate	Moderate	Moderate	Moderate
2	CS8	Moderate	Moderate	High	High
3	CS2	Low	High	Moderate	Moderate
3	CS6	Moderate	High	Very High	High
3	CS7	Low	Low	Moderate	Moderate
4	CS4	High	Very High	Moderate	High
4	CS5	Low	Low	Low	Low
4	CS10	High	Moderate	Very High	High

1 – Primary
2 – Secondary
3 – Tertiary
4 – Quaternary
Table F8. Category: Industry Sector

APPENDIX G Case Study Consequence Scenarios

G.1 Consequence Scenario 1: Regional Event - Earthquake

The REDS was based on the Pegasus Civil Defence exercise conducted in 2004. The characteristics of the event as presented at the workshop are:

- A magnitude 8 earthquake, with a 300km rupture long the Alpine Fault,
- Extensive liquefaction in and around the city
- Significant aftershocks for two weeks after (including a magnitude 7.2 earthquake two days after the main event)
- Aftershocks continue for 6-10 weeks.
- Timing of Event 5am Monday morning (12th Dec 2005)

Physical Impacts of Earthquake.

- Deaths and Injuries:
  - 75 dead
  - 330 seriously injured
  - 850 injured
- Housing:
  - 15% all buildings in CBD unusable
  - 10% of all houses in city unusable
- Services:
  - Electricity
    - Total loss for at least three days
    - Unclear how long until individual areas are restored
- Communications:
  - After 8 hours, phones went dead when batteries at local network hubs ran out.
  - No landline services available until either power back on or batteries in local server are replaced.
  - Some cell phone towers damaged; heavy congestion on all cell networks results in call prioritisation at a network level. Only limited services available to the public after 3 days.
- Water:
  - Liquefaction has altered water tables.
  - Water being brought into city in tankers
- Sewerage:
  - Sewage networks suffered significant damage.
  - Uncertainty over how long they will take to restore.
- Transportation:
  - Roads - Liquefaction has caused damage to roads in some parts of the city, plus some debris and damage to bridges.
  - Plea from Civil Defence is to restrict all non-essential trips.

Human impact of the earthquake on organisation: The staff members participating in the REDS were divided up into two groups. Each group was to consider arriving at work 4 days after the initial earthquake, as per the organisations emergency management plans. Those who attend the senior management team meeting that day are all that are available, and less than 50% of members are present. An initial walk-down reconnaissance indicates the following damage.

- Several buildings partially collapsed (three fatalities and multiple serious injuries)
- Two buildings totally collapsed including one important service building.
- Main administrative building has major cracking observed from the outside; unclear if it is safe to enter.
- Other damage includes significant damage to contents in buildings including critical computers and servers.

G.2 Consequence Scenario 2: Societal Event – Influenza Pandemic

The event: an Influenza Pandemic. The key challenges are:

- Loss of contextual and specialist knowledge,
- All regions similarly affected so less opportunity for bringing in external support,
- Event escalates over time, with uncertainty as to how long/how bad the event might be,
- Stress levels increasing as work pressures coupled with concern for family and friends, and,
- Community resilience lowered, creating greater need for undisrupted services.

A brief background to the outbreak of infectious disease, including Influenza in New Zealand:

- An old threat that is re-emerging; another influenza pandemic considered to be 'highly likely' or 'inevitable',
- Influenza, Bird Flu, SARS, Bio-terrorism,
- New Zealand experienced 3 influenza pandemics in the 20th Century (1918, 1957, 1968),
- 1918 pandemic infected 1/3 of the population in New Zealand and resulted in 8251 deaths.

The Ministry of Health has predicted the following in the case of the next Influenza outbreak in New Zealand.

- 35% incidence rate over an 8 week period
- 3,700 deaths in New Zealand
- 16,200 hospitalisations in New Zealand
- During the peak week of the outbreak
    - 42% of all hospital beds used for influenza victims
    - Average influenza consultations will be 83 per general practitioner.

Staff were divided up into two groups. Each group was to consider the situation of arriving at work on a Monday morning to find half of all staff, right across the organisation unavailable. In addition, there is uncertainty among remaining staff members about whether this is the peak of the emergency or will it get worse. Each group was asked to consider the following:

G.3 Consequence Scenario 3: Localised Event – Reputation Attack

E.Coli O157:H7 Poisoning: Community speculation about organisation as the source of the infection.

