

**BENCHMARKING THE RESILIENCE OF
ORGANISATIONS**

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Abstract

Our world is more technologically advanced and interdependent, risks are increasingly shared across local, regional and national boundaries and we are more culturally diverse than ever before. As a result, communities are increasingly confronted with emergencies and crises which challenge their social and economic stability. To be resilient, communities rely on services and employment provided by organisations, to enable them to plan for, respond to, and recover from emergencies and crises. However organisational and community resilience are two sides of the same coin; if organisations are not prepared to respond to emergencies and crises, communities too are not prepared.

Resilient organisations are also better poised to develop competitive advantage. However despite the potential business and performance rewards of becoming more resilient, organisations struggle to prioritise resilience and to allocate resources to resilience, which could be put to more immediate use. To enable organisations to invest in their resilience, the business case for resilience must be better than the case for new equipment or new staff.

This thesis develops a methodology and survey tool for measuring and benchmarking organisational resilience. Previous qualitative case study research is reviewed and operationalised as a resilience measurement tool. The tool is tested on a random sample of Auckland organisations and factor analysis is used to further develop the instrument. The resilience benchmarking methodology is designed to guide organisations' use of the resilience measurement tool and its incorporation into business-as-usual continuous improvement.

Significant contributions of this thesis include a new model of organisational resilience, the resilience measurement tool, and the resilience benchmarking methodology. Together these outputs translate the concept of resilience for organisations and provide information on resilience strengths and weaknesses that enable them to proactively address their resilience and to develop a business case for resilience investment.

Chapter 1 – Introduction

Our world is more technologically advanced and interdependent, risks are increasingly shared across local, regional and national boundaries, and we are more culturally diverse than ever before. Investment choices on one side of the world, can affect the cost of living on the other, and New Zealand communities have not been immune to the impacts of the recent financial crisis. An earthquake, volcano or tsunami affecting New Zealand could affect its communities, its economy, its ability to import and distribute goods, and the availability of services such as water. In addition to events on a global and regional scale, local emergencies and crises such as power failures, can affect communities' ability to function. Community resilience, the ability of communities to cope or bounce back from adverse events or situations, is increasingly important and is critical to maintaining economic and social stability.

To be resilient, communities rely on services and employment provided by organisations, to enable them to plan for, respond to, and recover from emergencies and crises. Lifeline organisations that provide services such as water, gas, electricity and transport, and organisations that provide education and healthcare, are commonly seen as critical. This is because it is these organisations which enable communities to function. Organisational and community resilience are two sides of the same coin; if organisations are not prepared to respond to emergencies and crises, communities too are not prepared.

In addition to the link between resilient communities and resilient organisations, there is also a link between being resilient and being competitive. To be resilient, organisations rely on strong leadership, their awareness and understanding of their operating environment, their ability to manage vulnerabilities, and their ability to adapt in response to rapid change. These characteristics run parallel to a competitive organisation whose leaders are able to leverage its strengths to adapt ahead of its competitors, and to respond to rapid changes in their market or industry sector.

Despite the many business benefits of becoming more resilient, organisations often struggle to prioritise resilience and to link resilience to emergency or crisis, with the

ability to operate effectively, efficiently and competitively during business-as-usual. Many organisational leaders agree with the need to improve their resilience in principle; however they lack the time or resources to address the problem. There always seems to be something more vital or important to address; either because the organisation is doing so well that they are working very hard to keep up, or because the organisation is already struggling and has nothing to spare. It is also very difficult to attract board level buy-in or support for investments that have no measurable return or quantifiable benefit. This is especially true where resilience activities are competing against more traditional projects for the same funds. The majority of organisations in New Zealand still evaluate investments based upon how they contribute to the organisation's bottom line. While social and cultural criteria are slowly being incorporated into organisations' decision making, this is not likely to increase significantly within the immediate future.

To improve community resilience, it is important for organisations to make the link between resilience and organisational competitiveness, and to invest in resilience. For an organisation to invest in resilience there must be an evidenced way of measuring it, and of demonstrating changes and trends in this measurement over time.

Measuring and benchmarking resilience will allow organisations to assess their current resilience management strategies and to evaluate their performance. Given this information, organisations can develop new strategies to address gaps in resilience and increase resilience capabilities. Measuring and benchmarking organisational resilience is about two things, firstly asking 'as an organisation how resilient are we and what do we need to work on?', and secondly remembering that what gets measured gets done!

This thesis focuses on developing a tool to measure and benchmark organisations' resilience. This chapter provides an introduction by outlining the problem and the solution investigated by this thesis. It emphasises the importance of organisational resilience and its interdependent relationship with community resilience. It also provides the aims and objectives of the thesis, discusses the significance of the research, and outlines the structure of the thesis.

1.1 The Importance of Organisational Resilience

Mitroff (2001, p. 29) discusses trends in crises, primarily man-made events or situations, and notes that, the fifteen years prior to his analysis in 2001, saw a sharp increase in the number of accidents. He goes on to attribute this to the increased complexity of social and technological systems and argues that crises have become an integral part of modern life. McManus et al. (2008) argue that increasing reliance on technology and technology providers has highlighted the interconnectedness and vulnerability inherent in such complex systems. Boin and Lagadec (2000, p. 185) support this when they note that “*Crises are becoming more complex in nature, they are increasingly transboundary and interconnected*”.

Organisational resilience is a continuously moving target which contributes to performance during business-as-usual and crisis situations (Mitroff, 2005). It requires organisations to adapt and to be highly reliable (Weick & Sutcliffe, 2007), and enables them to manage disruptive challenges (Durodie, 2003). Seville et al. (2008, p. 18) discuss organisational resilience as an organisation’s “...*ability to survive, and potentially even thrive, in times of crisis*”. Organisational resilience is important for two key reasons; firstly because community and organisational resilience are interdependent in a complex environment (Dalziell & McManus, 2004), and secondly because being resilient can provide organisations with competitive advantage (Parsons, 2007).

In the literature, community and organisational resilience are often addressed separately. However, communities rely on organisations to plan for, respond to and recover from disasters, and to provide critical services such as power, transport, healthcare, and food and water (Chang & Chamberlin, 2003). McManus et al. (2008) argue that the resilience of organisations directly contributes to the speed and success of community recovery following a crisis or disaster. Buckle (2006) reflects this when he discusses organisations as a level of social resilience. McManus et al. go on to discuss communities’ expectations of organisations and argue,

“Consumers and communities are increasingly demanding that organisations exhibit high reliability in the face of adversity and that

decision makers are able to address not only the crises that they know will happen, but also those that they cannot foresee”.

(McManus, et al., 2008, p. 82)

In order to address community resilience, organisations must ensure that they are able to avoid crisis where possible, to maintain essential services during a response, and to recover operations as quickly as possible.

Coleman (2004, p. 3) examines the frequency and cost of corporate crises defined as “...any problem or disruption which triggers negative stakeholder reactions and results in extensive public scrutiny”, and notes that in Australia “...one in four organisations which is impacted by a crisis does not survive” (Coleman, 2004, p. 8). Stern et al. (2003) discuss the failure of critical infrastructure in Auckland, the major financial and population centre of New Zealand. In February 1998, after years of industry restructuring, all four of the main power cables supplying Auckland’s central business district failed. While there was no formal declaration of an emergency, the outage lasted for three weeks and affected 2000 businesses (Newlove, et al., 2003). Hiles (2008, p. xx) notes,

“Maybe Auckland is simply unlucky. Failure of a 110KV power line in Auckland on 12th June 2006 exposed the still fragile power grid, left 750 000 people without power and cost businesses an estimated \$70 million in lost trade”.

During this crisis, organisation size offered no protection. Hiles (2008) highlights how the University of Auckland had to tell 24,000 staff and students to stay home, and Ports of Auckland had to turn ships away. While the Auckland power crisis happened in 1998, 10% of the Auckland organisations that took part in this research had experienced a power crisis in the last five years. Given the frequency and impact of these crises, and the consequences of performing poorly, it is critical that organisations address their resilience.

However crises can also present an opportunity for organisations that are resilient. Starr et al. (2003b, p. 3) support this when they argue,

“A resilient organisation effectively aligns its strategy, operations, management systems, governance structure, and decision-support capabilities so that it can uncover and adjust to continually changing risks, endure disruptions to its primary earnings drivers, and create advantages over less adaptive competitors”.

Here Starr et al. link organisational resilience with organisations’ ability to be competitive.

1.2 Why Measure Organisational Resilience?

Metrics for measuring and evaluating organisational resilience can contribute to four key organisational needs:

- The need to demonstrate progress towards becoming more resilient
- The need for leading, as opposed to lagging, indicators of resilience
- The need to link improvements in organisational resilience with competitiveness
- The need to demonstrate a business case for resilience investments

In recent years, organisations have increasingly focused on their ability to respond to crises. However, organisations often struggle to prioritise and allocate resources to building resilience, given the difficulty of demonstrating progress or success (Stephenson, et al., 2010). This is partly because emergency management and business continuity programs have to compete for resources, against profit-driven activities for which there are metrics for evaluating whether they have produced financial growth or not (Kay, 2010). Resilience however, focuses on social and cultural factors within organisations which are more difficult to measure and to link to financial outcomes. One example would be the difficulty of quantifying how the cost of running an emergency exercise affects an organisation’s resilience and their bottom line. Organisations must be

able to demonstrate progress towards becoming more resilient by quantifying improvements in their resilience, and tracking changes in that measurement over time.

Flin et al. (2000) review scales developed to measure safety climate in high reliability industries and note that in recent years, operating companies and regulators have moved away from lagging indicators, towards leading indicators of safety. Lagging indicators are based on retrospective data and, in the context of resilience, would measure how resilient an organisation has been. An example of this would be looking at an organisation's experience of crises to describe its resilience over the last 10 years, and then using that as a predictor of its resilience for the next 10 years. Leading indicators measure observable processes, actions and practises which are thought to contribute to the organisation's resilience. An example of this would be measuring an organisation's ability to communicate across organisational, social and cultural boundaries as a factor which contributes towards their resilience. Flin et al. (2000, p. 178) argue that leading indicators,

“...may reduce the need to wait for the system to fail in order to identify weaknesses and to take remedial actions”.

In the context of resilience, this is very important because leading indicators can provide organisations with information on their resilience strengths and weaknesses before a crisis happens. In a competitive environment, an organisation that is aware of its resilience strengths is also more equipped to find opportunities out of a crisis situation (Knight & Pretty, 1997).

Resilient organisations can also be more competitive during business-as-usual. Vargo and Seville (2010) discuss competitive excellence and provide Table 1.1 to illustrate the similarities and links between competitive excellence and organisational resilience. The comparison shows that elements of resilience and competitive excellence share many of the same features. For example the organisation's situation awareness, or its ability to interpret information about its business environment and understand what that information means for the organisation now and in the future, is very similar to its ability to know its competition and environment.

Table 1.1: Organisational Resilience and Competitive Excellence

Features of Resilience	Features of Competitive Excellence
20/20 Situation awareness and effective vulnerability management	Knowing your competition and environment
Agile adaptive capacity	Being quick to respond when things change
World class organisational culture and leadership	Having outstanding leadership
20/20 Situation awareness and effective vulnerability management	A robust capital structure
World class organisational culture and leadership	A commitment to your customer that is extraordinary
World class organisational culture and leadership	A cohesive culture of quality, responsibility and service

(Adapted from Vargo & Seville, 2010)

The link between crisis management and competitiveness or profitability is also emphasised by Mitroff (2005, p. 376) who argues,

“Smart organisations practice crisis management equally in good and bad times. As a result, they experience substantially fewer crises and are substantially more profitable”.

For organisations to invest in resilience, the business case for resilience investments has to go beyond insurance, and must be as good as the case for new equipment or new staff (Vargo & Stephenson, 2010). The business case for resilience needs to demonstrate the value added by resilience, the affect it has on the organisation as a whole, and also should consider the potential consequences of not investing in resilience.

1.3 Aims and Objectives

This research focuses on developing and testing a resilience measurement and benchmarking tool. The purpose of this is to provide organisations with leading, as opposed to lagging, indicators of their resilience. The aims and objectives of the research are shown below and relate to the research questions presented in Section 2.6.

Aims:

- 1 To quantitatively test existing organisational resilience theory derived from qualitative case study research against a wider population of organisations in New Zealand.
- 2 To develop a tool to measure and benchmark organisations' resilience.

Objectives:

1. To review McManus's (2007) definition and indicators of organisational resilience, and propose a model of organisational resilience.
2. To develop metrics and resilience measurement tool to measure and benchmark organisations' resilience.
3. To use the resilience measurement tool to test both McManus's (2007) definition and indicators, and the proposed model of organisational resilience.
4. To use the resilience measurement tool to gain a picture of the resilience of organisations in Auckland, New Zealand.

1.4 The Contributions of this Research

This Ph.D. thesis has been completed through the Resilient Organisations Research Programme with funding from the Foundation for Research Science and Technology (FRST) and the Auckland Civil Defence Emergency Management (CDEM) Group. It will contribute to the first Resilient Organisations objective; organisational planning for hazard events. The aim of this objective is:

- To understand how New Zealand organisations prioritise investment for hazard events, develop a framework for improved internal organisational planning and facilitate integration of hazard planning with other organisations.

This thesis develops a tool to measure organisations' resilience that will enable organisations to prioritise targeted investment towards areas of potential improvement.

In addition to contributing to the objectives of the Resilient Organisations Research Programme, this thesis:

- Quantitatively tests organisational resilience theory;
- contributes to organisational resilience literature;
- provides a snap shot of the resilience of Auckland organisations;
- provides a tool for organisations to measure and compare their resilience; and
- contributes towards the business case for resilience.

This thesis reviews and tests organisational resilience theory, using data collected from a random sample of Auckland organisations. This quantitative analysis is part of the development of the resilience measurement tool, and integrates previous research into a model of organisational resilience which is supported by the data. This thesis also adds to the literature on what organisational resilience is, and identifies leading indicators and metrics that can be used to measure it. This contrasts with current literature which relies on a qualitative case study approach (McManus, et al., 2008), or on measuring latent resilience (Mallak, 1998b) or resilience potential (Somers, 2009).

As part of developing the resilience measurement tool, it was tested on a sample of Auckland organisations. The resilience results of these organisations, and the implications for the resilience of Auckland organisations as a whole are discussed. This thesis also presents a tool for measuring organisational resilience and a benchmarking methodology to guide its use. This is important because it allows organisations, regardless of size or income, to access the tool and to integrate it into their organisational management. As a result, the tool has the potential to empower organisations to take a more proactive stance towards managing their resilience.

This research also contributes to the business case for organisational resilience and demonstrates a link between resilience and profitability. Recommendations for further research to better understand this link, and how organisations can use it to link investments in resilience with the organisation's bottom line, are discussed.

1.5 Thesis Structure

Chapter 2 – Theoretical Development. This chapter presents a review of the literature which provides the theoretical basis for this research. It includes a discussion of the key points that have been developed to form the hypotheses and models that are tested, and also presents the research questions.

Chapter 3 – Identifying the Indicators of Organisational Resilience. This chapter presents a review of McManus' (2007) model of Relative Overall Resilience (ROR) which is used as the starting point for this thesis. It also discusses a workshop which was used as part of a review to update the indicators of organisational resilience.

Chapter 4 – Thesis Methodology. This research uses survey methodology to test a model and tool for measuring organisational resilience. This chapter discusses the methods used and also presents the hypothesised models, based on McManus' (2007) Relative Overall Resilience model, and an Adjusted Relative Overall Resilience model, which are tested through this thesis.

Chapter 5 – Scale Development. This chapter discusses the development of the resilience measurement tool including the generation of survey items or questions, and the pilot study which was used as a pre-test for the tool.

Chapter 6 – Evaluating the Resilience Measurement Tool. This chapter presents the results and analysis for the test of the resilience measurement tool. The reliability and validity of the tool are discussed.

Chapter 7 – Evaluating the Resilience of Organisations in Auckland. This chapter uses the data gathered through the resilience measurement tool, to evaluate the resilience of the Auckland organisations that took part in the research. Results are discussed in relation to the resilience of the community of organisations that took part, and the various industry sectors represented. The highest and lowest scoring organisations, as well as the industry sector achieving the highest response rate, are also presented as case studies to demonstrate the detail achieved through the tool.

Chapter 8 – The Resilience Benchmarking Methodology. This chapter presents the benchmarking methodology which has been developed through this thesis to guide the application and use of the resilience measurement tool.

Chapter 9 – Conclusion. This chapter summarises the research findings, answers the research questions, discusses the limitations of the research, and provides suggestions for future research.

Chapter 2 – Theoretical Development

This thesis takes a systems approach towards organisational resilience, and integrates literature from crisis management and high reliability organisation theory. It also considers literature on organisational management and performance, organisational culture and business continuity.

The literature is introduced by considering how crisis management literature, which is based on the study of industrial accidents, can be applied to organisations. This literature is reviewed in relation to how crises develop within organisations and how organisations respond to crisis, change and uncertainty. As part of the discussion, a number of disaster and crisis models are reviewed. The purpose of discussing these models is to provide a background of current theory on how organisations and their environment interact, before, during and after crises and emergencies.

The discussion of organisational resilience defines resilience and introduces the concept of high reliability organisations (HROs). It also discusses whether HRO theory, based on the study of organisations such as air traffic control and nuclear submarines, is applicable to other organisations. The relationship between organisational resilience and organisational performance, excellence and competitiveness are also discussed. Standards relating to organisational resilience, risk management and business continuity are reviewed to identify any aspects which are applicable to the resilience measurement tool developed through this thesis.

Previous research, which focuses on measuring organisational resilience, is reviewed to identify potential indicators and metrics for this study. Types and uses of benchmarking are discussed in the context of the methods used in this thesis, and also as part of the methodology developed through this thesis, for the continued use of the resilience measurement tool by organisations.

The literature review in this chapter is concluded with a discussion of anticipation vs. resilience which is a central theme that runs through the literature and is relevant to the final results of this thesis.

The research questions, presented in Section 2.6, follow on from the literature review, and link into the aims and objectives discussed in Section 1.3. They provide direction for the thesis and outline what the thesis sets out to achieve.

2.1 The Exploration of Organisations through Crisis Literature

This section defines crisis and crisis management, and discusses the applicability of crisis management theory to this thesis. This provides a context for the remainder of the literature review, and its integration into a discussion of organisational resilience.

There are many different definitions of crisis, but the term is most often used in relation to political and organisational crises. Boin and McConnell (2007) discuss events or situations of change and uncertainty affecting organisations on a variety of scales; emergencies, crises, disasters and catastrophes. They characterise crises as threats to the core values of the system, under conditions of deep-rooted uncertainty and rapid change that require rapid action (Boin & McConnell, 2007). Shrivastava et al. (1988) offer the most appropriate definition in the context of organisational resilience; they define crises as,

“...organisationally-based disasters which cause extensive damage and social disruption, involve multiple stakeholders, and unfold through complex technological, organisational and social processes”.

(Shrivastava, et al., 1988, p. 285)

This definition implies that crises are large-scale events, however other authors recognise that crises are often created by the accumulation of smaller events or cascade failures (Turner, 1976). Despite the negative connotations of organisational crises presented by most definitions, Smith (1990, p. 266) argues that *“...organisations can have a “successful” crisis which helps to improve the overall performance of the enterprise”.*

Pearson and Clair (1998, p. 61) define crisis management as,

“...a systematic attempt by organisational members with external stakeholders to avert crises or to effectively manage those that do occur”.

Here, Pearson and Clair suggest that crisis management is systematic, involves external stakeholders, and accept that it is impossible to avoid or prevent all crises. In addition Mitroff (2001) notes that increased globalisation and competitiveness is driving the emergence of new organisational forms and types. These organisations are characterised by the ability to adapt to a rapidly changing competitive environment, a characteristic which is increasingly incorporated into discussions of crisis management (Mitroff, 2001) and resilience (Woods & Wreathall, 2008).

Crisis management theory is traditionally based on studies of industrial accidents such as the Challenger and Columbia space shuttles and Bhopal (Stead & Smallman, 1999). However, since this time, crisis management principles have also been applied to other types of organisational failure. When discussing the applicability of crisis management theory to business failure, Stead and Smallman (1999, p. 13) provide an example of this and note *“Understanding financial crises using industrial crisis theory and analytical tools has been shown to be possible and effective”*. Here Stead and Smallman suggest that crisis management theory can be used to explore other types of organisational failure such as financial crisis.

Hills (2000) reviews the place of resilience as a tool in crisis management, and discusses resilience as a quality or characteristic displayed by an organisation in response to change or pressure. As a result of this view, he links resilience and crisis management, and suggests that resilience is an outcome or goal, and that crisis management is a strategy or tool which organisations can use to achieve it.

In the context of this thesis, crisis management theory and literature provides a framework against which organisational resilience, and the interaction between organisations and their environment, can be discussed. In line with the use of crisis management theory, organisations are viewed as systems.

2.1.1 Systems Thinking and Theory

This section introduces the concept of systems thinking, and how it relates to organisational resilience. An understanding of systems thinking is important for this research, because it underpins the majority of the literature that is reviewed as well as the way that resilience is discussed in this thesis.

Crisis management and organisational resilience are dominated by systems thinking and a general systems approach (Stead & Smallman, 1999). Systems' thinking involves viewing organisations and groups as though they were systems, made up of components, which together have a value which is more than just the sum of their parts. Examples of the application of systems theory to the field of resilience and crisis management include Coles' (2003) systems based discussion of UK national vulnerability, and Comfort et al.'s (2001) discussion of risks emerging from the interaction between private and non-profit organisations.

In the context of organisational resilience, systems' thinking is useful because it considers the relationships between components as a potential source of failure or alternatively strength. In particular, the speed of impact of the relationships between components and the critical path of relationships between components for the system to function are important. Two of the key concepts within systems thinking are *complexity* and *coupling* which refer to the speed of the relationship between component parts.

Perrow (1999) discusses the concept of coupling, and notes that systems can be tightly or loosely coupled. In tightly coupled systems there is no buffer or gap between components – a change in one will immediately cause a change in another. Perrow (1999, p. 93) discusses the sequence of events in a tightly coupled system and argues that “*B must follow A, because that is the only way to make the product*”. An example of a tightly coupled system could be a dam, chemical plant or power grid.