Event Characteristics

- E.Coli bacteria live in the intestines of some healthy cattle, sheep and pigs as well as deer and seagulls. Eating undercooked meat, usually minced meat, contaminated during the slaughter process has historically been blamed for most E.Coli O157:H7 infections.
- However, it is now well recognised that eating some raw vegetables, drinking untreated water and unpasteurised milk, and handling farm animals that are shedding the pathogen are perhaps more frequent sources of infection.
- Person-to-person transmission can occur if infected people do not wash their hands after using the toilet.
- The symptoms usually appear about three days after exposure, with a range of one to nine days.
- Most people recover without antibiotics or other specific treatment in five to 10 days.
- In some people, particularly children under five years of age, the infection can cause a complication called haemolytic uremic syndrome (HUS). This is a serious disease in which red blood cells are destroyed and the kidneys fail. Transfusions of blood or blood clotting factors as well as kidney dialysis may be necessary. A prolonged hospital stay is often required. While most people with HUS recover completely, it can be fatal.

E.Coli – The Event

- The first cases of e.coli are reported the health authorities on the evening of Saturday, 7th October, 2006.
  - The first hospitalisation occurs on Monday 9th October.
  - A total of 4 children under the age of 10 are hospitalised with suspected e.coli poisoning.
  - One child is in serious condition with kidney failure.
  - All 4 children were part of a large group picnic and bbq over the weekend.
  - By Monday evening, a number of other discrete e.coli outbreaks, separate to the children's bbq and picnic, have been reported - all in the local area.
  - By Tuesday morning, 10th October, there is media speculation about the source of the e.coli outbreak being from a local retail source, as yet unnamed.
- It is Tuesday 10th October, 2006; 3 days after the first reported e.coli infection.
  - Two staff members have reported in ill with suspected food poisoning.
  - A quick survey of staff reveals that there is considerable community speculation about the organisation being the source of the outbreak.
  - By mid morning, local radio reports have named the organisation as the source of the outbreak and management is bombarded with phone calls from media nationwide.
  - There are also rumors that health authorities are to be involved and investigate organisation as a reported source of the outbreak: this is unsubstantiated at the present time.
- It is Tuesday 24th October, two weeks after media reports named organisation as the source of the e.coli outbreak in local area.
  - The food safety authorities have completed an initial investigation. Their preliminary findings include:
    - The outbreak of e.coli is thought to have occurred because of cross-contamination of infected raw meat and cooked meat.

        - The source of the outbreak cannot be confirmed as coming from the organisation.
        - They have reported on some unsafe practices at the organisation particularly related to a single staff member.
    - The organisation has reported a significant downturn in customer numbers in the past 2 weeks. This is supported by reports of increased customer numbers in the local competition.
    - The community is still suspicious of the organisation, even after official reports claiming that the source of the outbreak is unknown. This is having a flow-on effect with other similar organisations in different regions.
    - There is still media speculation about a 'corporate cover-up' of unsafe practices in the organisation.

G.4 Consequence Scenario 4: Distal Event – Rise of a Competitor

- Overview of Event
    - Notification of competitor's aggressive expansion in critical business unit in New Zealand.
    - Potential for loss of some key staff throughout organisation to competitor.
    - Extensive media and customer speculation together with potential reputation impacts.
    - Significant rumors circulating internally in organisation.
- Media Releases
    - Competitors have issued an overnight media release.
        - They have officially opened a New Zealand office.
        - They initiate an intensive media campaign to attract customers in New Zealand.
        - They announce a recruitment drive critical specialist staffing area in NZ.
    - Organisation has issued an immediate response in the media.
    - Organisation states that business unit under threat intends to be the market leader in NZ despite competitors assertions.
- Internal Issues
    - Organisation has been dealing with internal rumors about competitor for many months including:
        - There are rumors that organisation does not have the technical ability to be a market leader.
        - There are rumors about better pay rates with competitor.
        - There are rumors that competitor may try and buy out business unit.
        - There are rumors that organisation may be forced to close some of its regional offices and consolidate in the main urban areas.
    - Organisation has sent assistance to business unit
        - Two representatives from the Risk Management team have just arrived to assist business unit in addressing this current threat from competitor.
- Stakeholder Speculation
    - The Media are speculating.
        - Organisation have recently experienced problems due to technical difficulties.
        - There is talk in the media that business unit management are no longer committed to their customers and the effects this may have on the wider community.
    - The customers are speculating.
        - Many customers are frustrated with current levels of service organisation.

- Some customers have commented to the media that they would use the competition's products in preference to organisations products.