In loosely coupled systems there is a buffer or gap between components. A change in one component may still cause a change in another, but it will not be immediate (Perrow, 1999). An example of a loosely coupled system would be a university; there is more than one way to achieve an outcome and feedback is slow (Weick, 1976). The

concept of coupling is important for organisational resilience, because it describes the connectivity and responsiveness between the organisation and its environment.

The concepts of linear vs. complex systems are also important in systems thinking. Perrow discusses systems in which interactions can be either linear - “...*those in expected and familiar...sequence, and those that are quite visible even if unplanned*” (Perrow, 1999, p. 78), or complex - “...*those of unfamiliar sequences, or unplanned and unexpected sequences, and either not visible or not immediately comprehensible*” (Perrow, 1999, p. 78). An example of a linear system would be a production line where each step had to be completed in a sequential order. An example of a complex system would be a production line where not all processes were essential, and the sequence was flexible. The concept of complexity is important for organisational resilience, because complex systems can produce problems as a result of their complexity. However, they can also produce redundancy, which can increase resilience. In contrast, linear systems can be more predictable, but they lack flexibility.

Zhichang (2007) discusses the difficulties of applying systems thinking to human social systems e.g. organisations. He argues that the role of managers creates a paradox; on one side they are human and are part of the system, on the other they have to stand outside of the system to be able to understand it. This problem is particularly apparent during scenario building and risk identification.

2.2 The Organisational Development of Crises

This section discusses how crises develop within organisations. This literature is introduced by considering whether crises are caused by human error or interaction, or by the design of organisations (or systems) themselves. Five models or sequences of crisis generation are presented and reviewed, each representing a different approach to organisational crises. The contribution of each model to this thesis is discussed.

Reason (2000) introduces two approaches to the accident or crisis causation problem; person and system. The person approach focuses on the errors of individuals and attributing blame. Reason observes several problems with the person approach; it

discourages a culture of reporting, it prevents the organisation from learning lessons, it breaks down trust, and errors can be made by anybody and do not necessarily reflect their knowledge or expertise (Reason, 2000). The systems approach focuses on the conditions within the system, e.g. organisations, which incubate or create errors. The systems approach is the most common within crisis and disaster management literature, where it is accepted that the person approach is counterproductive. Dawes et al. (2004) provide an example of this when they review the response to the September 11th terrorist attacks, and identify lessons from technology, information, relationships, resources and response strategies.

Turner (1976) was one of the first to create a disaster sequence to describe the stages of disaster which included pre-disaster or crisis conditions as part of the escalation or creation of the crisis itself. This can be seen as Table 2.2. For the purpose of his analysis, Turner focused on *failures of foresight*, or crisis events where some forewarning was potentially available but where there was a failure to act to prevent the crisis (Turner, 1976).

Table 2.2: The Sequence of Events Associated with a Failure of Foresight

Stage	Description
Stage 1	Notionally normal starting point: (a) Initial culturally accepted beliefs about the world and its hazards (b) Associated precautionary norms set out in laws, codes of practice, mores, and folkways
Stage 2	Incubation period: The accumulation of an unnoticed set of events which are at odds with the accepted beliefs about hazards and the norms for their avoidance
Stage 3	Precipitating event: Forces itself to the attention and transforms general perceptions of stage 2
Stage 4	Onset: The immediate consequences of the collapse of cultural precautions become apparent
Stage 5	Rescue and salvage – first stage adjustment: The immediate post-collapse situation is recognised in ad hoc adjustments which permit the work of rescue and salvage to be started
Stage 6	Full cultural readjustment: An inquiry or assessment is carried out, and beliefs and precautionary norms are adjusted to fit the newly gained understanding of the world

(Turner, 1976, p. 381)

Of the six stages in this sequence, the *incubation period* has received the most attention. Within the context of organisations, it suggests the idea that the triggering event (e.g. a fault in a component of a space shuttle) should not necessarily be labelled as the *cause*

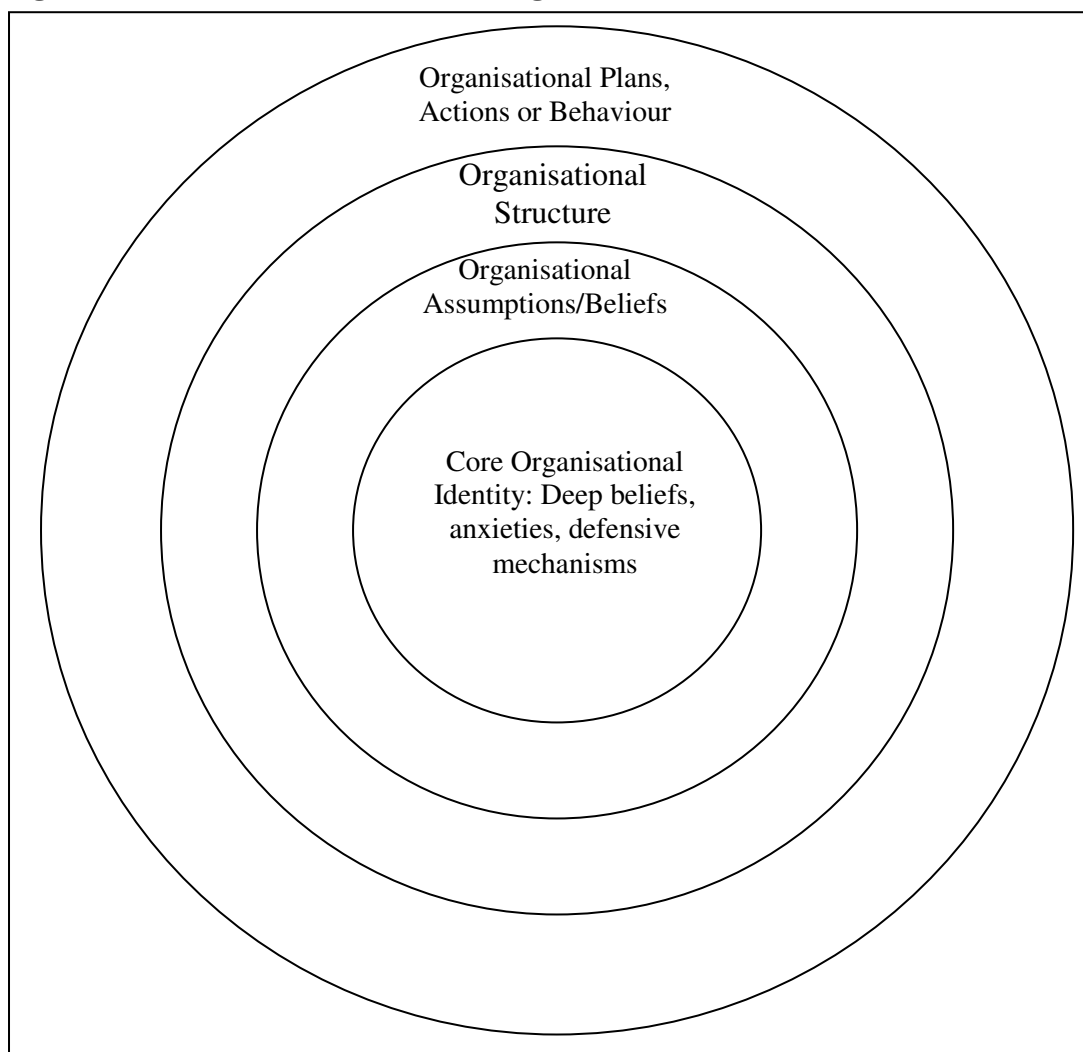
of a disaster or crisis. This is revisited by Smith (1990) who argues that managerial style and organisational culture often promulgate crises.

In his seminal publication *Man-made Disasters*, Turner (1978) discusses an *ill-structured problem*, as a complex problem which needs to be managed by a variety of groups across organisational boundaries, because no one individual or organisation has a big enough picture (Turner, 1978). Using this idea, Turner (1978) suggests that the interaction between social and technical systems could provide a platform for the incubation of crisis.

The incubation of crisis is also the stage of Turner's (1976) sequence where resilience is most important. This is highlighted by Turner and Toft (2006) when they extend Turner's original discussion with ideas of organisational learning. Traditionally, resilient characteristics are more visible in the response phase (Dynes & Quarantelli, 1986); described in Turner's model as stages 5 and 6. However, resilience is not necessarily only a reactive approach, it can also be proactive. Organisations must use their awareness and understanding of the situation to continuously jump ahead of their current performance curve. This then fits into the incubation of crisis stage because an awareness and understanding of the situation and potential consequences could prevent the *accumulation of unnoticed events* (Turner, 1976).

Mitroff et al. (1989) explore the effects of corporate culture on crisis management. They argue that organisational culture is the most influential factor on crisis management, and present this argument using the model seen as Figure 2.1. In this model, core organisational identity represents factors including self-centeredness, defensive mechanisms, and fatalism or passivity. The organisational assumptions layer represents those assumptions that can make organisations vulnerable to crises, e.g. large organisations sometimes feel that an organisation of their size could recover from any crisis (Mitroff, et al., 1989). The organisational structure and the organisation's plans, actions and behaviours layers, represent the aspects of organisational culture which are most visible. Factors of this include crisis management structures, flexibility, roles and responsibilities, resources cohesion and surveillance (Mitroff, et al., 1989).

Figure 2.1: The Onion Model of Crisis Management - The Nature and Impact of Organisational Culture on Crisis Management



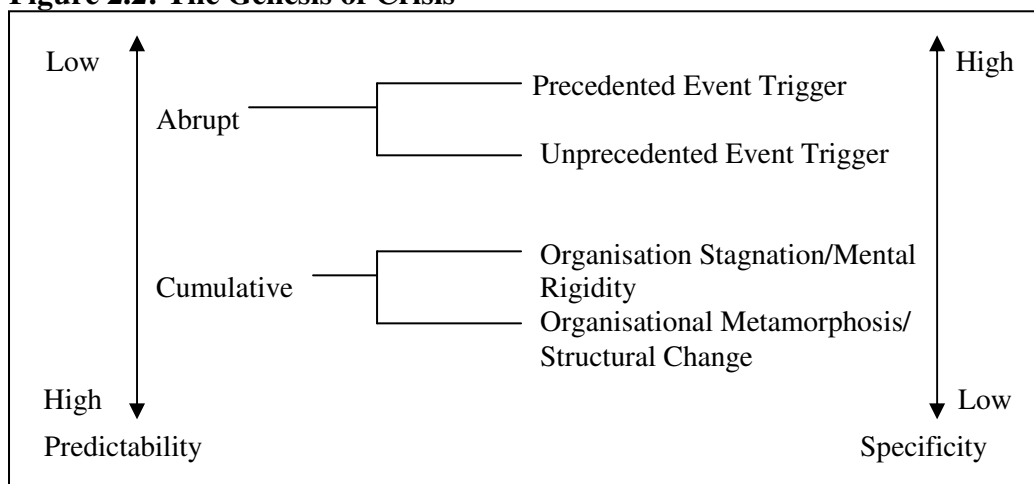
(Adapted from Mitroff, et al., 1989, p. 272)

Mitroff et al. (1989) go on to emphasise that organisations can be either crisis-prone or crisis-prepared. Using the factors identified under each of the layers of their onion model as scales, they argue that an organisation that has ‘a great deal’ of, e.g. defensive mechanisms (Core Organisational Identity) is more crisis-prone – equally the opposite applies. Discussing the model as a whole, Mitroff et al. (1989) explain that the model is multiplicative, that is, an organisation that performs at a satisfactory level on all four of the layers can be labelled as crisis-prepared. However, an organisation that performs very well on three layers but poorly on the fourth is not crisis-prepared. That organisation is vulnerable, and despite the fact that it may appear to be crisis-prepared, it is in fact, crisis-prone to some degree (Mitroff, et al., 1989). In addition Mitroff et al.

(1989) suggest a hierarchy of influence between the layers (from the inside out) when they argue that good performance on the outer three layers, will not produce a crisis-prepared organisation unless it also performs well on the core beliefs layer.

Hwang and Lichtenthal (2000) use survival analysis, a technique used in materials engineering to study the fracture probability of components. They propose a model of how and why organisations fail and the probability of this happening, and identify two types of crises; abrupt and cumulative. Abrupt crises are those that happen suddenly and create tension between the organisation and its stakeholders, and cumulative crises are those that build up over time until a certain threshold-limit is reached. They go on to argue that the probability of crisis because of abrupt failures is constant and independent of the length of time that the organisation has been established. However, the probability of a crisis because of cumulative failures is an increasing function of time (Hwang & Lichtenthal, 2000); this accumulation of latent errors is Turner's (1976) incubation period. Hwang and Lichtenthal (2000) call their model the Genesis of Crisis; it can be seen as Figure 2.2.

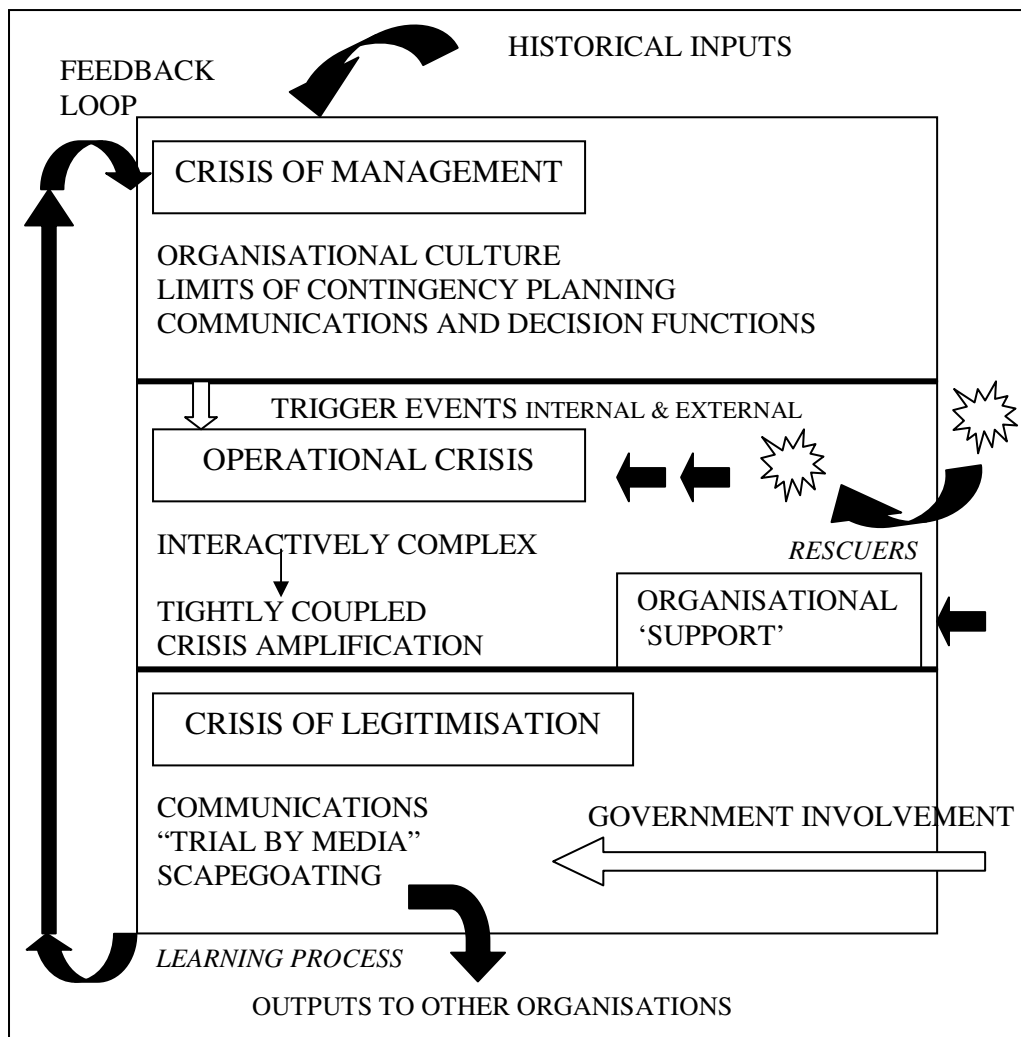
Figure 2.2: The Genesis of Crisis



(Hwang & Lichtenthal, 2000, p. 133)

Smith (1990) reviews common approaches to crisis management and notes that the management process is often characterised by three phases; crisis of management, operational crisis, and crisis of legitimisation (shown as Figure 2.3).

Figure 2.3: Model of Crisis Management



(Smith, 1990, p. 271)

Smith (1990) notes that the crisis of management phase is characterised by a failure to take account of impending situations where,

“...the actions (or inactions) of management can promulgate the development of an organisational climate and culture within which a relatively minor triggering event can rapidly escalate up through the system and result in a catastrophic failure”.

(Smith, 1990, p. 271)

Here Smith (1990) shows how management, and by extension leadership, play a key role in the development of organisational crises. This occurs through the mismanagement of organisational culture which can enable latent errors, and promote

organisational silos. In a later publication, Smith and Sipika (1993) expand on this model within the context of emergency planning. As part of this discussion, they identify *the 7Cs of crisis management*; culture, communications, contingency planning, control, configuration, cost, and systems coupling and complexity (Smith & Sipika, 1993, p. 29). They go on to argue that these seven characteristics are important in determining an organisation's 'proneness' to crises (Mitroff, et al., 1989) and they have an impact on the first phase of Smith's (1990) model – crisis of management.

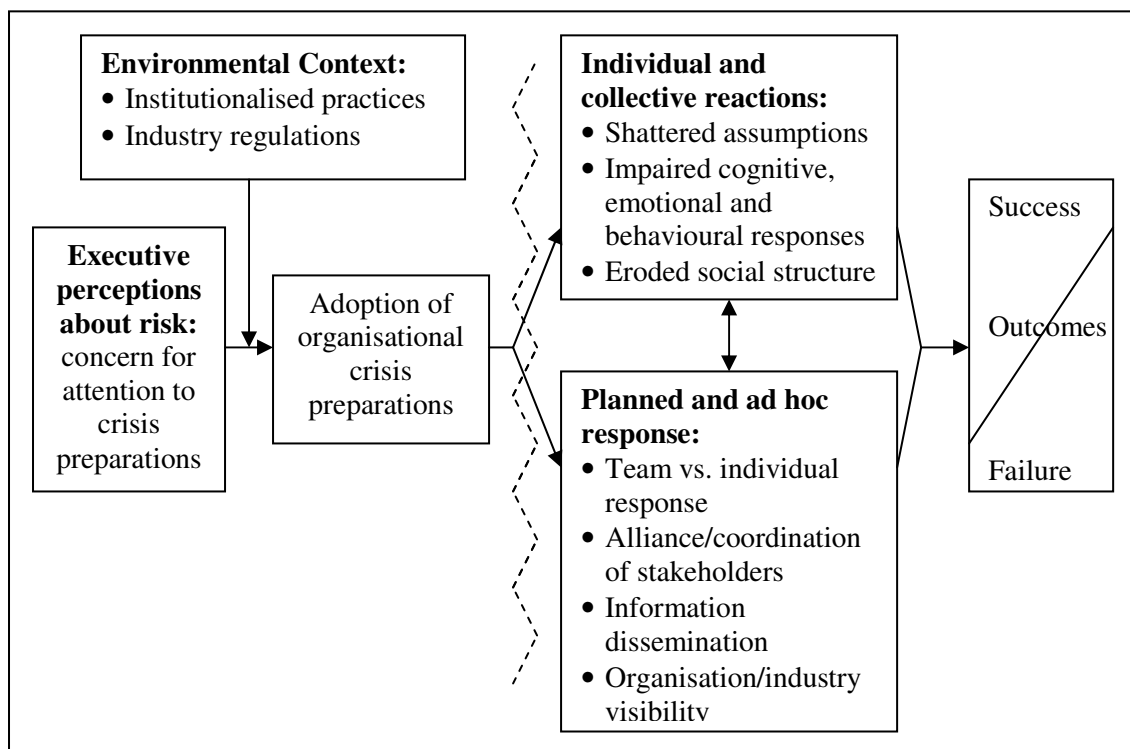
The second phase, the operational crisis, causes the organisation to move into crisis mode. Often referred to as the response phase, this is the time when the organisation is confronted with the effects of the crisis, and has to manage its impacts. The third phase, the crisis of legitimisation is often overlooked by other models which refer instead directly to the idea of recovery. Smith (2005) refers to recovery as part of the crisis of legitimisation stage but realises that organisations are also struggling to negotiate a new 'normal' at this time. Crisis of legitimisation is characterised by attempts to apportion blame and has been the subject of considerable research regarding crisis communications and media strategies (Coombs & Holladay, 2002). Following this final phase, Smith (1990) addresses the idea of recovery again, but instead discusses a move towards equilibrium, recognising that a return to normal may not be either possible or desirable. In this model, resilience is the quality and use of information, organisational learning, and the management of an organisational culture in which a relatively minor triggering event can rapidly escalate.

Smith and Sipika (1993) expand the model of crisis management further by considering what happens within an organisation after a crisis; they present another side to the model, which is discussed in Section 2.3.

The four models of crisis generation and management discussed above; Turner's disaster sequence, the onion model, the genesis of crisis, and Smith's model of crisis management, are based on a socio-political perspective. This means that crises are characterised by a breakdown in the social and cultural practises, norms or values within an organisation (Pearson & Clair, 1998). With the exception of Perrow's (1984) Normal

Accident theory and High Reliability Organisation (HRO) theory which are based on a technological-structural perspective and will be discussed in Section 2.3, the socio-political perspective represents the dominant approach within crisis management (Pearson & Clair, 1998). Pearson and Clair (1998) argue that these approaches alone are ineffective, have led to the fragmentation of the field, and have prevented the research from being fully accepted within management theory (Pearson & Clair, 1998, p. 59). They go on to acknowledge the multidisciplinary nature of crisis management, and argue that it could be improved by properly integrating the three broad domains upon which it is based; socio-political, technological-structural and psychological. To achieve this, Pearson and Clair (1998) present an integrated model of crisis management; shown as Figure 2.4.

Figure 2.4: The Integrated Model of Crisis Management



(Pearson & Clair, 1998, p. 66)

Working from left to right in the model, executive perceptions about risk are affected by the environment or business landscape, this in turn informs and determines the crisis management preparations that are adopted. Once the trigger event has occurred the organisation's response is shown as individual and collective actions. An important

feature of this model is that it not only incorporates the three perspectives, but also the idea that organisations can fail or succeed as a result of crisis.

2.3 Organisational Response to Crisis

This section discusses how organisations respond to crises. The literature is introduced by reviewing the Disaster Research Center (DRC) typology which was one of the first typologies developed to study organisational responses to crises. Five approaches to organisations' response to crises are then presented and reviewed. The five approaches are adaptive fit, the edge of chaos, power laws, crisis turnarounds and high reliability organisations. The contribution of each approach to this thesis is also discussed.

Organisations respond to disruption and uncertainty in ways which may show different levels of resilience or alternatively failure:

- They centralise internal controls (Pfeffer, 1978);
- they adapt (Ashkanasy, et al., 2000; Webb, 1999);
- they learn (Carroll, 1998; Weick, et al., 2005); and
- they are creative (Kendra & Wachtendorf, 2003a).

Dynes and Quarantelli (1968) were among the first to focus on organisational responses, as opposed to individual reactions to disaster. In the 1960's they combined organisational and behaviour theories and proposed the Disaster Research Center (DRC) typology consisting of four types of organised behaviour in disaster. The typology is shown as Figure 2.5. The typology identifies four types of organisation; established, expanding, extending and emergent. Each of the types has the potential to be resilient, however the emergent organisations, those that do not exist prior to the disaster or crisis, are themselves a resilient response. The act or development of their emergence is a resilient response from a group, a realisation that something needs to be done, and an ad hoc solution to the problem.

Figure 2.5: The DRC Typology of Organised Behaviour in Disaster

		Tasks	
		Regular	Non-Regular
Structure	New	<p>Type 1: Established Already established and have a specified role to play in responding to the disaster, such as the police and fire service</p>	<p>Type 3: Extending Not expected to respond to disasters but they perform non-regular tasks using their existing structures</p>
	Old	<p>Type 2: Expanding Organisations such as the Red Cross that are expected to be involved in the response and perform business-as-usual tasks but transform structurally (i.e. they expand)</p>	<p>Type 4: Emergent Characterised by both a new structure and the performance of non-regular tasks. These emergent organisations do not exist prior to the disaster</p>

(Dynes & Quarantelli, 1968, p. 419)

Quarantelli (1995) later updated the typology to reflect different types of emergence that they observed through DRC studies. They found that emergent behaviours existed, not only in emergent groups, but also in non-emergent groups. Examples of this were provided by groups that “...often underwent no major alterations in their structures or functions but nonetheless...exhibited emergent qualities” (Quarantelli, 1995, p. 17). Here Quarantelli (1995) notes how some organisations respond to disaster by expanding their ability to respond, without altering their structure or core business.

Lengnick-Hall and Beck (2005, p. 738) discuss adaptive fit as the ability of an organisation to “...accommodate the level of complexity presented by its environment”. They go on to argue that organisations adapting to uncertainty can take “...deliberate, intentional and rational steps to reach equilibrium” (Lengnick-Hall & Beck, 2005, p. 738). This is perhaps the most practiced approach where organisations do just enough to regain a balance and to survive, while maintaining their existing organisational structure and values. Chakravarthy (1982) describes three states of adaptive fit; unstable, stable, and neutral. Lengnick-Hall and Beck (2005) discuss the characteristics of each of Chakravarthy’s states of adaptive fit; this is presented in Table 2.3.

Table 2.3: Lengnick-Hall and Beck's (2005) Adaptive Fit and Underlying Assumptions

Fit	Strategic Posture	Focus	Characteristics
Unstable	Defensive	<ul style="list-style-type: none"> Reducing a firm's interactions with its environment 	<ul style="list-style-type: none"> Mechanistic organisational design or structure Very vulnerable to external elements Reliance on buffers for protection from adverse consequences Relies on passive insulation for survival Best suited to an environment that changes slowly and predictably
Stable	Reactive	<ul style="list-style-type: none"> Trying to meet every environmental change with a corresponding organisational action 	<ul style="list-style-type: none"> Bureaucratic organisational structure Adequate resources to respond to environmental shift but constrained by administrative processes Attempt to sense and respond to environmental changes in ways that conserve resources
Neutral	Proactive	<ul style="list-style-type: none"> Forecasting and pre-emptive judgement 	<ul style="list-style-type: none"> A natural match between a firm's material resources and its ability to exploit them Ability to reduce vulnerability in highly complex environments Able to anticipate and capitalise on external shifts

Dervitsiotis (2003) discusses organisational resilience as business landscape fitness. Organisations' resilience is the fit between their competitive environment, and their performance at a specific point in time. He goes on to argue that conventional business excellence, such as that measured by the EFQM model or the Baldrige Awards, is a goal based on the idea that all organisations are competing on the same business landscape towards the same goals. However, this ignores the fact that organisations' environments are continuously changing and that every organisation faces different challenges. As a result, Dervitsiotis (2003) argues that business excellence is single loop learning, and that double loop learning is required,

"...in which there must be a search for different more fundamental goals...in view of the inadequacy of the ones presently taken for granted and the prospect of decline or collapse".

(Dervitsiotis, 2003, p. 253)

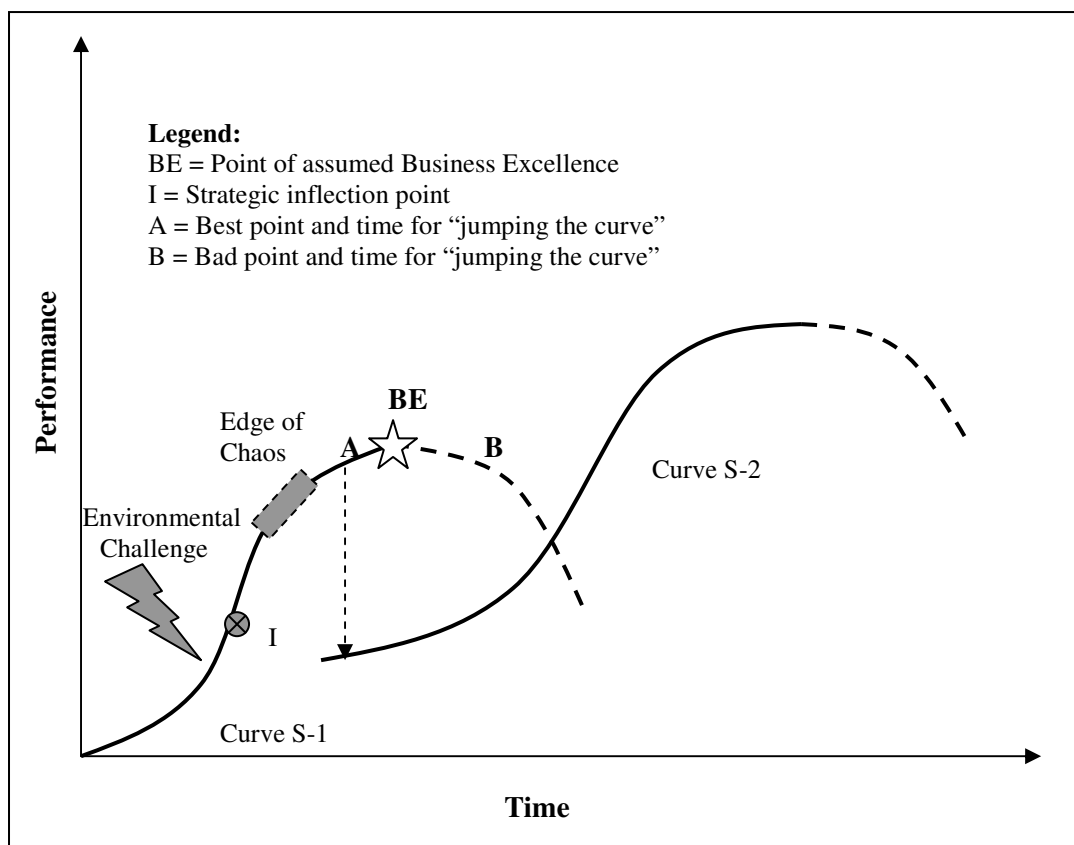
The idea of a resilient organisation that questions their assumptions and is aware of the fallibility of their organisational system, is also reflected in high reliability organisations theory as a *preoccupation with failure* (Weick & Sutcliffe, 2007) and in resilience engineering as *restlessness* (Hollnagel, et al., 2008).

Dervitsiotis (2003) conceptualises a more uneven business landscape, and includes the concept of the *edge of chaos* as a property of complex adaptive systems. Based on a definition of the business environment as characterised by rapid change Dervitsiotis (2003, p. 255) argues,

“As the value of a particular system variable is changed, a complex system suddenly exhibits ordered behaviour and then may become disordered again. The region where such changes occur is called the edge of chaos”.

Figure 2.6 shows the edge of chaos on a curve representing an organisation's performance over time. The diagram shows how an environmental change can create an inflection point; shown on the diagram as point I. An inflection point is the point at which there is *“...a critical shift in a company's performance curve”* (Dervitsiotis, 2003, p. 259). Following this, the organisation operates on the edge of chaos and, at point A on the diagram, can either make the decision to jump the curve, or to remain on its current course which will eventually enter a state of decline. If the organisation chooses to jump the curve, it will enter another curve with potentially higher achievements. Dervitsiotis's (2003) model provides some useful ideas for the study of organisational resilience. The idea that an organisation can jump ahead of its current performance curve is a useful analogy, because it provides a visual of what it means to be resilient.

Figure 2.6: Organisational Performance at the Edge of Chaos



(Dervitsiotis, 2003, p. 255)

Kauffman (1995) also refers to the concept of the edge of chaos, Anderson (1999, p. 223) reviews this and notes that,

“...all complex adapting systems evolve to the edge of chaos, the point where small and large avalanches of coevolutionary change cascade according to a power law”.

Here Anderson (1999) describes how systems evolve to a state of self-organised criticality, in which changes in the environment appear to have a disproportionate impact on the system. Using a normal distribution, practitioners often refer to disasters and crises as high impact low probability events. However, Anderson (1999) uses power laws to account for the way in which organisations experience large fluctuations, or crises, more often than expected. The term *power law* refers to a mathematical relationship between two variables, where the frequency of an event, such as a crisis or

disaster, varies as a power of some attribute of that event. This relationship can be seen in the equation below:

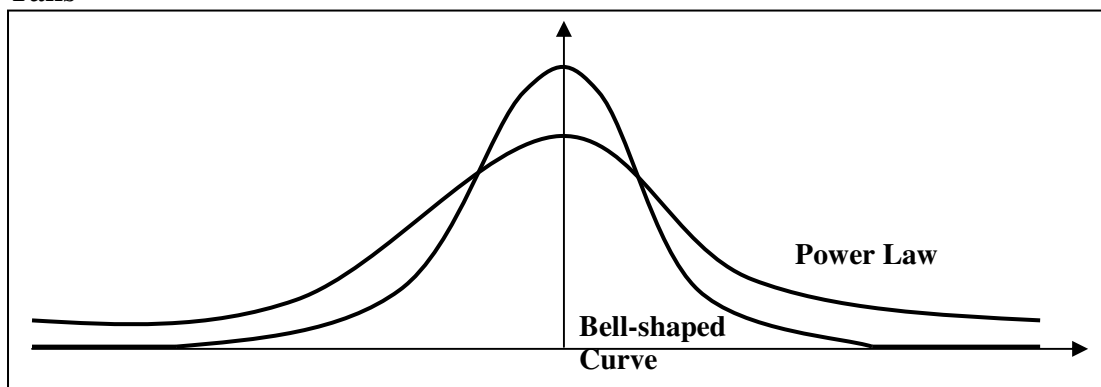
$$P(x) = Cx^{-\alpha}$$

$$\text{With } C = e^c$$

(Newman, 2005, p. 323)

Newman (2005) discusses power law curves and notes that they are often characterised by *fat tails*, or a high frequency of large events. He provides examples of power laws including the magnitude of large earthquakes. Buchanan (2004) uses the diagram shown as Figure 2.7 to illustrate how the power law curve differs from the bell-shaped curve, and how this affects organisations. Normal statistics practices use the bell-shaped curve as a normal distribution which can be applied or expected in most situations. The bell-shaped curve on Figure 2.7 shows how the tails are quite 'thin'; this means that, according to the bell-shaped curve, there is a very low probability of high impact events such as earthquakes and industrial accidents. However, high magnitude events occur more often than the bell-shaped curve suggests (Perrow, 1999). The power law curve on Figure 2.7 accounts for this variance. The tails on this curve are 'fatter' showing that, according to power law, the probability of high impact events, is in fact much higher. This has significant implications when estimating risks and assessing the likelihood of high impact events.

Figure 2.7: The Bell-shaped Curve vs. the Power Law: The Importance of 'Fat Tails'

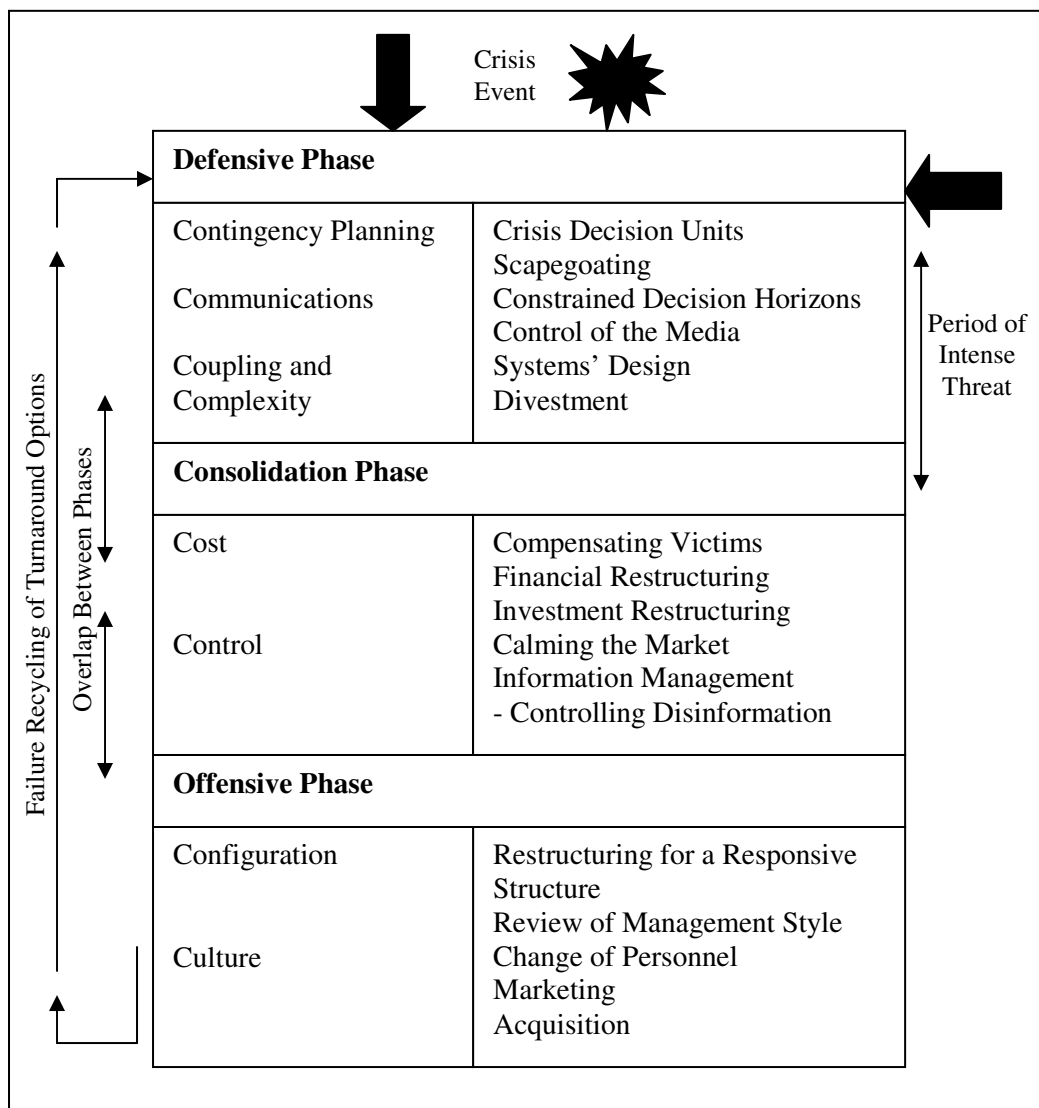


(Adapted from Buchanan, 2004, p. 5)

Buchanan suggests that organisations can use the power law curve, and the knowledge that high impact low probability events happen more often than we might think, to develop strategies to manage crises.

Smith and Sipika (1993) present a model of the post-crisis turnaround stages of crisis management which is shown as Figure 2.8. Within this, they identify three stages; defensive phase, consolidation phase and offensive phase.

Figure 2.8: Post-crisis Turnaround Stages



(Smith & Sipika, 1993, p. 33)

During the Defensive Phase organisations activate their formal and informal response mechanisms. Working within their continuity plans and arrangements, organisations

often operate under uncertainty where the flow and availability of information is restricted. Smith and Sipika (1993) include coupling and complexity in the model, not only because these are key factors in creating crises, but because it is important for organisations to ensure that they have identified the cause of crises and fixed any problems, before moving on. During the Consolidation Phase, organisations place more emphasis on strategy, and focus on organisational recovery. As indicated in the model, organisations also look to restore confidence to their internal and external stakeholders and networks. The Offensive Phase is characterised by changes to the organisations' culture, and configuration or structure. Here, the organisation is experiencing the crisis of legitimisation (Smith, 1990), and it is important to reassure stakeholders further by restructuring the organisation to improve systems and processes to prevent future crises, and by reviewing existing management. This phase is also linked to cultural change within the organisation because leadership, or management and structure, are both integral to the re-positioning, maintenance or change of an organisation's culture.

Smith and Sipika's model of post-crisis turnaround is useful for the discussion of organisational resilience because it provides a description of how organisations can respond to a crisis that they have failed to prevent.

The concept of High Reliability Organisations (HRO's) originates from the military. These organisations have a *collective preoccupation with the possibility of failure* (Reason, 2000); they expect things to go wrong and errors are generalised rather than isolated. High Reliability theory was originally developed to explain how organisations such as nuclear submarines and air traffic control centres maintain high levels of safety and low incidence of accidents despite operating in hazardous and continuously changing environments. Reason (2000, p. 768) characterizes HRO's as those organisations "*...which have less than their fair share of accidents*". The concept has since been extended to describe space agencies, chemical facilities and clinical environments. Bigley and Roberts (2001) argue that reliability is an increasingly critical quality and competency for organisations responding to crises. They go on to define reliability as "*...the capacity to continuously and effectively manage working conditions*" (Bigley & Roberts, 2001, p. 1281). Bigley and Roberts discuss a fire department and argue that a structure based on an incident command system can be highly reliable; they go on to note that,

“They appear able to structure and restructure themselves on a moment-to-moment basis and to provide members with means to oscillate effectively between various preplanned organisational solutions to the more predictable aspects of a disaster circumstance and improvised approaches for the unforeseen”.

(Bigley & Roberts, 2001, p. 1282)

This describes more than being able to manage working conditions, and is very similar to resilience. HRO's can,

“...reconfigure themselves to suit local circumstances. In their routine mode, they are controlled in the conventional hierarchical manner. But in high tempo or emergency situations, controls shift...The organisation reverts seamlessly to the routine control mode once the crisis has passed”. (In doing so they recognise) ...that human variability in the shape of compensations and adaptations to changing events is one of the system's most important safeguards”.

(Reason, 2000, p. 770)

This provides an example of a strategy which achieves a balance between anticipation and resilience and is discussed in more detail in Section 2.5. Reason (2000, p. 769) goes on to argue, *“High reliability organisations...offer important models for what constitutes a resilient system”*. The similarities or cross-over between HRO and resilience theory are further emphasised by Weick and Sutcliffe (2007) who use HRO theory as a basis for their organisational resilience audits which measure organisational resilience and ask to what extent organisations display HRO characteristics. They go on to discuss patterns of organisational resilience and argue,

“HROs overcome error when interdependent people with varied experience apply a richer set of resources to a disturbance at great speed and under the guidance of swift negative feedback”

(Weick & Sutcliffe, 2007, p. 72)

Vogus and Sutcliffe (2008) discuss organisational resilience and HRO's interchangeably, however they do argue that "...resilience and reliability are not identical constructs" (Vogus & Sutcliffe, 2008, p. 3421). Figure 2.9 summarises the characteristics of HRO's and how they prevent or respond to crises.

Figure 2.9: High Reliability Organisations

Source	Characteristics of HRO's
Roberts (1990)	HRO's are sufficiently technologically advanced that errors can have far-reaching negative consequences Tightly coupled interdependencies between system components and functions Complexity which is embedded in system components and the way in which they come together
Grabowski and Roberts (1999)	HRO's prioritise safety and reliability as organisational goals. The use of effective and varied communications to reduce uncertainty
Reason (2000)	The ability to switch from business-as-usual mode to crisis mode and back again quickly and efficiently Clearly defined and shared goals
Weick and Sutcliffe (2007)	Mindfulness
HRO Crisis Prevention and Response Strategies	
Perrow (1984)	Organisational learning
Weick (1987)	Strong organisational culture to reinforce safety and reliability as goals
Roberts (1990)	Continuous staff training Responsibility and ownership for problems at all levels Multiple communications pathways or redundancies In-built system flexibility Resources redundancy
Grabowski and Roberts (1999)	Redundancy in staff and technology Decentralised high reliability culture Continuous development of interpersonal trust
Reason (2000)	Reconfiguring and restructuring to suit the business environment and migrating controls and decision making Encouraging variability HRO's not only address surface problems but also seek to improve underlying system conditions that contribute to crisis Training staff to recognise and report early warning signs
Weick and Sutcliffe (2007)	Preoccupation with failure which leads them to continuously question their environment and their current assumptions Commitment to safety and reliability as goals They defer decisions to those with appropriate knowledge and skills rather than hierarchical position
Vogus and Sutcliffe (2008)	Use information about 'near misses' as information about the underlying health of the system and as a source of learning

Note: Sources are listed in chronological order.

The study of HRO's has been dominated by post-disaster analyses of major accidents such as Bhopal (Roberts, 1990), the Columbia space shuttle (Mason, 2004), and the

Challenger space shuttle (Weir, 2002). Few studies have been conducted on organisations that have the potential for catastrophe but have not experienced major accidents (Roberts, 1990). The characteristics that contribute to organisations' reliability, may also contribute towards their resilience. Normal Accident Theory (NAT) argues that the cause of accidents is in "...*the complexity and coupling of the system itself, not in the failures of its components*" (Perrow, 1999, p. 354) and that as a result, accidents are inevitable. This theory is not in competition or contradiction to HRO theory (HRT) but is complimentary. Rijmpa (1997, p. 21) examines the two theories and argues,

"NAT does not only explain normal accidents: it can also be used to explain overall reliability. HRT explains more than overall highly reliable performance: it also highlights factors which contribute to an organisation's proneness to system accidents".

In his seminal work, 'Normal Accidents' Perrow (1999) discusses high risk organisations as those organisations that combine a complex environment with tightly coupled operations and have the potential to fail with catastrophic consequences (Perrow, 1999). Weick (1987) argues that organisational culture determines whether or not high risk organisations can transform into HRO's. In terms of organisational resilience, high reliability is a desirable trait (Vogus & Sutcliffe, 2008).

2.4 Resilience

This section introduces and defines the concept of resilience and specifically disaster and organisational resilience. Models of organisational resilience are presented and reviewed and the applicability of each is discussed. This section also reviews standards that are relevant to the thesis as well as previous research on measuring organisational resilience and benchmarking as a methodology for continuous improvement.

Resilience is a theoretical concept, a metaphor, a result of interactions between people and the environment, a property of a dynamic system (Carpenter, et al., 2001), a measurable social and cultural construct (Mallak, 1998b) and a paradigm (Paton &

Johnston, 2001). The first use of the term resilience is contested but can be attributed to either ecology, physics or psychology (Manyena, 2006). In ecology, it was introduced through Hollings' (1973) seminal work *Resilience and Stability of Ecological Systems*. Holling described resilience as,

“...a measure of persistence of systems and their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables”.

(Holling, 1973, p. 14)

Kasperson and Kasperson (2005) discuss examples of the influence of random events on natural systems and suggest that we can better understand resilience if we “...*shift the emphasis towards assuming change and then try to explain stability*” (Kasperson & Kasperson, 2005, p. 255). Holling (1973) also notes that traditional analysis within the field of ecology has been inherited from developments in physics. In physics resilience is “...*the ability for a material to get back to its initial shape following an external shock*” (Lecoze & Capo, 2006, p. 3). Zimmerman and Arunkumar (1994, p. 2) refer to psychological resilience and argue that it refers to “...*fending off maladaptive responses to risk and their potential negative consequences*”. Another common understanding of resilience, is the ability to *bounce back* (Coutu, 2002). Holling (1996) discusses the difference between resilience in engineering versus resilience in ecology. He describes resilience in engineering as the stability of equilibrium near a steady state and argues that, in engineering, resilience can be measured as the speed of return to equilibrium.

2.4.1 Disaster Resilience

In the context of emergency management, the term resilience was established with the adoption of the Hyogo Framework for Action 2005-2015 by the United Nations as the result of the World Conference on Disaster Reduction in 2005. The framework focused on the prioritisation of risk reduction, identifying risks and enhancing early warning systems, building a culture of safety and resilience, reducing underlying risk factors, and strengthening disaster preparedness and response capabilities (UNISDR, 2005).

Tierney and Bruneau (2007, p. 14) note that “...*resilience has gained prominence as a topic in the field of disaster research, supplanting the concept of disaster resilience*”. Coles and Buckle (2004) argue that recent events such as the September 11th Terrorist Attacks in America have given currency to the concept of resilience and increased its use within emergency planning and management. This can be observed in the emergency management legislation and accompanying guidance of the UK (Civil Contingencies Secretariat, 2004) and New Zealand (MCDEM, 2004). McEntire (2005) discusses the emergence of the resilience paradigm within emergency management and notes how it was interpreted differently by some academics as hazard mitigation, and by some practitioners as post-disaster recovery.

Conflicts between definitions of disaster resilience are common. Some authors argue that resilience and anticipation are separate (Wildavsky, 1998) and others argue that they are complementary (Comfort, et al., 2001). Vogus and Sutcliffe (2008, p. 3418) clarify this and differentiate an anticipatory approach “...*that attempts to avoid error by design*” from a resilience approach,

“...that recognizes the inherent fallibility of any organisational system and instead attempts to monitor how closely the system is operating relative to its performance limits and to manage any deviations as quickly as possible once they emerge”.

(Vogus & Sutcliffe, 2008, p. 3418)

This is discussed further in Section 2.5.

2.4.2 Organisational Resilience

The majority of research into organisational resilience has been qualitative and descriptive (Somers, 2007). However some researchers have used concepts from engineering to operationalise organisational resilience. Researchers at the Multi-disciplinary Center for Earthquake Engineering Research (MCEER) incorporate withstanding forces and coping and define resilience as the capacity for,

“...physical and social systems to withstand forces and demands generated by disaster events...and to actively cope with such events through employing effective response and recovery strategies”.

(Tierney, 2003, p. 2)

Tierney (2003) goes on to argue that resilience has four components; robustness, redundancy, resourcefulness and rapidity, as well as four domains; technical, organisational, social and economic. These are described in Table 2.4.

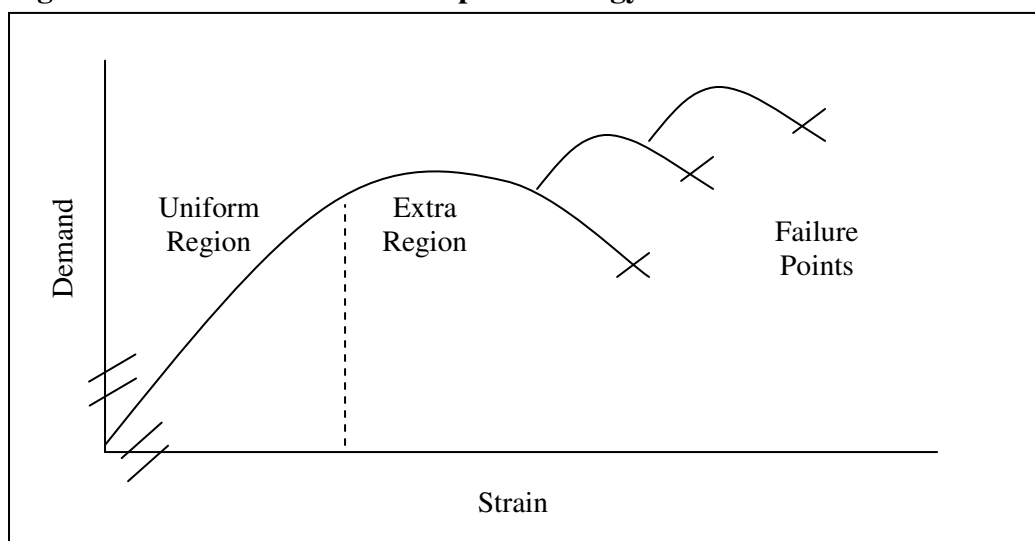
Table 2.4: Tierney's (2003) Components and Domains of Resilience

Components	Description
Robustness	The ability of elements, systems, and other <i>units</i> of analysis to withstand stresses and demands without suffering damage, degradation or loss of function.
Redundancy	The extent to which elements, systems, or other units of analysis exist that meet functional requirements in the event of disruption, degradation, or <i>loss</i> of functionality of primary systems.
Resourcefulness	The capacity to identify problems, establish priorities, and mobilise resources to avoid or cope with damage or disruption; the ability to apply human and material resources to meet priorities and achieve goals.
Rapidity	The capacity to meet priorities and achieve goals in a timely manner.
Domains	Description
Technical	The ability of systems, such as physical structures, to perform during and after disasters.
Organisational	The ability of organisations to make decisions and take actions to reduce disaster vulnerability and impacts.
Social	The ability to the communities to lessen negative consequences of disaster.
Economic	The capacity of firms and economies to limit and absorb economic losses resulting from disaster.

Borrowing from materials engineering, Woods and Wreathall (2008) use a *stress-strain state space analogy* to further understand organisational resilience as adaptive capacity; this is shown as Figure 2.10. They identify two regions, the first – *the uniform response region*, when a material or an organisation stretches or copes with stress using existing capacity and capability; they label this *first order adaptive capacity*. The second region they identify – *the extra region*, occurs when “...the demands exceed the limit of the *first order adaptations*” (Woods & Wreathall, 2008, p. 146). Woods and Wreathall refer

to this, during which the organisation can no longer cope using its existing plans, procedures and resources, as *second order adaptive capacity*. They go on to argue that first order adaptive capacity (e.g. the use of pre-determined emergency plans and business-as-usual resources) cannot be labelled as resilience. Instead only second order adaptive capacity, when the organisation innovates and develops new ways of working, can be labelled as resilience. This also reflects the way that anticipation and resilience are separated in the literature, with anticipation represented by first order adaptive capacity and resilience represented by second order adaptive capacity. This is discussed further in Section 2.5.

Figure 2.10: Stress-strain State Space Analogy



(Adapted from Woods & Wreathall, 2008, p. 148)

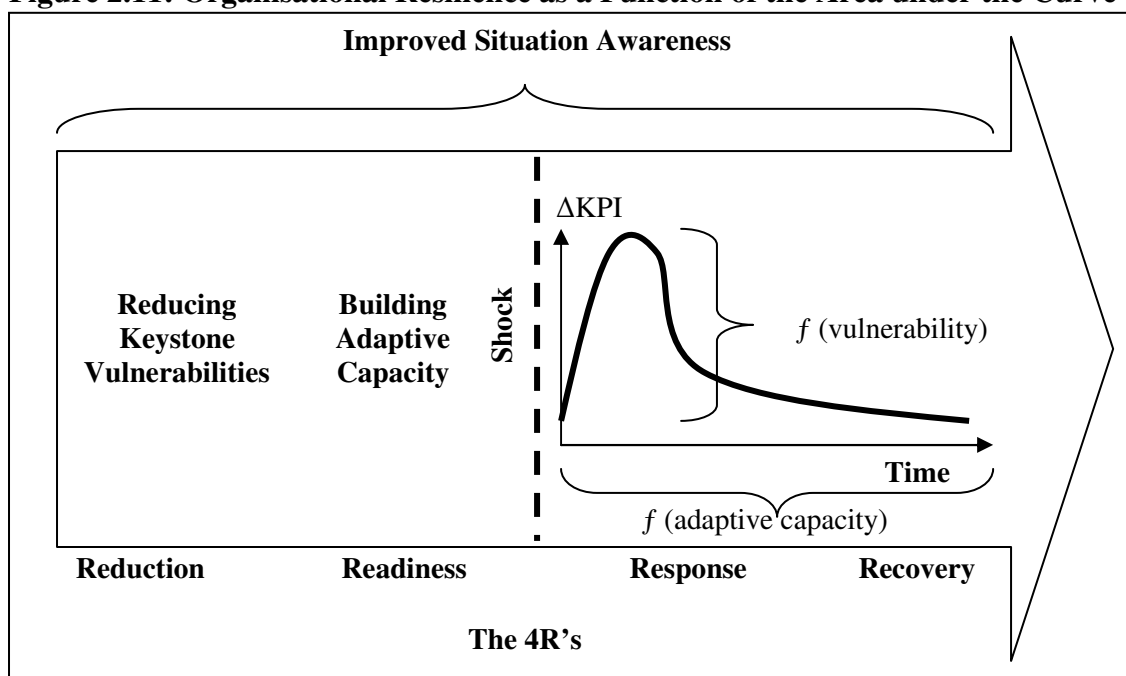
The similarities between Dervitsiotis' (2003) organisational performance at the edge of chaos (discussed in Section 2.3) and Woods and Wreathall's (2008) stress-strain analogy, indicate that the innovative and emergent adaptive capacity of organisations is linked to, or is the same as the organisations ability to decide to jump ahead of the curve, and to its resilience.

Dalziell and McManus (2004) use the sequence of the 4Rs of emergency management in New Zealand; reduction, readiness, response and recovery, as a time scale by which to measure the progress of organisations using key performance indicators (KPIs); an annotated version of this can be seen in Figure 2.11. In this sequence resilience is displayed as part of the organisation's response and recovery once a shock has occurred.

Resilience is higher, or perhaps more visible, during the response and is shown as the area under the curve. Again in this model anticipation is separated from resilience. Developing the 4R's model further, McManus (2007, p. 4) incorporates vulnerability management and adaptive capacity alongside situation awareness and defines organisational resilience as,

“...a function of an organisation’s situation awareness, management of keystone vulnerabilities and adaptive capacity in a complex, dynamic and interconnected environment”.

Figure 2.11: Organisational Resilience as a Function of the Area under the Curve



(McManus, 2007, p. 10)

Other researchers have approached the problem of resilience from a management perspective. Hamel and Valikangas (2003) discuss strategic resilience arguing it,

“...is about continuously anticipating and adjusting to deep, secular trends that can permanently impair the earning power of a core business. It’s about having the capacity to change before the case for change becomes desperately obvious”.

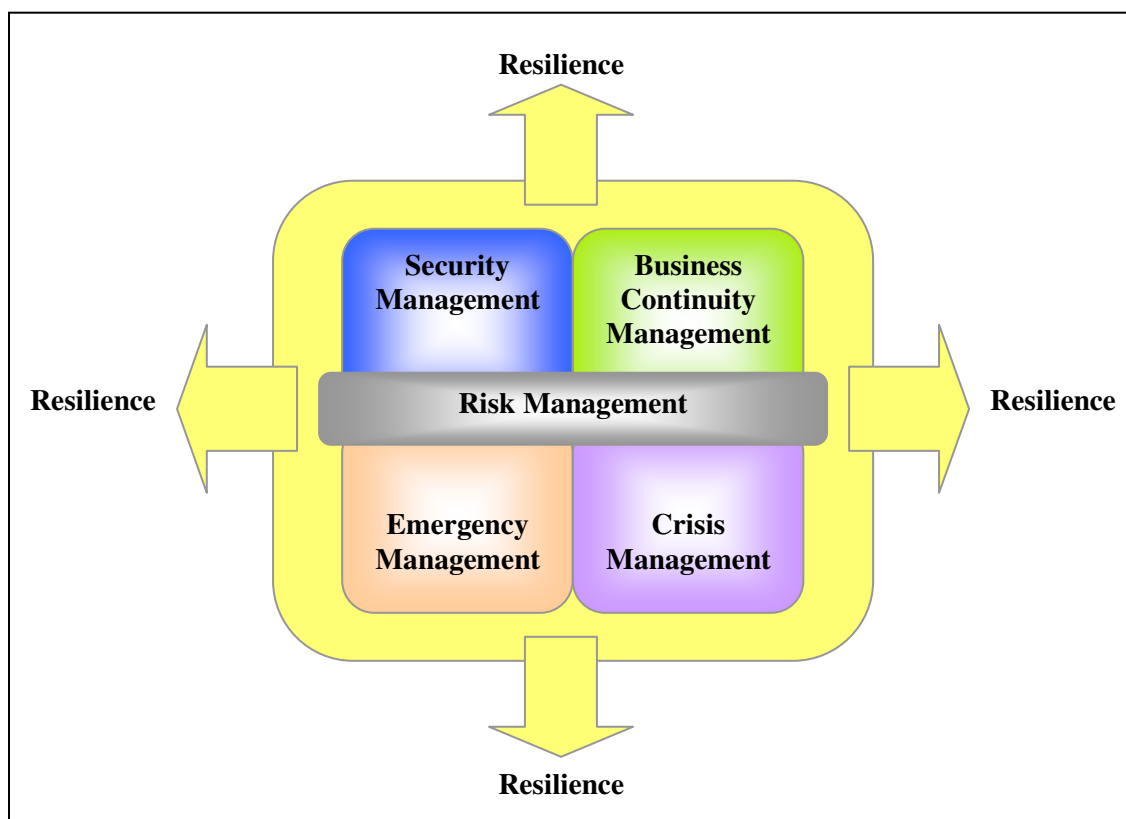
(Hamel & Välikangas, 2003, p. 2)

Coutu (2002) identifies three characteristics of resilient people and organisations which include; the ability to accept reality, a deep belief and strong values, and the ability to improvise.

Gibson and Tarrant (2010) present several conceptual models of organisational resilience, three of which will be discussed in this section. Two of them provide different conceptualisations of resilience, and the third addresses strategies which organisations can use to improve their resilience.

Gibson and Tarrant (2010) present the integrated functions model which suggests that organisational resilience is a goal that results from a combination of other activities such as risk management and business continuity. This model can be seen as Figure 2.12.

Figure 2.12: The Integrated Functions Model

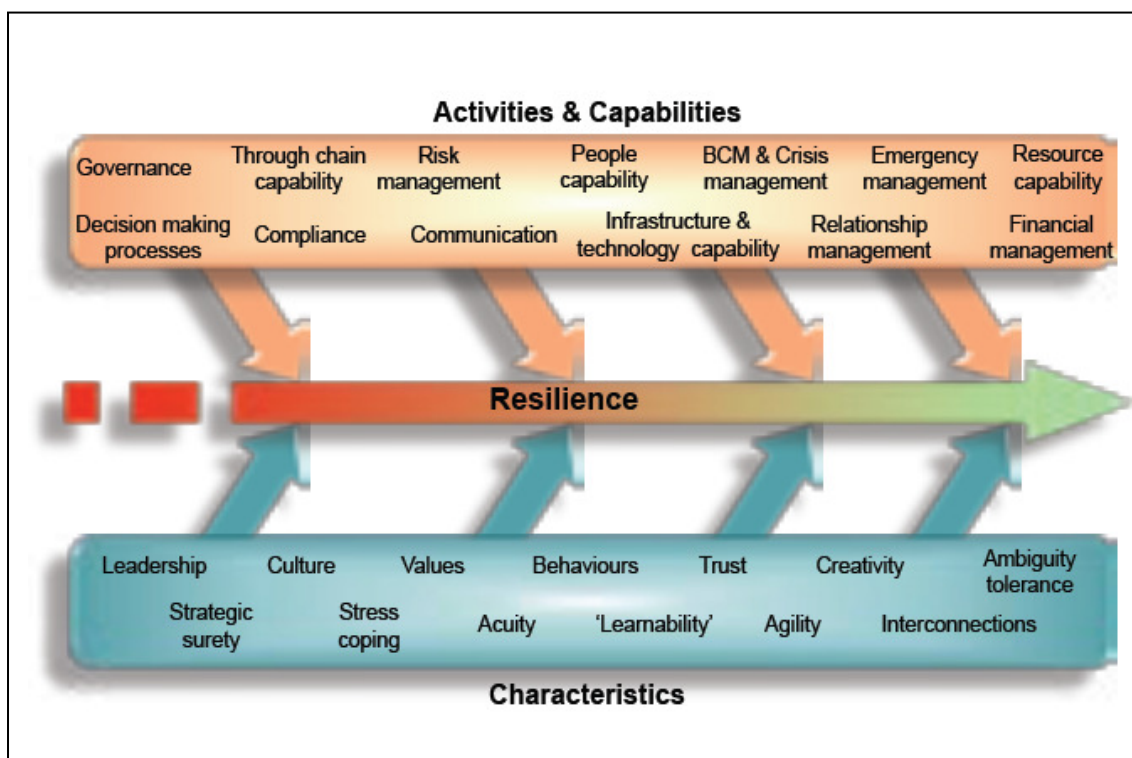


(Gibson & Tarrant, 2010, p. 8)

Gibson and Tarrant criticise this model, not because these activities do not produce any level of resilience, but because it is over prescriptive. They continue and argue that it represents an attempt to *re-badge* existing disciplines with a term that might attract them more attention. However this model is useful for discussions of organisational resilience and organisations' planning strategies because it identifies organisational disciplines which could contribute towards an organisation's resilience.

Gibson and Tarrant also present the herringbone resilience model shown as Figure 2.13. This model suggests that resilience is enhanced by a combination of organisations' characteristics or attributes and their activities and capabilities, or who they are and what they do (Gibson & Tarrant, 2010). The herringbone model incorporates many of the factors considered as possible indicators of organisational resilience in this thesis.

Figure 2.13: Herringbone Resilience Model

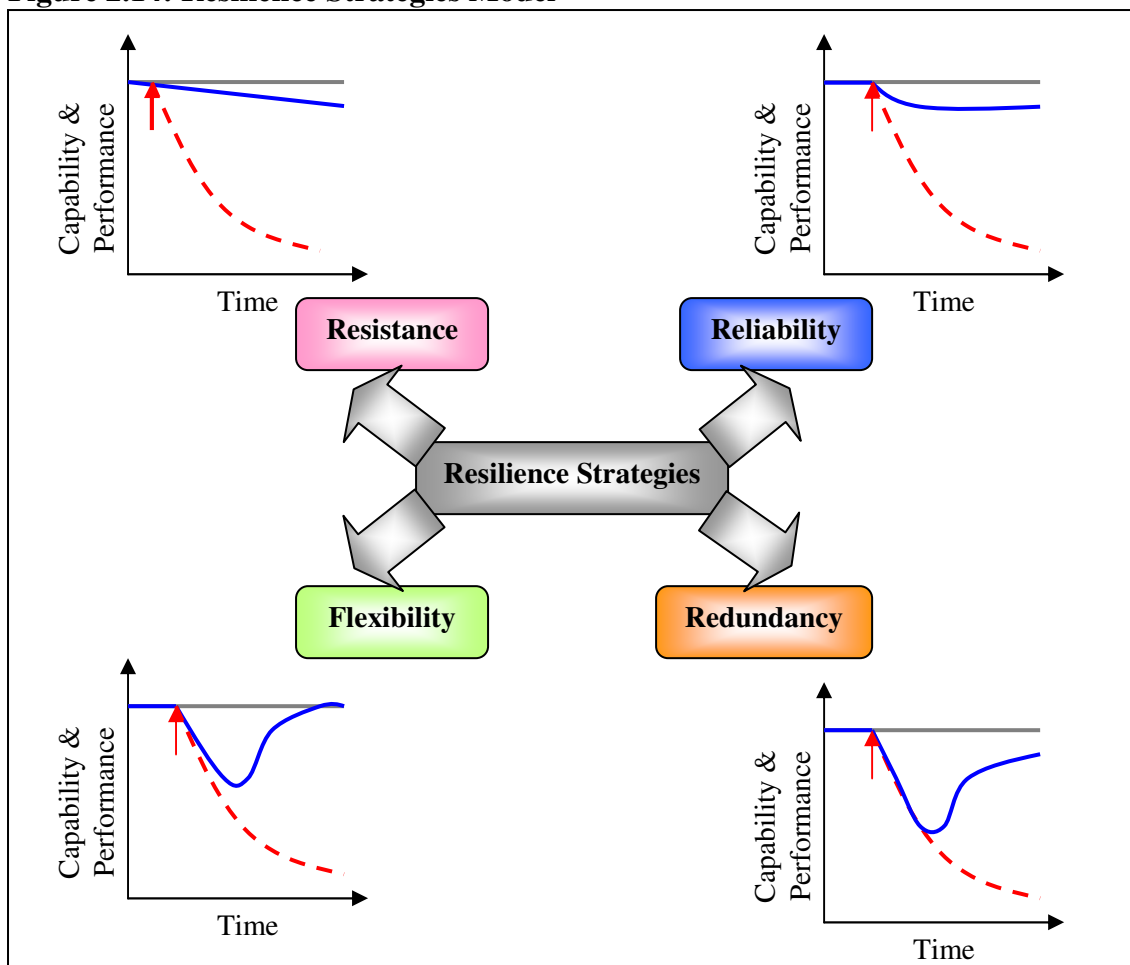


(Gibson & Tarrant, 2010, p. 10)

Gibson and Tarrant (2010) also present the resilience strategies model which addresses how organisations might actually improve their resilience. This model can be seen as Figure 2.14 and the small graphs on the figure should be interpreted using the notes provided. The model identifies four types of strategy which organisations can develop

to improve their resilience; resistance, reliability, flexibility, and redundancy. The model suggests that the two most successful resilience strategies are resistance and flexibility. The small graph relating to resistance shows that the organisation will only experience a small disruption to its business-as-usual capabilities and performance. However the resistance strategy graph also suggests that the organisation's capability and performance will not fully recover back to previous levels. The flexibility strategy is the only strategy on Figure 2.14 that suggests that an organisation can recover to their previous capabilities and performance. It is also worth noting that none of the four strategies included in the resilience strategies model provide an organisation with a way to increase its capabilities and performance during or after a crisis. This contrasts definitions of organisational resilience which include the organisation's ability to take advantage of opportunities during crises and to thrive (Seville, et al., 2008).

Figure 2.14: Resilience Strategies Model



Note: The dotted line on each small graph shows the organisation's capability and performance, the arrow on each small graph represents a disruptive event, and the line shows

the organisation's capability and performance taking into account the resilience strategy which would moderate its deterioration.

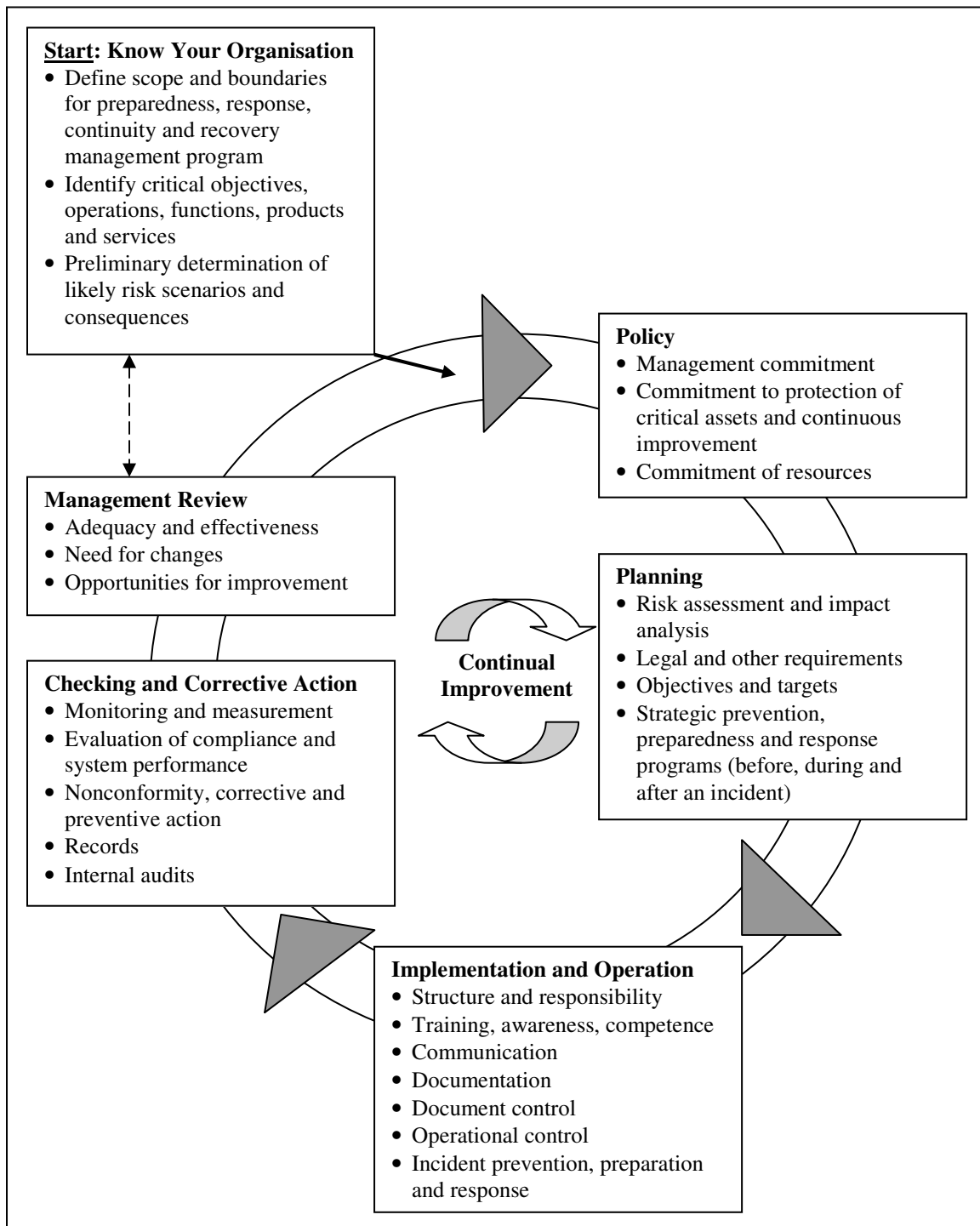
(Gibson & Tarrant, 2010, p. 11)

2.4.2.1 Relevant Standards

The purpose of the resilience measurement tool developed through this thesis is to provide organisations with information on their resilience, not to measure their resilience against a standard. However a review of relevant standards is useful to inform the development of the tool.

The American National Standards Institute (2009) ASIS SPC 1-2009 is an organisational resilience standard which specifies requirements for an organisational resilience management system within organisations. Figure 2.15 shows a flow diagram for the organisational resilience management system advocated in the standard. It provides an overview of the requirements outlined in the standard which describe an activity cycle that encompasses common phases from various models and disciplines, e.g understanding the organisation and review.

Figure 2.15: Organisational Resilience Management System Flow Diagram



(ANSI, 2009, p. 4)

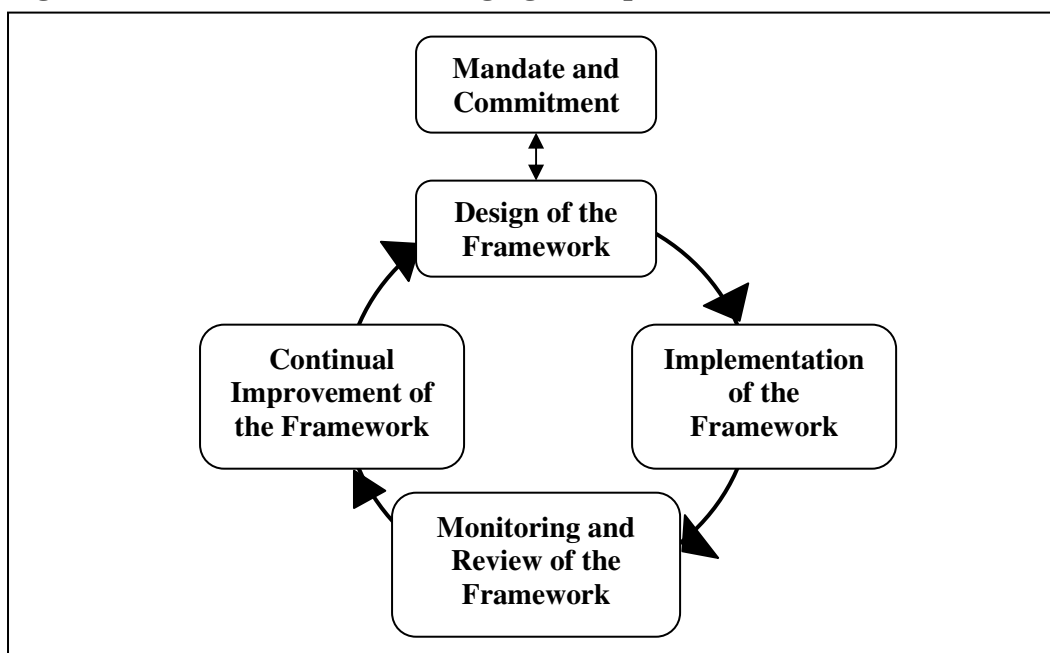
The joint Australian New Zealand standard AS/NZS 5050:2010 (2010) focuses on the management of disruption-related risks and explains how to apply the international risk management standard ISO 31000:2009 to disruption-related risks. In particular AS/NZS 5050:2010 explains the relationship between the principles, framework and process of

management of disruption-related risks which are adapted from those set out in ISO 31000:2009. The principles of managing disruption-related risk are outlined in 5050:2010 (AS/NZ, 2010, p. 5) and state that risk management:

- Creates and protects value;
- enhances an organisation's resilience and creates strategic and tactical advantage;
- is an integral part of all organisational processes;
- is part of decision making;
- explicitly addresses uncertainty;
- is systematic, structured and timely;
- is based on the best available information;
- is tailored;
- takes human and cultural factors into account;
- is transparent and inclusive;
- is dynamic, iterative and responsive to change; and
- facilitates continual improvement of the organisation.

Alongside these principles, AS/NZS 5050:2009 provides a management framework to guide the planning cycle to manage disruption-related risk; this is shown as Figure 2.16 and is similar to most other planning cycles.

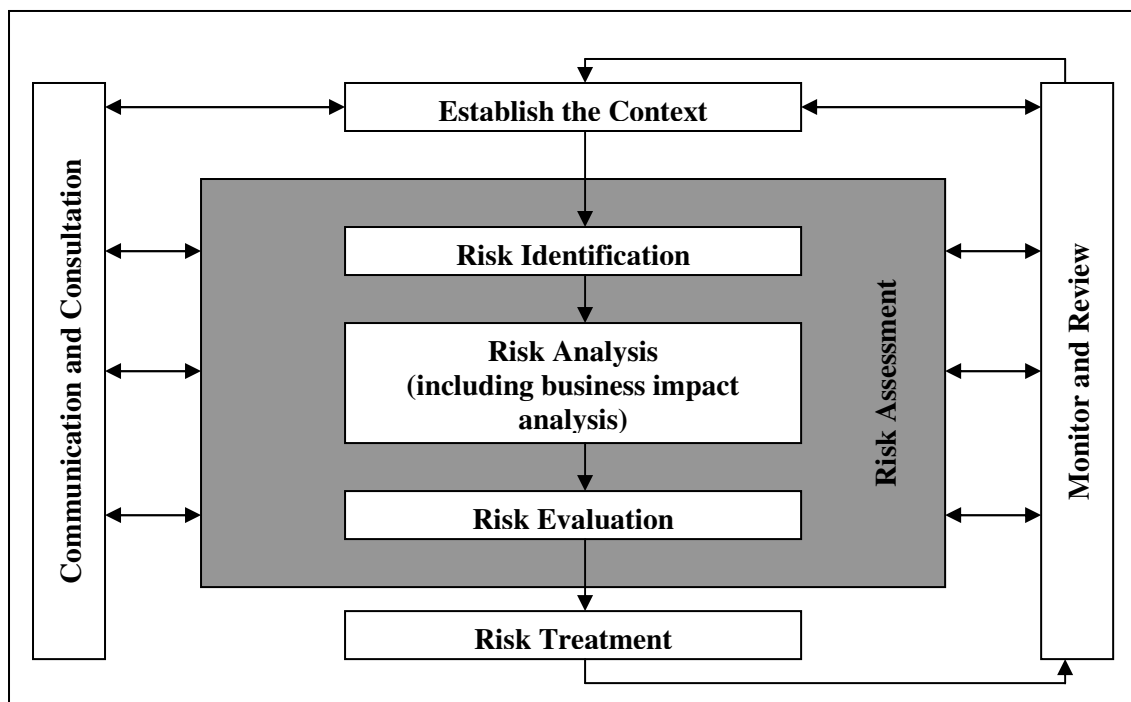
Figure 2.16: Framework for Managing Disruption-related Risk



(AS/NZ, 2010, p. 18)

The management framework then relates to a process for managing disruption-related risk which is taken from the older Australia New Zealand risk management standard 4360:2004 (AS/NZ, 2004) and is shown as Figure 2.17.

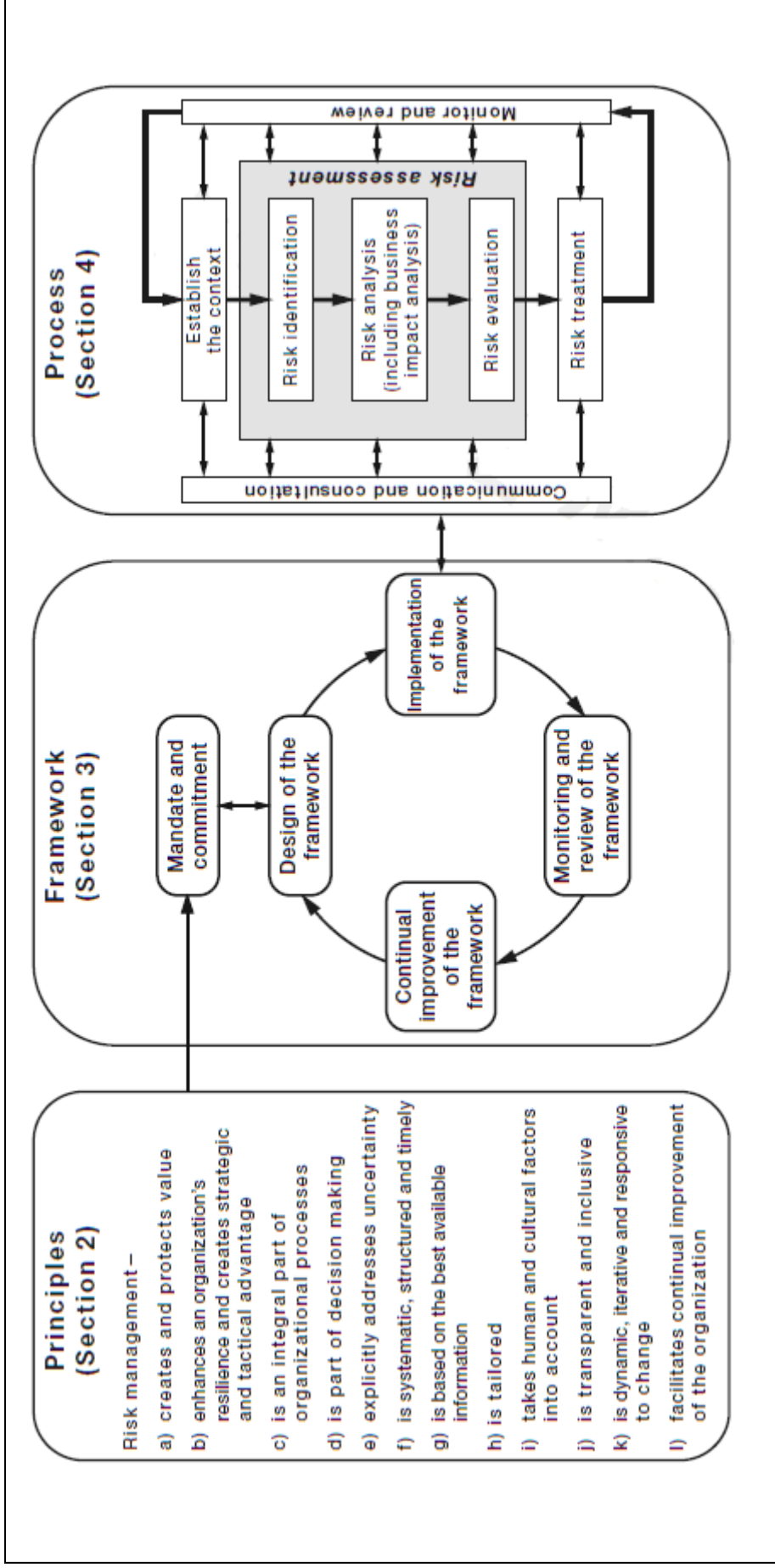
Figure 2.17: Risk Management Process



(AS/NZ, 2010, p. 22)

AS/NZS 5050:2009 also presents a model for how the principles, framework and process relate together; this is shown as Figure 2.18. The important parts of the diagram are the arrows linking the principles, framework and process. As shown, the principles directly feed into the mandate and commitment element of the framework. This means that the principles should provide the drivers for management commitment to risk management. The implementation of the framework is then linked to the risk management process.

Figure 2.18: The Relationship between Principles, Framework and Process



2.4.3 Measuring Organisational Resilience

Somers (2009) describes resilience as a reaction to an event and argues that “...*resilience is demonstrated after an event or crisis has occurred*” (Somers, 2009, p. 13). As a result, to measure resilience during business-as-usual, he focuses on measuring latent resilience or resilience potential. However this ignores the positive role that resilience can play in helping organisations to avoid crises (Pearson & Clair, 1998). This could include monitoring and detection of early warning signals which help organisations to avoid or prevent crisis or decline. Much the same as organisational culture, the visibility of resilience does not necessarily reflect its impact on the organisation and its operations. As a result, this thesis argues that resilience is always active within an organisation but may only be visible during the post-crisis phases.

Attempts to measure or assess organisational resilience can generally be classified as either qualitative case studies and interviews, or quantitative surveys. Mallak (1998b) surveyed nursing executives in the acute healthcare industry to measure organisational resilience. To enable this, he operationalised three concepts introduced by Weick (1993); bricolage, attitude of wisdom, and virtual role system. With responses from 128 nursing executives Mallak (1998b) used confirmatory factor analysis to develop six factors which he named goal directed solution seeking, avoidance or skepticism, critical understanding, role dependence, source resilience, and access to resources. Through his analysis Mallak focuses on the individual as the unit of analysis and argues that organisational resilience relies on the resilience of individuals. This link is not emphasised within the majority of organisational literature, however it is supported within information systems and technology (Cho, et al., 2006; Riolli & Savicki, 2003).

Somers (2009) extended Mallak’s (1998b) research and applied it to 142 public works organisations. He used Mallak’s six factors to measure resilience potential or latent resilience, defined as “...*resilience that is not presently evident or realised*” (Somers, 2007, p. 13). Through his research Somers (2009) uses data from a non-probability sample, which does not involve a random selection, to develop the Organisational Resilience Potential Scale (ORPS). In addition to Mallak’s six factors, Somers (2009) also includes measures of decision structure and centralisation, connectivity, continuity

planning and agency accreditation in the ORPS. While both Mallak's (1998b) and Somers's (2009) studies represent significant theoretical contributions, neither was developed using a random sample and so cannot be used as the sole basis for a robust resilience measurement tool.

Weick and Sutcliffe (2007) discuss high reliability as a key characteristic of resilience and present a series of nine audits to measure resilience. Each resilience audit consists of questions based on high reliability and organisational theory. Smith et al. (2005, p. 130) advocate the use of Weick and Sutcliffe's resilience audits to organisational managers to create mindfulness and to diagnose areas that need specific attention. However, the audits have yet to be fully quantitatively tested (Fratous, 2006, p. 29). Some of Weick and Sutcliffe's concepts and questions have been used in the development of the resilience measurement tool; this will be discussed in Chapter 5.

Paton (2007) developed a survey to measure community resilience in Auckland New Zealand. While Paton did not measure organisational resilience, it is included here because it was resilience measured using a survey within the same geographic area as the research in this thesis, and because of the possible links between individual and organisational resilience as suggested by Mallak (1998b). Paton (2007, p. 7) defines community resilience as,

“...the capacity of a community, its members and the systems that facilitate its normal activities to adapt in ways that maintain functional relationships in the presence of significant disturbances”.

He goes on to discuss resilience and adaptive capacity interchangeably and argues that resilience comprises four components; resources, competencies, planning and development strategies, and sustained availability. Based on these general components, Paton (2007) developed a survey tool to measure community resilience based on a volcanic eruption scenario. He argues,

“The assessment of resilience must take place in a context in which the demands that people have to adapt to is known or can be estimated”.

(Paton, 2007, p. 12)

Here Paton is arguing that, when developing a model of community resilience, it is important to be able to collect responses in the context of a scenario where the researcher can evaluate whether or not a particular response makes the participant more or less resilient. For example, when measuring negative outcome expectancy Paton (2007, p. 49) asks respondents the extent to which they agree or disagree that *volcanic eruptions are too destructive to bother preparing for*. This enables Paton to make a judgement on whether the respondent would prepare, given the likelihood and consequence of a specific event. This of course might be quite different to whether a respondent in Auckland might prepare for a flood.

He administered the survey by telephone to a random sample of 400 households in August 2005; however a problem with the survey administration left 297 useable responses which were then taken forward to develop a model of community resilience. Paton (2007) used Principal Components Analysis, which is essentially the same as factor analysis with rotation, to determine dimensionality, Cronbach's Alpha to test reliability, and structural equation modelling to develop the model. Through this analysis Paton (2007, p. 21) identified eight components of community resilience which included;

- Action coping;
- positive outcome expectancy;
- community participation;
- empowerment;
- negative outcome expectancy;
- articulating problems;
- trust; and
- intention.

The UK Business Continuity Institute (BCI, 2007) developed an online business continuity benchmarking survey to benchmark organisations' performance against the BCI business continuity guidelines which are based on the British Standards Institute

BS25999 (BSI, 2006). While this survey was primarily concerned with operational continuity, it paved the way for a raft of similar surveys and tools in the UK which are slowly incorporating the more social and cultural elements of resilience.

The UK Financial Services Authority (2005), as part of the Tripartite Authorities, conducted a resilience benchmarking study of the UK financial sector in 2005. As part of this study they developed an online benchmarking survey and used it to benchmark the resilience of 60 financial sector organisations. Although the focus of the study was described as resilience, the questions themselves focused primarily on business continuity and addressed recovery times, the effectiveness of planning, and potential areas of vulnerability (Financial Services Authority, 2006). The results of the study identified IT resilience as a key strength and the primary focus of most organisations' business continuity activities. However the social and cultural side of resilience was noted as an area that needed more attention (Financial Services Authority, 2006).

The UK Financial Services Authority (2010) has also more recently completed a similar project to benchmark the resilience of the UK insurance sector. The online resilience benchmarking survey that was used for the financial sector was adapted and used to benchmark the resilience of 19 insurance sector organisations. Again this study focused on business continuity; however it also included more emphasis on staff welfare, human resources management, and risk assessment (Financial Services Authority, 2010).

Hurley-Hanson (2006) investigates whether organisations increased their crisis response planning following the September 11th Terrorist Attacks. To do this she developed a survey to measure employees' perceptions of their organisations' crisis preparedness. Hurley-Hanson's (2006) survey focused on the following segments;

- Employee safety and security;
- crisis planning and communications;
- resilience (the ability to recover from catastrophic event); and
- economic and human losses.

Despite calls from the US Government for organisations to prepare, and the poignant reminder provided by 9/11, Hurley-Hanson (2006) found that the majority of organisations, even those that were directly affected by 9/11, were still unprepared for crisis (Hurley-Hanson, 2006).

As part of the Resilient Organisations Research Programme, McManus (2007) used grounded theory to explore organisational resilience in New Zealand. She conducted a qualitative study using semi-structured interviews with ten case study organisations to assess their resilience qualities. From these case studies, McManus proposed a definition of organisational resilience as,

“...a function of an organisation’s situation awareness, management of keystone vulnerabilities and adaptive capacity in a complex, dynamic and interconnected environment”.

(McManus, 2007, p. 4)

Through this she hypothesised a model where Relative Overall Resilience (ROR) is composed of three dimensions (situation awareness, management of keystone vulnerabilities and adaptive capacity) and also proposed fifteen indicators of organisational resilience; five for each dimension. The ROR model has been chosen as the starting point for this thesis because it presents an operationalised definition of organisational resilience which has been developed through research with New Zealand organisations and so provides a good context for this study. The indicators it proposes can be seen in Table 2.5; definitions of each of the three dimensions and the fifteen indicators are discussed in Chapter 3.

Table 2.5: McManus's Dimensions and Indicators of Organisational Resilience

Situation Awareness		Management of Keystone Vulnerabilities		Adaptive Capacity	
SA ₁	Roles & Responsibilities	KV ₁	Planning Strategies	AC ₁	Silo Mentality
SA ₂	Understanding & Analysis of Hazards & Consequences	KV ₂	Participation in Exercises	AC ₂	Communications & Relationships
SA ₃	Connectivity Awareness	KV ₃	Capability & Capacity of Internal Resources	AC ₃	Strategic Vision & Outcome Expectancy
SA ₄	Insurance Awareness	KV ₄	Capability & Capacity of External Resources	AC ₄	Information & Knowledge
SA ₅	Recovery Priorities	KV ₅	Organisational Connectivity	AC ₅	Leadership, Management & Governance Structures

(McManus, 2007, p. 18)

2.4.4 Benchmarking

Benchmarking is the process of measuring and comparing one organisation against another in order to identify and implement improvements (Anderson & Pettersen, 1996). In the context of resilience this is not a new concept; organisations often compare internally and externally during post-crisis debriefs. However comparison before disaster occurs is also important. Doyle (1996) supports this and advocates using benchmarking to improve performance in emergency management.

Codling (1996) identifies three types of benchmarking; internal, external and best practice, and Anderson and Pettersen (1996) identify four types of benchmarking; internal, competitive, functional and generic.

Internal benchmarking tends to focus on business processes and takes place between departments or locations of the organisation. The purpose of this is to identify efficient practises, cost savings, unnecessary duplications, and anomalies within the organisation. The benefit of internal benchmarking is that it provides an easy introduction for organisations new to benchmarking; the process is also often easier as the units involved share the same culture and language (Codling, 1996).

External benchmarking focuses on comparing an organisation and its processes with other organisations which the organisation does not share a common management or workforce. The purpose of external benchmarking is again to identify efficiency, cost savings and unnecessary duplications and anomalies, as well as to examine two or more organisations in light of their differences. Codling (1996, p. 10) argues,

“The more externally focused the benchmarking exercise, the greater the potential for removing blinkers, overturning paradigms, and over-coming the ‘not-invented-here’ syndrome”.

Best practice benchmarking focuses on seeking out the world leader in a particular process, and then benchmarking against them in order to identify what makes that organisation the world leader, and how your organisation can learn from their example. Out of the three types of benchmarking Codling (1996) argues that best practise benchmarking offers the highest potential gains including paradigm shifts, breakthroughs, and the most significant improvement. Generic benchmarking involves benchmarking against an organisation in a totally unrelated industry.

Competitive benchmarking is where an organisation compares their business processes against a direct competitor (Anderson & Pettersen, 1996). Although in theory this sounds like a great opportunity for identifying lessons and for investigating network resilience, organisations rarely do it because of the need to maintain competitive advantage and protect copyright.

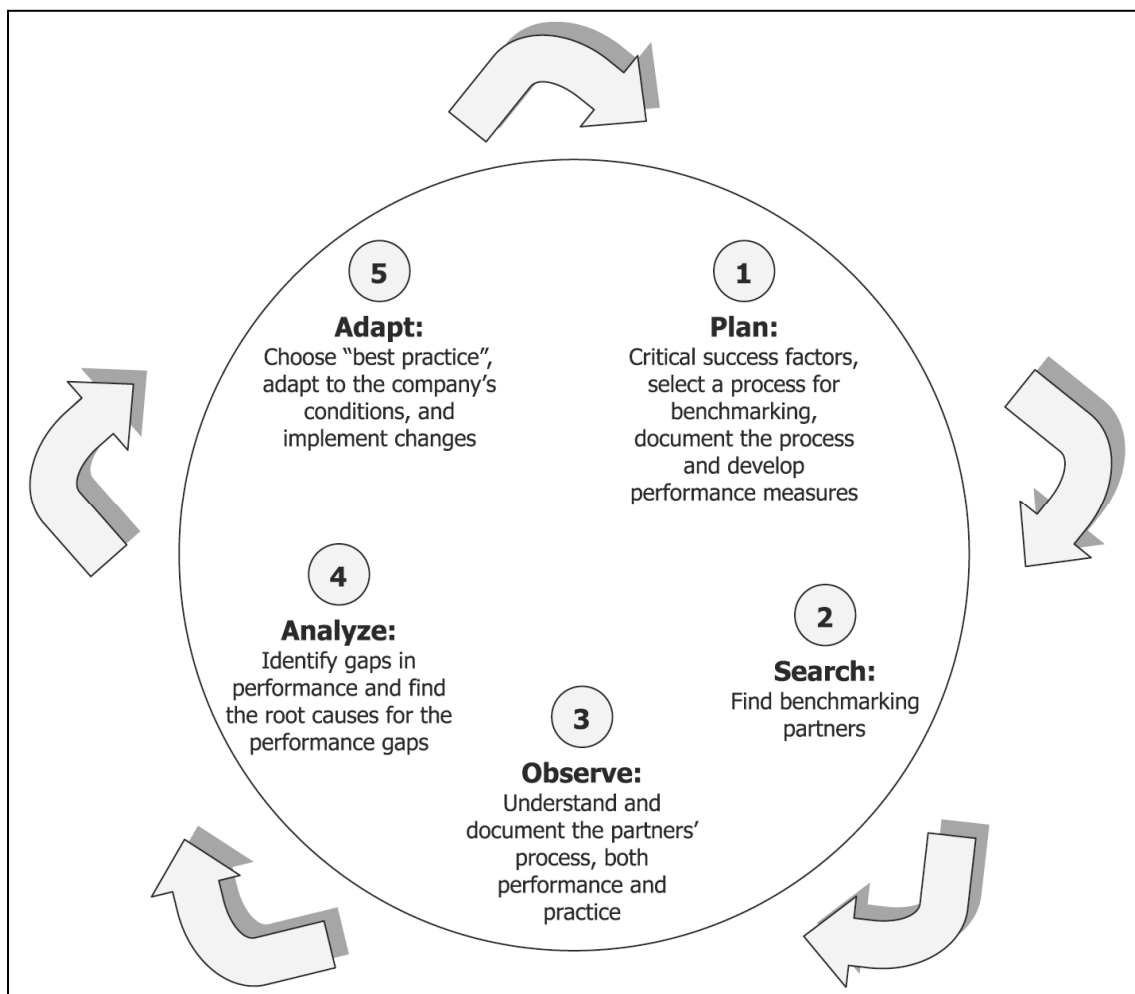
Functional benchmarking provides a step towards competitive benchmarking and involves partnering with an organisation that is very close to your own, for example a supplier or customer, who faces the same industry challenges and climate but is not a direct competitor. This can provide an examination of an industry sector and can also help to align processes across an organisation’s value chain.

Anderson and Pettersen (1996) also discuss what organisations compare when they benchmark. They identify three types of comparison; performance, processes and strategy. Comparing process and strategy can provide organisations with information on

their strengths and weaknesses in these areas, and what other organisations do that puts them ahead (Anderson & Pettersen, 1996).

Benchmarking involves more than just using a survey to measure processes or strategies. Anderson and Pettersen (1996) present a model of benchmarking which is echoed across many other models. Their model involves five steps and is shown in Figure 2.19. Although the steps are shown as separate phases, Anderson and Pettersen note that in reality they often overlap.

Figure 2.19: The Benchmarking Wheel



(Anderson & Pettersen, 1996, p. 14)

Of the five stages the planning stage is the most important. Anderson and Pettersen (1996) suggest that planning can take up to 50% of the time spent on the benchmarking project.

For the purposes of this thesis, external benchmarking was used to compare measurements of resilience between organisations in Auckland. The thesis methodology is presented in Chapter 4 and the benchmarking methodology, which has been developed to guide the continuous use of the tool over time, is presented and discussed in Chapter 8.

2.5 Anticipation vs. Resilience

A central theme throughout this thesis is the question of anticipation vs. resilience, planning vs. adaptation. This section defines anticipation and resilience and discusses how these two approaches can be combined within organisations to address organisational resilience.

Anticipation involves predicting possible sources of failure or causes of crisis or disaster, so that they can be planned for, mitigated or avoided altogether. Vogus and Sutcliffe (2008) refer to this as *avoiding error by design* whereby a system of controls, processes and checks is put in place to prevent possible crises from occurring. Comfort (2001, p. 146) argues,

“A strategy of anticipation builds upon a careful assessment of the community to identify not only its vulnerabilities to risk, but also likely points of strength and safety”.

Hurley-Hanson (2006) emphasises the importance of developing crisis response plans and provides numerous examples, mainly in relation to September 11th, of successful crisis responses enabled by planning. However Boin and McConnell (2007, p. 53) discuss critical infrastructure breakdowns and argue that “...*prevention and planning come with serious shortcomings*”. Valle (1999) highlights this when he discusses an anticipatory approach to organising, where leaders anticipate problems by focusing on rules, procedures and policies and discourage deviation from them. These leaders reward those members of staff who follow the rules and this also serves to discourage innovation, improvisation and creativity. Valle (1999) goes on to note that an

anticipatory approach is more suited to environments characterised by stability and predictable outcomes.

In contrast resilience, as discussed in Section 2.4, involves adaptation to changing environments. Vogus and Sutcliffe (2008) discuss the resilience approach and note that resilient organisations recognise that it is impossible to prevent all crises and disasters all of the time. Instead they monitor their organisation as a system with inputs and outputs, the characteristics of which can provide information about the *health of the system*. Comfort (2001, p. 146) argues,

“A strategy of resilience identifies the capacity of a community to mobilise in response to a threat, once it has occurred”.

Here she notes that resilience is also about a capacity to act and refers to it as an emergent response to a threat, rather than an existing property. Comfort (1994) discusses self-organisation and adaptation as part of resilience and notes that organisations often restructure the way in which they mobilise and manage resources as they progress through the response.

Egan (2007, p. 8) argues that anticipation and resilience are not mutually exclusive and that “...*anticipatory change...should be based on developing greater resilience*”. Wildavsky (1998) discusses ways to reduce risk and proposes a balance between anticipation and resilience. Comfort (2001) discusses Wildavsky’s work and argues that disaster management practices are moving towards a combination of anticipation and resilience strategies. She goes on to explain that this combination provides a dynamic tension which, if managed effectively can produce effective response strategies (Comfort, et al., 2001). Boin and Lagadec (2000, p. 188) also suggest a two-pronged approach and state “*While we agree that resilience is the key to coping, it is necessary to organise for resilience*”. Here they suggest that the anticipatory approach, including planning, is used to enable organisations to be resilient. Planning and formalising response arrangements in advance means that the organisation is free, at the time of crisis, to be much more adaptive and resilient in its response (Hurley-Hanson, 2006).

Weick and Sutcliffe (2007) discuss high reliability organisations (HROs) as resilient organisations, and present one possible resolution of the conflict between anticipatory and resilience strategies. They go on to identify 3 principles of *anticipation* and 2 principles of *containment* which they argue characterise HROs. The 3 principles of anticipation are preoccupation with failure, reluctance to simplify, and sensitivity to operations.

Weick and Sutcliffe (2007) discuss organisations' preoccupation with failure as their understanding that it is impossible to prevent all accidents and crises from happening. Instead, HROs look to identify *weak signals*, or early warning signals, which will enable them to avoid the *accumulation of unnoticed events* which can lead to disaster (Turner, 1976). In detecting these potential failures, Weick and Sutcliffe (2007) also note that HROs question their organisations' assumptions and accepted ways of working. HROs are concerned with how their expectations or assumptions can mislead them, or mask potential crises from their attention. HROs are reluctant to simplify problems or the way they view systems, because this means losing sight of some of the complexity which has an impact on the possible outcomes of their actions. An understanding of the complexity and coupling of their organisation as a system is also important for HROs sensitivity to operations. HROs monitor their performance and are responsive to unexpected changes or deviations in the system's performance, regardless of whether they look important at the time or not (Weick & Sutcliffe, 2007).

Weick and Sutcliffe (2007) also identify 3 problems posed by anticipation and planning, which provide evidence of the need for a combined anticipation and resilience strategy. Firstly, plans can cause complacency and mindlessness. They formalise the expectations of the organisation to such an extent, that the 'preoccupation with failure' and 'reluctance to simply' are much more difficult to achieve (Weick & Sutcliffe, 2007). Secondly, plans limit organisations' view of what to expect and what can be achieved during an emergency response. Although this may not be their intention, plans appear to specify that a crisis will occur in a certain way, however there are no routine crises (Boin & Lagadec, 2000). Thirdly, plans promote a standardised response to crisis which discourages innovation and improvisation (Weick & Sutcliffe, 2007). Crichton et al. (2009) echo this and argue that planning encourages blindness to new and emerging risks.

Weick and Sutcliffe (2007) discuss the idea of containment as minimising the impact or escalation of an unexpected crisis that has occurred. They go on to identify 2 principles of containment which are commitment to resilience, and deference to expertise.

Commitment to resilience, which is also discussed in Section 3.3.1, concerns organisations' ability to make sense of emerging patterns and a mind-set and culture that favours organisational learning from errors as opposed to purely the prevention of errors (Weick & Sutcliffe, 2007). This means that the organisation is focused on increasing its resilience and is able to prioritise resilience to the extent that resources for addressing resilience issues can be made available. This commitment is also related to what Pearson and Clair (1998) refer to as *executive perceptions about risk* which are one of the drivers of success of a resilience management program.

Weick and Sutcliffe (2007) argue that during business-as-usual all organisations, including HRO's, demonstrate *deference to the powerful*. This means that decisions are made based on hierarchical position and delegated responsibility. However as the pace of change increases and a crisis begins, HROs push decision making down to *the front line* of the organisation where people have access to better information and expertise to make informed decisions which incorporate the complexity of the system.

This combination of anticipation and resilience is important for organisations that need to be both planned and adaptive in order to be competitive across a range of environmental changes and shifts.

2.6 Research Questions

Despite the organisational resilience theories and concepts reviewed so far, key questions still remain and this thesis attempts to answer a few of them. This section presents the research questions which will be answered through this thesis. A discussion of how, and where in the thesis, each research question is answered is also included. Each of the research questions is also linked to the aims and objectives discussed in Section 1.3.

Research Question 1: What social or behavioural indicators influence and determine organisations' resilience?

To develop a tool to measure and benchmark organisations' resilience, it is necessary to identify indicators that can be used to measure organisational resilience. Organisational resilience research was reviewed and updated through a literature review and a workshop to identify possible social and behavioural indicators of organisational resilience. The indicator literature review is presented in Chapter 3, and a discussion of the workshop is presented in Section 3.2. The proposed indicators were tested using a random sample of Auckland organisations. The results and analysis, including a factor analysis, as well as a new model of organisational resilience are presented in Chapter 6. This satisfies objectives 1 and 3 as discussed in Section 1.3.

Research Question 2: What metrics can be developed to measure the indicators of organisational resilience?

To measure organisational resilience it is important to develop robust metrics and scales. Metrics and scales were developed to measure the proposed indicators of organisational resilience using the literature reviews and indicator definitions presented in Chapter 3. The proposed metrics were then pre-tested and refined through the pilot study which is presented in Chapter 5. This satisfies objective 2 as discussed in Section 1.3. Cronbach's alpha was used to test the reliability of the metrics and scales and the alphas for each scale are discussed alongside the metrics developed in Chapter 6. This satisfies objective 3 as discussed in Section 1.3.

Research Question 3: What conclusions can be drawn from the data about organisational resilience in the Auckland region?

It is important to identify what information the resilience measurement tool provides and to discuss the usefulness of the information. As part of developing the resilience measurement tool, it was tested using a random sample of Auckland organisations. The results of the Auckland organisations are presented in Chapter 7; this satisfies objective 4 as discussed in Section 1.3.

Research Question 4: What is a suitable benchmarking methodology for organisational resilience?

A resilience benchmarking methodology was designed to guide the ongoing use of the resilience measurement tool developed through this thesis. The benchmarking methodology draws on various elements of the research including the literature review, survey methodology, the administration of the survey in the Auckland test, and the feedback from organisations that took part in the research. This satisfies objective 2 as discussed in Section 1.3 and is presented in Chapter 8.

Chapter 3 – Identifying Indicators of Organisational Resilience

McManus (2007) used grounded theory to explore organisational resilience in New Zealand. She conducted a qualitative study using semi-structured interviews, with ten case study organisations, to assess their resilience qualities from 2005-2007. From these case studies, McManus hypothesised a model where Relative Overall Resilience (ROR) is composed of three dimensions (situation awareness, management of keystone vulnerabilities and adaptive capacity), and also proposed fifteen indicators of organisational resilience; five for each dimension.

McManus's (2007) ROR model was selected as a starting point for this research because it was developed from an operational definition of organisational resilience, that clearly identifies its component parts, and was developed within the New Zealand context. The operational definition reflects the systems approach taken throughout this thesis, and also provides a good basis for the development of metrics. A discussion of the component parts and the broad approach of the ROR model, can be found in Section 2.4.3, McManus (2007) and McManus et al. (2008).

Before developing the resilience measurement tool based on McManus's ROR model, it is important to assess whether the model is applicable to a wider population of organisations. McManus's case study organisations were selected to represent a range of organisation types and sizes. However, McManus (2007, p. 113) notes that the indicators identified through her research are limited to the case study organisations. It is therefore important that the ROR model is reviewed before developing the resilience measurement tool. In its initial stages, the measurement tool should encompass all possible indicators of organisational resilience. It can then be refined during the analysis to find the most parsimonious model of organisational resilience, and the tool can be developed so that it is applicable to as many organisations as possible.

This chapter discusses a mini-workshop and literature review that were used to review the definition and indicators of organisational resilience proposed by McManus (2007), as part of her Relative Overall Resilience (ROR) model. Through the mini-workshop

and literature review, an updated version of McManus's model was developed, and is presented and tested alongside the original model in this thesis.

3.1 Relative Overall Resilience

McManus's (2007) definition and indicators of organisational resilience, which she called, Relative Overall Resilience (ROR), were introduced in Section 2.4.3. To review, ROR is based on a definition of organisational resilience as,

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

(McManus, 2007, p. 4)

This definition identifies three components or dimensions of organisational resilience; situation awareness, management of keystone vulnerabilities, and adaptive capacity. McManus (2007) goes on to present fifteen indicators of organisational resilience, five for each dimension, which can be seen in Table 3.6.

Table 3.6: McManus's Dimensions and Indicators of Organisational Resilience

Situation Awareness		Management of Keystone Vulnerabilities		Adaptive Capacity	
SA ₁	Roles & Responsibilities	KV ₁	Planning Strategies	AC ₁	Silo Mentality
SA ₂	Understanding & Analysis of Hazards & Consequences	KV ₂	Participation in Exercises	AC ₂	Communications & Relationships
SA ₃	Connectivity Awareness	KV ₃	Capability & Capacity of Internal Resources	AC ₃	Strategic Vision & Outcome Expectancy
SA ₄	Insurance Awareness	KV ₄	Capability & Capacity of External Resources	AC ₄	Information & Knowledge
SA ₅	Recovery Priorities	KV ₅	Organisational Connectivity	AC ₅	Leadership, Management & Governance Structures

(McManus, 2007, p. 18)

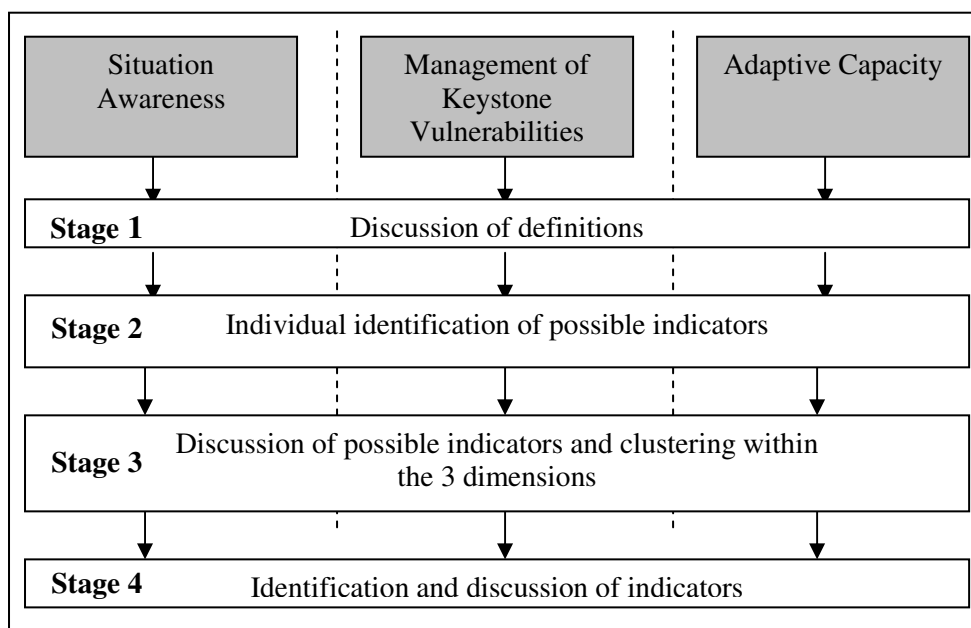
3.2 Indicators Mini-workshop

The purpose of the indicators mini-workshop was to review the definition and indicators of organisational resilience proposed by McManus (2007), and identify any gaps. The mini-workshop was held on 25th January 2008 in Wellington, New Zealand. Participants included two academics specialising in organisational resilience and risk management, three practitioners in the field of organisational resilience, emergency management and business continuity, and the author.

3.2.1 Mini-workshop Method and Process

An agenda for the mini-workshop was sent to participants in advance; this included the purpose of the workshop and the intended outcome. The intended outcome was an evaluation of McManus's (2007) indicators and a list of possible indicators which participants felt were not represented in McManus's (2007) ROR model. This list would then be used to develop an updated version of the ROR model to be tested. The mini-workshop followed the 4-stage process shown in Figure 3.20. The three dimensions of organisational resilience identified by McManus (2007) were used as a starting point for the discussion. Stages 1-3 of Figure 3.20 were completed for each individual dimension in turn, and then stage 4 was completed for all of the dimensions combined.

Figure 3.20: Workshop Process



Stage 1 involved a discussion to define and familiarise the group with each dimension; the resulting mind maps can be seen in Appendix A1-A3. Table 3.7 summarises key points from this discussion for each of the three dimensions.

Table 3.7: A Summary of the Key Points from the Workshop Discussion on Each of the Dimensions of Organisational Resilience

	Key Points
Situation Awareness	<p>It is not enough to be aware of a situation or business environment. An organisation must actively draw on that intelligence when making decisions and planning strategically.</p> <p>Situation awareness must include internal and external factors. If the organisation only looks externally or internally the awareness is incomplete.</p>
Management of Keystone Vulnerabilities	<p>It is important to differentiate between risk and vulnerability, risk being event focused and vulnerability which focuses on factors that make organisations more susceptible to risks.</p> <p>The focus of the definition should be on the management of the vulnerabilities and not just a list of possible vulnerabilities an organisation might face.</p> <p>What are the financial, environmental and social drivers of the management of vulnerabilities?</p> <p>What criteria must a vulnerability meet for it to be a keystone vulnerability?</p>
Adaptive Capacity	<p>The importance of drivers to infuse adaptive behaviour.</p> <p>Adaptive behaviour, in relation to resilience, is a time-critical entity. The organisation must adapt before the case for change becomes critical or obsolete.</p> <p>Adaptive behaviour provides the most benefit when integrated into the culture of an organisation.</p>

In **stage 2** each participant took 10 minutes to write down possible indicators on post-it notes; this was done without discussion and no limit was put on the number of indicators that each participant could suggest. In **stage 3** participants shared the post-its and put similar suggested indicators into groups without discussion. This was done on a white board and created a number of clusters of possible indicators under each dimension. In **stage 4** participants discussed the indicator clusters and identified overarching terms or labels for each one. The post-it suggestions, clusters, and the overarching terms that were developed by the group are shown in Appendix A4-A6.

3.2.2 Mini-workshop Outcomes

Possible indicators suggested by participants, which they felt were not adequately captured by McManus's (2007) ROR model, included:

- Effective crisis leadership and ownership
- Organisational culture
- Commitment to vulnerability reduction and robust enabling strategies
- Effective vulnerability monitoring and analysis
- Devolved and responsive decision making
- Innovation and creativity

3.3 Indicator Literature Review

Following the workshop, one additional dimension and eight indicators were added to McManus's (2007) original indicators to take forward as the updated model; these can be seen as the shaded areas on Table 3.8. The indicators were developed as a result of the literature review before and after the workshop and workshop discussions.

The following discussion reviews literature and develops a definition for each of the proposed dimensions and indicators shown in Table 3.8. These definitions are also provided as a list in Appendix A7. Both McManus's (2007) ROR model, shown as Table 3.6, and the updated model, shown as Table 3.8, are tested in this thesis.

Table 3.8: Updated Indicators of Organisational Resilience

Resilience Ethos					
RE ₁	Commitment to Resilience				
RE ₂	Network Perspective				
Situation Awareness		Management of Keystone Vulnerabilities		Adaptive Capacity	
SA ₁	Roles & Responsibilities	KV ₁	Planning Strategies	AC ₁	Silo Mentality
SA ₂	Understanding & Analysis of Hazards & Consequences	KV ₂	Participation in Exercises	AC ₂	Communications & Relationships
SA ₃	Connectivity Awareness	KV ₃	Capability & Capacity of Internal Resources	AC ₃	Strategic Vision & Outcome Expectancy
SA ₄	Insurance Awareness	KV ₄	Capability & Capacity of External Resources	AC ₄	Information & Knowledge
SA ₅	Recovery Priorities	KV ₅	Organisational Connectivity	AC ₅	Leadership, Management & Governance Structures
SA ₆	Internal & External Situation Monitoring & Reporting	KV ₆	Robust Processes for Identifying & Analysing Vulnerabilities	AC ₆	Innovation & Creativity
SA ₇	Informed Decision Making	KV ₇	Staff Engagement & Involvement	AC ₇	Devolved & Responsive Decision Making

(Adapted from McManus, 2007, p. 18)

3.3.1 Resilience Ethos

The resilience ethos dimension was added to McManus's (2007) model because workshop participants identified commitment, buy-in and leadership as key drivers and enablers of organisational resilience. While leadership is included within the adaptive capacity dimension of McManus's (2007) ROR model, participants at the workshop felt that it also had a more overarching role.

The resilience ethos dimension also reflects elements of Pearson and Clair's (1998) model of integrated crisis management that are not represented in the ROR model. Pearson and Clair (1998, p. 66) refer to these elements as *Executive Perceptions about Risk* which they characterise as "Concern for, or attention to, crisis preparations". Pearson and Clair (1998) argue that *executive perceptions about risk* have a considerable impact on the mindset of the organisation and its approach to crisis

management. Executives' perception, or resilience ethos, determines the crisis management approach taken by the organisation.

Sheaffer and Mano-Negrin (2003) operationalised executive perceptions about risk to empirically investigate corporate perceptions and orientations as antecedents of organisational crisis preparedness or proneness. They focus on four areas; structure, strategies, human resource management and organisational unlearning. Sheaffer and Mano-Negrin (2003, p. 581) refer to organisational unlearning as “...*the prevention of organisational inertia and potential crises by systematically rethinking and overhauling prescribed procedures*”. This emphasises the importance of questioning organisational assumptions, and sometimes throwing them out, in favour of new paradigms or ways of working.

Weick and Sutcliffe (2001) discuss the importance of a *culture of resilience* as the key to successful organising. This culture represents “...*a willingness to share and refresh knowledge and constant readiness to take community action*” (Granatt & Paré-Chamontin, 2006, p. 53). Elwood (2009, p. 246) argues that “*Organisations need to define their resilience culture and implement it through altering the component parts of resilience*”. He goes on to suggest that organisations need to develop an understanding of resilience that goes beyond just business continuity or risk management and is shared across the entire organisation. He argues,

“No amount of planning, expenditure, use of resources or ingenious mitigation measures will ever guarantee triumph if the espoused resilience culture is only visible within the readily accessible corporate values”.

(Elwood, 2009, p. 247)

Here Elwood emphasises that an organisation is only resilient if that resilience is embedded in the culture of the organisation. It is not enough that the organisation talks about resilience; it must also be part of the organisation's culture.

The definition of resilience ethos adopted for this research is shown in Box 1.

Box 1: Definition of Resilience Ethos

A culture of resilience that is embedded within the organisation across all hierarchical levels and disciplines, where the organisation is a system managing its presence as part of a network, and where resilience issues are key considerations for all decisions that are made.

From this definition two indicators of Resilience Ethos are proposed, they include;

- RE₁ - Commitment to Resilience
- RE₂ –Network Perspective

RE₁ Commitment to Resilience

Commitment to Resilience is included as an indicator of resilience ethos because commitment was identified as a driver of resource allocation and culture at the workshop. This is echoed by Pearson and Clair (1998, p. 69) who argue “*Perceptions of senior executives determine cultural beliefs in the organisation about the value and need for crisis management*”.

Weick and Sutcliffe (2007) explain that high reliability organisations (HROs), which they suggest are resilient, do not confine themselves to anticipating all hazards, because this is impossible and can lead to gaps in preparedness. Instead they pursue a *commitment to resilience* which is more about the ability to make sense of emerging patterns and a mind-set and culture that favours organisational learning from errors as opposed to purely the prevention of errors (which inevitably leads to a lack of resilience). Weick and Sutcliffe (2007) identify four ways in which commitment to resilience can be evident in organisations; a culture that encourages widespread conviction that formal procedures are fallible, training that is designed to build skills, the capability to cope and learn from experience, and management practices and organisational norms that encourage a willingness to question what is happening (Weick & Sutcliffe, 2007, p. 73).

Weick and Sutcliffe (2007) include commitment to resilience as one of their resilience audits; this is shown as Figure 3.21. Some of the concepts included in this audit are covered by other indicators within McManus’s (2007) model or the updated indicators.

In particular questions 4, 5, 7 and 8 have been incorporated into the development of the resilience management tool in this thesis.

Figure 3.21: Commitment to Resilience Audit

How well do the following statements describe your work unit, department, or organisation? For each item, circle the number that best reflects your conclusion: 1 = not at all, 2 = to some extent, 3 = a great deal.			
1. Resources are continually devoted to training and retraining people to operate the technical system.	1	2	3
2. People have more than enough training and experience for the kind of work they do.	1	2	3
3. This organisation is actively concerned with developing people's skills and knowledge.	1	2	3
4. This organisation encourages challenging 'stretch' assignments.	1	2	3
5. People around here are known for their ability to use their knowledge in novel ways.	1	2	3
6. There is a concern with building people's competence and response repertoires.	1	2	3
7. People have a number of informal contacts that they sometimes use to solve problems.	1	2	3
8. People learn from their mistakes.	1	2	3
9. People rely on one another.	1	2	3
10. Most people have the skills to act on the unexpected problems that arise.	1	2	3
Scoring: Add the numbers. If you score higher than 20, the <i>commitment to resilience</i> is strong. If you score between 12 and 20, the commitment to resilience is moderate. Scores lower than 12 suggest that you should be actively considering how you can immediately begin building resilience and the capacity for mindfulness.			

(Weick & Sutcliffe, 2007, p. 99)

The definition of commitment to resilience adopted for this research is shown in Box 2.

Box 2: Definition of Commitment to Resilience

A belief in the fallibility of existing knowledge as well as the ability to learn from errors as opposed to focusing purely on how to avoid them. It is evident through an organisation's culture, training and how it makes sense of emerging crises and emergencies.

RE₂ Network Perspective

In line with the systems approach which dominates crisis and disaster research, and the importance resilient supply chains and industry sectors, this thesis considers

communities of organisations as networks, and how this relates to their resilience ethos. Benini (1999) argues that the network structure is becoming the dominant *pattern* of organisation as a response to increased global competition and interdependency. This is reflected by Starr et al. (2003b, p. 29) who argue,

“Over the course of the last half century, the vertically integrated company has given way to the networked enterprise, an organisational structure characterised by greater agility and adaptability”.

Borgatti and Foster (2003) discuss *network organisations*, a concept that became popular in the 1980s. Network organisations are characterised by relationships that rely on trust and embedded cultural values, and achieve a balance between flexibility and control. Borgatti and Foster (2003, p. 996) go on to identify some of the features of network organisations including “...*flat hierarchy, empowered workers, self-governing teams, heavy use of temporary structures (e.g. project teams, task forces), lateral communication, knowledge-based*”.

A culture of network resilience, having a network perspective, is important not only between organisations but also within organisations. McManus (2007, p. 5) argues that “...*much of the risk that organisations face is tied up in their intrinsic interconnectedness; the organisational network*”. The inherent interdependency between organisations is important for organisational resilience because it can lead to rapid changes in the business environment and the escalation of crises. This occurs due to the level of *coupling* between two organisations or tasks. Organisations or tasks that are tightly coupled have little room for error; change in one will affect change in the other - escalation. Alternatively, some organisations or tasks may be loosely coupled; this means that while they are linked, there is more lag time built into the relationship and changes in one may or may not cause significant changes in the other, and these changes may be delayed (Perrow, 1999). In the context of a culture of network resilience this means that a resilient organisation will be aware of network interdependencies and coupling. However for this to be possible the organisation’s culture must enable that awareness, and the organisation’s ability to create and maintain the desired structure.

The definition of network perspective is shown in Box 3.

Box 3: Definition of Network Perspective

A culture that acknowledges organisational interdependencies and realises the importance of actively seeking to manage those interdependencies to better prevent or respond to crises and emergencies. It is a culture where the drivers of organisational resilience, and the motivators to engage with resilience, are present.

3.3.2 Situation Awareness

The term situation awareness was first used in connection with the military where pilots are required to understand, assimilate and act on large volumes of information in order to perform their roles (Endsley, 1995). Endsley et al. (2003, p. 13) define situation awareness as,

“...being aware of what is happening around you and understanding what that information means to you now and in the future”.

They go on to note that the term is usually applied to operational situations. One example of this is Masys (2005) application to airline operation and safety which argues that situation awareness is distributed across teams, groups and organisations, as well as human and machine *agents*. Masys (2005) draws on Stout and Salas (1998) and argues that situation awareness (SA),

“...should be regarded as an essential requirement for competent performance in dynamic environments, with inaccurate and incomplete SA often leading to dangerous and life-threatening consequences”.

(Masys, 2005, p. 548)

Crichton et al. (2005) echo this when they discuss incident command skills in the oil industry. They argue that situation awareness is a vital command skill in a crisis because the first step in decision making is to evaluate the situation. Roth et al. (2006) discuss the importance of shared situation awareness as an informal cooperative strategy between railroad workers which *“...facilitates work, and contributes to the*

overall efficiency, safety, and resilience...of railroad operations” (Roth, et al., 2006, p. 967). This informal cooperative strategy, which occurs within the organisation’s culture, is the mechanism through which the organisation shares or communicates their situation awareness.

The definition of situation awareness adopted for this research is shown in Box 4.

Box 4: Definition of Situation Awareness

An organisation’s understanding of its business landscape, its awareness of what is happening around it, and what that information means for the organisation now and in the future.

This thesis proposes seven indicators of situation awareness; these are shown below. Indicators SA₁ to SA₅ are McManus’s (2007) indicators of situation awareness within her Relative Overall Resilience (ROR) model, and indicators SA₆ and SA₇ have been added as part of the updated model discussed in Section 3.3.

- SA₁ – Roles and Responsibilities
- SA₂ – Understanding and Analysis of Hazards and Consequences
- SA₃ – Connectivity Awareness
- SA₄ – Insurance Awareness
- SA₅ – Recovery Priorities
- SA₆ – Internal and External Situation Monitoring and Reporting
- SA₇ – Informed Decision Making

SA₁ – Roles and Responsibilities

The concepts of role and responsibility form part of a widely accepted public rhetoric and are often used interchangeably. In the context of disasters, roles and responsibilities are continuously assigned and re-assigned. McManus et al. (2007) argue that knowledge of one’s own role as well as the role of others is a key awareness issue. Bello et al. (2007, p. 1) emphasise the importance of roles and responsibilities when they discuss a Government Accountability Office report in which “...analysis following Hurricane Katrina showed improvements were needed in leadership roles and responsibilities”.

Organisations are affected by roles and responsibilities at all levels of organisational activity and function, however it is easier to observe during the response phase. Dynes (1986, p. 5) echoes this when he states,

“...the emergency period of sudden disasters optimise the conditions for role “problems” and provide the best opportunity to examine the functioning of roles”.

Robbins et al. (2003, p. 281) define roles as “A set of expected behaviour patterns attributed to someone occupying a given position in a social unit”. This definition includes notions of *position*, conveying that an individual or group holds a position which is related to the role that they take. Vecchio (2000) discusses three different types of role; expected role, perceived role and enacted role. An expected role is pre-defined, accepted and formalised, and is often recorded in a job description, plan or manual. A perceived role can also be accepted and recorded, but it is a set of actions or activities which an individual or group themselves believe they should carry out. An enacted role is one that an individual or group actually performs. Vecchio (2000) goes on to note that enacted roles are more likely to reflect a person’s perceived role than their expected role and this provides impetus for pre-disaster training for roles and responsibilities. Vecchio (2000) describes factors that contribute to this relationship; role conflict and role ambiguity.

Nicholson Jr. and Goh (1983, p. 149) define role conflict as, “...an incompatibility between job tasks, resources, rules or policies and other people”. An example of this would be a nurse who is also a parent of a young child (O’Sullivan, et al., 2009). Dynes and Quarantelli (1986) review whether or not role conflict exists and note that different types of disaster encourage different types of behaviour. They argue that the conditions for role conflict are most often created by disasters such as earthquakes that occur without warning (e.g. so that other arrangements for childcare cannot be made in advance) and affect a large area (e.g. others in the local area that may have helped with childcare have also been affected by the disaster).

At the same time Dynes and Quarantelli (1986) observe that while in theory, and perhaps in normal situations, role conflict affects performance, there is no empirical or

anecdotal evidence to suggest that it actually happens in disaster situations (Dynes & Quarantelli, 1986, p. 29). Despite this argument Dynes and Quarantelli (1986) accept that some social process does happen when a person is required to take on multiple roles. They conclude that the word *conflict* does not accurately describe the process and suggest the term *role strain* instead. Dynes and Quarantelli (1986) propose that role strain also occurs during business-as-usual and that,

“Since this is the normal state of affairs, certain institutionalised mechanisms exist to reduce the strain e.g. compartmentalisation, delegation, and elimination of role relationships”.

(Dynes & Quarantelli, 1986, p. 33)

Through the process of *role simplification* they argue that families, organisations and communities use compartmentalisation and delegation to temporarily restructure roles and responsibilities. This means that an agreement or balance is found between the different roles, e.g. people should go home and check on their families first, and then come into work (Dynes & Quarantelli, 1986). Role strain is then reduced and role conflict avoided, however the degree to which this role simplification process is effective will be different in every organisation.

Despite the ability of role simplification to reduce or eliminate role strain, crisis roles should still be clearly defined. Crichton et al. (2005) discuss incident command skills in the oil drilling industry and claim that *“Previous incidents...have identified teamwork errors as being the result of roles not being clearly defined”* (Crichton, et al., 2005, p. 121). Cotton (1993) discusses the riots in Los Angeles in 1992 from a public utilities perspective, and highlights lessons that should be learnt from the event and states that, *“...clearly defined roles and responsibilities facilitate the execution of emergency operations and minimise redundant efforts”* (Cotton, 1993, p. 23). This lack of clear roles can be seen as a determinant of a poor emergency management response.

High reliability organisations (HRO's) take a different approach to roles and responsibilities. During business-as-usual, roles and responsibilities are based on authority and position, however as crisis develops this begins to change (La Porte,

1996). As the tempo of the situation increases, the structural and social dynamic of the organisation shifts to one which focuses less on predefined roles and more on expertise and delegated authority. Bigley and Roberts (2001) discuss the *structuring mechanisms* through which decision making is restructured during a crisis and identify four basic processes; structure elaborating, role switching, authority migrating and system resetting. Table 3.9 provides the characteristics of each structuring mechanism.

Table 3.9: Bigley and Roberts (2001) Structuring Mechanisms

Structuring Mechanism	Characteristics
Structure elaborating	<ul style="list-style-type: none"> • Rapid ad hoc development of new organisational structures to respond to situations as they develop • Roles, tasks and resources are assigned as problems arise • Goals and plans may be revised frequently as the situation evolves
Role switching	<ul style="list-style-type: none"> • Roles requirements are established according to the functional requirements of the situation • Roles may be deactivated when they are no longer needed
Authority migrating	<ul style="list-style-type: none"> • Roles, and their relevant authority, are assigned to those most qualified • The assignment of roles is decoupled from the formal hierarchy • Expertise outside of people's official training is taken into account
System resetting	<ul style="list-style-type: none"> • If the current system or assignment of roles is not working it may be reset • A new set of priorities is formed and the organisation is restructured around these new challenges

The characteristics of Bigley and Roberts's (2001) structuring mechanisms shown in Table 3.9 do not only relate to roles and responsibilities; they also relate to deference to expertise which is discussed by Weick and Sutcliffe (2007) as when decisions are made by people who are experts as opposed to by people with a certain hierarchical position within the organisation. This is discussed in relation to the devolved and responsive decision making indicator of organisational resilience (AC₇) in more detail towards the end of this section. This also emphasises the link between roles and responsibilities and devolved and responsive decision making as they are discussed in the high reliability organisation literature.

The role switching mechanism shown in Table 3.9 is the one most relevant to the roles and responsibilities indicator of organisational resilience. It suggests that high

reliability organisations (HRO's) do not only focus on predefined roles during a crisis. Instead they review the situation and assign roles based on what the organisation needs to do to respond (Bigley & Roberts, 2001). An example of this would be a technician who is tasked with monitoring safety during an accident at an oil refinery when an electronic system is normally used. In this situation of technician is required to take the place of a mechanical sensor to increase the quality of feedback about the *health* of the system. In addition roles can be deactivated if they are no longer needed (Bigley & Roberts, 2001). An example of this would be if the technician was reassigned to a new role because the safety monitoring system had been checked and either found to be working properly or fixed.

In the context of this thesis, the fact that HRO's do not focus on predefined roles does not make defining them unnecessary (La Porte, 1996). However it does support the idea that resilient organisations need to understand how their roles might change during an emergency and what these changes could mean.

The definition of roles and responsibilities adopted for this research is shown in Box 5.

Box 5: Definition of Roles and Responsibilities

Roles and responsibilities are clearly defined and people are aware of how these would change in a crisis or emergency, the impact of this change, and what support functions it would require.

SA₂ – Understanding and Analysis of Hazards and Consequences

McManus (2007) emphasises the importance of organisations' understanding of a range of potential hazards, what impact they might have, and how they might be managed. Through her case studies McManus (2007) notes that less resilient organisations were not aware of the full range of potential hazards and that planning in response to high profile risks, such as pandemics, was sometimes abandoned because organisations assumed that there was nothing they could do (McManus, 2007, p. 61). The more resilient organisations in her case study focused heavily on hazard specific planning relating to their past experience of crises, but still did not understand or plan for other hazards (McManus, 2007, p. 61).

Understanding and analysis of hazards and consequences involves the processes of anticipation (discussed in Sections 2.5) and sensemaking, and is a critical process in organisations creating and maintaining situation awareness. It not only requires organisations to make sense of disaster or crisis situations and uncertainty, but also to maintain an anticipatory awareness.

Weick et al. (2005, p. 409) define sensemaking as “...*the ongoing retrospective development of plausible images that rationalise what people are doing*”. This is how organisations interpret and assign meaning and value to information about their business environment. Beunza and Stark (2004) examine sensemaking in the context of organisational resilience in a Wall Street trading room after the September 11th terrorist attacks in 2001. They note how the attack on the two towers caused an “...*abrupt departure from the traders’ established mental schemata*” (Beunza & Stark, 2004, p. 9). In other words the attack was so much of a shock that the traders struggled to make sense of what had happened, and often commented that despite seeing the attack unfold, they still could not believe it was really happening. Beunza and Stark (2004) discuss how the traders used a website to start *making sense* of the situation by posting information and questions. They go on to argue that the organisation’s resumption of trading activities enabled it to return to a stable state.

The definition of understanding and analysis of hazards and consequences adopted in this research is shown in Box 6.

Box 6: Definition of Understanding and Analysis of Hazards and Consequences

An anticipatory all hazards awareness of any events or situations which may create short or long term uncertainty or reduced operability, and an understanding of the consequences of that uncertainty to the organisation, its resources and its partners.

SA₃ – Connectivity Awareness

McManus (2007) discusses connectivity awareness as an awareness of the impacts and speed of impact of crisis on the organisation and its environment. This is related to the organisation’s position in a network of organisations under conditions of change and

uncertainty. It also involves understanding the coupling and complexity inherent in the organisation's network.

In the context of networks, McManus (2007, p. 6) argues that there is “...*the potential for small changes at one scale to become significant, even devastating, at another*”. She goes on to note how a broken link in the network can not only affect one organisation, but can also cause a ripple effect. This ripple effect could then have effects on a whole community, industry sector, economy, or geographic region. This demonstrates the potential consequences of an organisation's connectivity. It is therefore important that an organisation has an awareness of what events or situations could cause significant network disruption, how disruptions could escalate, and what signals could serve as early warnings of network disruptions.

For a resilient organisation connectivity could present opportunities in the form of potential to gain market share (Starr, et al., 2003b), but for less resilient organisations this can lead to decline and failure. Van der Vegt and Janssen (2003) identify four sources of interdependence in work group systems; role differentiation, the distribution of skills and resources, the manner in which goals are achieved, and the manner in which performance is rewarded and feedback is given. They go on to suggest that the structure of these interdependencies largely determines system performance. Other potential sources of interdependency include shared resources, geographical proximity, supply chain relationships and government regulation and legislation. Viewed as interdependencies these links can be seen as a negative characteristic for organisations, links that could create crisis if a high level of awareness is not maintained and relationships managed. However organisational networks are also a potential source of strength. When describing network resilience Ehrhardt et al. (2008) states,

“Once the transition to a highly connected network has taken place, the network is robust, surviving even a reversion to ‘unfavourable’ conditions”.

(Ehrhardt, et al., 2008, p. 2)

Ehrhardt (2008) also emphasises how the relationships between organisations can often change abruptly. As a result, it is important for organisations to maintain and continually refresh their awareness. Carroll (1998) further emphasises the importance of connectivity awareness when he argues that organisational knowledge is distributed among organisation members; no one individual has all of the necessary information and organisational knowledge is shared. The organisation must work as a cohesive system to develop and distribute awareness of its connectivity.

The definition of connectivity awareness adopted for this research is shown in Box 7.

Box 7: Definition of Connectivity Awareness

An awareness of the organisation's internal and external interdependencies and links, and an understanding of the potential scale and impact that crises or emergencies could have on those relationships.

SA₄ – Insurance Awareness

McManus (2007) emphasises the importance of an organisation's knowledge and awareness of their business disruption insurance as well as the realities of claiming on insurance following a large scale disaster. She goes on to suggest that the accuracy of the organisation's perception of their business disruption insurance is critical and, in the context of her case studies, she notes,

“In most organisations this knowledge only extended to an assumption that there was some level of coverage, but few knew any details...(they) 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”.

(McManus, 2007, p. 62)

Starr et al. (2003a) discuss insurance in the context of risk management where it is seen as a mitigation and preparedness measure, and note that the level of insurance cover is a critical question for organisations increasing their resilience. Webb et al. (2002) used

the purchase of earthquake insurance as an indicator of preparedness when discussing organisations in US cities. This is echoed by Chow (2000) when he claims that the purchase of insurance cover is a key success factor in information systems disaster recovery in Hong Kong. Hickman and Crandall (1997) move away from the mere purchase of insurance and argue that an awareness of insurance coverage is essential for crisis preparation.

The definition of insurance awareness adopted for this research is shown Box 8.

Box 8: Definition of Insurance Awareness

An awareness of insurance held by the organisation and an accurate understanding of the coverage that those insurance policies provide in a crisis or emergency situation.
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SA₅ – Recovery Priorities

The term recovery can mean different things to different people in different situations, for example repair, restoration and reconstruction (Alexander, 2002), or more sociological and cultural community recovery (Nigg, 1993).

Graham (2007) highlights the need for clear recovery priorities and objectives that can guide organisations in creating both short and long term strategies and decisions following disasters. He goes on to discuss the recovery of small businesses following the September 11th attacks and argues that short and long term objectives are different. Short term objectives are often pursued at the expense of long term strategies and Graham notes,

“Short-term solutions are typically enacted to minimise uncertainty, to create a back-to-business mentality that enables individuals to cope with the immediate uncertainty of working in a devastated zone...Yet, this clouds victims’ ability to consider the future”.

(Graham, 2007, p. 308)

Here Graham also describes how the *back-to-business* mentality can cloud victims' ability to consider the future and the changes that they may need to make to recover and avoid future crises. Further to this, Webb et al. (2002) argue that owners' perception of the broader business climate is the strongest predictor of long term organisational recovery.

Petterson (1999, p. 3) discusses community recovery and the value of pre-existing recovery plans defining them as,

"...steps that could be outlined ahead of time to ensure that community development and infrastructure is rebuilt to withstand similar future events or other hazards the community might face".

Clearly defined recovery priorities could include broad strategic visions and directions, or more specific targets related to stakeholders, economic measures, production, service delivery or competitiveness. They could also take into account the prioritisation of systems, technologies or locations and their contribution to the organisation's survival.

The definition of recovery priorities adopted for this research is shown in Box 9.

Box 9: Definition of Recovery Priorities

An organisation wide awareness of what the organisation's priorities would be following a crisis or emergency, clearly defined at the organisation level, as well as an understanding of the organisation's minimum operating requirements.

SA₆ – Internal and External Situation Monitoring and Reporting

The internal and external situation monitoring and reporting indicator was added to the adjusted model to encompass elements of monitoring, analysis and feedback loops that workshop participants felt were missing from McManus's (2007) Relative Overall Resilience (ROR) model. The majority of crisis management models acknowledge input or feedback from the organisation's environment. In Smith's (1990) model of crisis management, feedback loops, organisational learning and historical inputs are included as inputs to the organisation's crisis management. Pearson and Clair (1998) echo this

when they discuss the impact of the organisation's environmental context on its ability to anticipate and respond to crises.

Internal and external situation monitoring and reporting refers to the processes and mechanisms that organisations use to create and maintain situation awareness. This knowledge and understanding of the situation is developed through common displays, environments and communication (Masys, 2005), as well as decision support systems and previous experience (Endsley, et al., 2003).

Matheus et al. (2003) argue that situation analysis (the process of developing situation awareness, similar to situation monitoring and reporting) requires organisations to monitor the business environment using mechanical and human sensors, and then use their connectivity awareness to provide a context for the information to be interpreted. Hale et al. (2006, p. 290) argue "*Responding effectively to signals from audits is also a characteristic of a resilient organisation*". Here they emphasise how resilient organisations not only conduct audits of their performance (or *situation analysis*) but also respond effectively to the conclusions and recommendations of those audits. Many organisations however, neglect to actually address issues identified as critical during the crisis or post-crisis phase (Birkland, 2009). It is therefore important to monitor methods of achieving situation awareness and how well it is percolating and being shared across the organisation. Within organisations, this information sharing is achieved through reporting such as documentation, speech, memos, meetings or emails etc. One further important aspect of this feedback is whether the information being shared is actually being received and understood, this includes whether or not it is being assimilated into shared organisational situation awareness.

Senge (2006) notes that we are taught to break down problems to solve them and make them more manageable. However he argues that this is counterproductive because it oversimplifies our world view and means that we cannot appreciate or account for the complexity inherent in our environment. This is echoed by Weick and Sutcliffe (2007) who identify *reluctance to simplify* as a principle of high reliability organisations (HROs) arguing that "*...less simplification allows you to see more*" (Weick & Sutcliffe, 2007, p. 10). To address this Senge (2006) emphasises the value of *systems thinking*, one of his five disciplines of learning organisations. He argues that understanding

problems as part of a system provides a more complete view of the problem, its complexity and interdependencies. The development of a full world view or the ability to see the big picture, by assimilating (rather than simplifying) complex system feedback, enables organisations to develop situation awareness.

The definition of internal and external situation monitoring and reporting adopted for this research is shown in Box 10.

Box 10: Definition of Internal and External Situation Monitoring and Reporting

The creation, management and monitoring of human and mechanical sensors that continuously identify and characterise the organisation's internal and external environment, and the proactive reporting of this situation awareness throughout the organisation to identify weak signals of crisis or emergency.

SA₇ – Informed Decision Making

Decision making is addressed in the literature in different ways including levels of decentralisation, empowerment and trust (Mishra, 1996), and decision making as a paradigm applicable to complex organisational environments (Huber & McDaniel, 1986). In the context of crisis management, much of the literature discusses decision making as a potential source of error (Pearson & Clair, 1998; Smith, 2006). Smith (2006) discusses possible models of crisis management and argues,

“The scope of the decision making process within crisis situations is often narrowed by the urgent nature of events which require an expeditious resolution of the fundamental problem”.

(Smith, 2006, p. 150)

Here Smith highlights both the difficulty of decision making in crisis situations and the need to make decisions quickly despite this difficulty. The inclusion of informed decision making as an indicator of organisational resilience reflects that it is not sufficient for an organisation to be aware of a situation; they must also use that knowledge and incorporate it into their decision making. It is about feeding the information, knowledge and understanding (situation awareness) into the corporate

decision making machinery. Mallak (1998b) discusses the resilience of healthcare providers and notes, “*As workers become more empowered, more important decisions are made, often without immediate approval and under time pressure*” (Mallak, 1998b, p. 148). Smart and Vertinsky (1977) discuss the effect of group pathologies on crisis decision units and advocate varying membership to ensure that leaders are exposed to new points of view, discussing alternatives with others outside of the crisis decision unit, and inviting experts to comment on decisions and processes.

The definition of informed decision making adopted for this research is shown as Box 11.

Box 11: Definition of Informed Decision Making

The extent to which the organisation looks to its internal and external environment for information relevant to its organisational activities and uses that information to inform decisions at all levels of the organisation to prevent or better respond to crises or emergencies.

3.3.3 Management of Keystone Vulnerabilities

The term vulnerability has many different definitions and applications; social and cultural (Etkin, et al., 2004), infrastructure (Ezell, 2007), business (Chang & Falit-Baiamonte, 2003), IT networks (Martin, 2001), children (Engle, et al., 1996), and ecological systems (Adger, et al., 2005). When proposing the management of keystone vulnerabilities as a dimension of organisational resilience, McManus (2007) focuses on organisational vulnerability.

Turner (1978) made the first theoretical analysis of organisational vulnerability to technological disasters emphasising the role of organisational norms and values. Several authors have also utilised case study and survey research to identify organisational vulnerabilities which have contributed to organisational losses or failure during and after disasters. Kroll et al. (1990) identify organisational size as a vulnerability when they discuss how small businesses suffered more severe losses during and after the Loma Prieta earthquake. Durkin (1984) and Alesch and Holly (1998) identify pre-

disaster economic health as a vulnerability during and after the 1984 Coalinga earthquake and the 1994 Northridge earthquake. Alesch and Holly (1998) also identify the owners entrepreneurial skills, or lack of, and the effect of the disaster on demand for the organisation's products or services as vulnerabilities. Chang and Falit-Baiamonte (2003) review research conducted at the University of Delaware Disaster Research Center using large scale survey research and highlight a number of vulnerabilities observed during and after floods, hurricanes and earthquakes. These vulnerabilities include disruption to infrastructure, difficulties with supplies and shipments, drops in demand, and pre-disaster economic health (Chang & Falit-Baiamonte, 2003, p. 60).

During the indicators workshop, participants questioned what criteria would characterise vulnerabilities as *keystone vulnerabilities*. McManus (2007) discusses this and notes other uses of the term keystone: ecological and architectural. She goes on to define keystone vulnerabilities as,

"...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".

(McManus, 2007, p. 14)

This is also addressed within the field of business continuity management (BCM) where organisations aim to identify and assess potential single points of failure, such as a single source suppliers or resources, through business impact analyses (BSI, 2006).

The definition of management of keystone vulnerabilities adopted for this research is shown in Box 12.

Box 12: Definition of Management of Keystone Vulnerabilities

<p>The identification, proactive management, and treatment of vulnerabilities that if realised, would threaten the organisation's ability to survive.</p>

The seven indicators of management of keystone vulnerabilities proposed in this thesis are shown below. Indicators KV₁ to KV₅ are McManus's (2007) indicators of management of keystone vulnerabilities within with her Relative Overall Resilience (ROR) model, and indicators KV₆ and KV₇ have been added as part of the updated model.

- KV₁ – Planning Strategies
- KV₂ – Participation in Exercises
- KV₃ – Capability and Capacity of Internal Resources
- KV₄ – Capability and Capacity of External Resources
- KV₅ – Organisational Connectivity
- KV₆ – Robust Processes for Identifying and Analysing Vulnerabilities
- KV₇ – Staff Engagement and Involvement

KV₁ – Planning Strategies

McManus (2007) discusses planning strategies as the collective term for business continuity, risk and emergency management, and planning programs. In addition to public sector planning, Alexander (2005, p. 158) argues “...*many commercial and industrial companies have recognised that they need to prepare business continuity or crisis control plans*”. Spillan and Hough (2003) emphasise the importance of planning and argue that every organisation should have a plan. Continuing they note that, “*With an effective plan, business may even be able to turn adversity into advantage*” (Spillan & Hough, 2003, p. 399). Penrose (2000) supports this and suggests prior planning as the characteristic that differentiates between organisations that survive crisis and organisations that are able to take advantage of opportunities.

Approaches to planning vary, however there are four broad planning strategies applicable to organisations; business continuity management (Cerullo & Cerullo, 2004), emergency planning or management (Williams, et al., 2000), crisis management (Fowler, et al., 2007) and risk management (Starr, et al., 2003a).

Laye and Torre-Enciso (2001) discuss strategies to reduce the impact of disasters on businesses and identify business continuity planning and management as the primary

approach. Business continuity management (BCM) has evolved from an IT based discipline in the 1970s to focus on managing disruption to business processes and assets. The UK Business Continuity Institute (BCI, 2006) defines business continuity management (BCM) as a,

“Holistic management process that identifies potential threats to an organisation and the impacts to business operations that those threats, if realized, might cause, and which provides a framework for building organisational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities”.

This definition presents BCM as a management process aimed at building organisational resilience through managing and responding to disruption-related risks. Castillo (2004) also argues that while planning documents are useful they do not address the fundamental issue – staying in business. This is reflected by Clarke (1999) who argues that planning documents themselves can be *fantasy documents* and are often more symbolic as a sign of managements’ good intentions, than functional, effective and realistic as a sign of managements’ capabilities.

Emergency planning or management (EM) is generally performed by government organisations or units (Doyle, 1996). Often this involves the publication of a national strategy such as the ‘Resilient New Zealand National Civil Defence Emergency Management Strategy 2003-2006’ (MCDEM, 2004), laws such as the UK ‘Civil Contingencies Act’ (Civil Contingencies Secretariat, 2004), and guidelines such as the UK Resilience ‘Emergency Response and Recovery’ (Civil Contingencies Secretariat, 2010).

The New Zealand Ministry of Civil Defence and Emergency Management defines emergency management as,

“...the application of knowledge, measures, and practices that—
(i) are necessary or desirable for the safety of the public or property;
and

- (ii) *are designed to guard against, prevent, reduce, or overcome any hazard or harm or loss that may be associated with any emergency; and*
- (b) *includes, without limitation, the planning, organisation, co-ordination, and implementation of those measures, knowledge and practices”.*

(MCDEM, 2006, p. 216)

This definition focuses on emergency management as concerned with public safety, property, and reducing and responding to hazards. Alexander (2002) argues that the main scope of emergency management is the protection and safety of disaster victims and that protecting the public, physical structures and infrastructure are secondary. This does not necessarily mean that public protection is not important, but reflects the origins of the profession within the emergency services and government organisations.

Crisis management focuses primarily on the response to, and management of, man-made events or situations that are caused by, or affect organisations (Mitroff, 2001). A particular focus within crisis management is communicating with stakeholders, the public and the media during and after a crisis, and crisis leadership (Blythe, 2010). One reason that crisis communications and leadership receive so much attention is that crises are preventable, unlike natural disasters they did not have to happen, and so stakeholders, the public and the media are much less forgiving of organisations who fail to manage crises effectively (Mitroff, 2001). Boin and McConnell (2007) note that crisis management is a top down response characterised by centralisation which aims to enable rapid decision making, allocation of resources and control.

Smallman (1996) discusses risk management and describes *two poles of opinion*; reactive and proactive. He goes on to argue that reactive risk management “...relies on institutions setting predetermined risk tolerances and to converting these goals into quantified decision rules” (Smallman, 1996, p. 14). Within this reactive approach an organisation decides the level of risk that it is willing to accept, and then applies that as decision criteria when deciding whether to invest in a project, which risks to address, calculating the probability of making a profit etc. He goes on to argue that this approach

is narrow and reactive because the organisation is responding to *immediate* threats as indicated by their current model.

Smallman (1996) discusses proactive risk management and argues that this is more holistic and is based on formal risk assessments where as many risks as possible are assessed and then prioritised according to the most immediate. The difference between the reactive and the proactive is that the reactive approach relies on models based on statistics and past experience to differentiate between those risks that should be addressed and those that should not and it also only addresses risks that present a current threat. In contrast the proactive approach relies on risk assessment based on the situation awareness of the assessor and it addresses risks with the potential to affect the organisation as well as current threats. Smallman (1996) goes on to note that organisations are increasingly following the more holistic proactive risk management approach.

Despite the importance of planning, and the different strategies available, McManus (2007) notes that very few of her case study organisations had completed planning, and any planning that had been done was more often focused on single high profile risks or events such as pandemics.

The definition of planning strategies adopted for this research is shown in Box 13.

Box 13: Definition of Planning Strategies

The identification and evaluation of organisational planning strategies designed to identify, assess and manage vulnerabilities in relation to the business environment and its stakeholders.

KV₂ – Participation in Exercises

Peterson and Perry (1999) note that exercises are a critical part of disaster planning and are advocated by the majority of industrialised nation governments. They go on to argue that exercises fall under the rubric of preparedness and define them as,

“...rehearsals or simulations of plans that would be instituted during a response phase to deal with a threat over which there is insufficient human knowledge and control to prevent”.

(Peterson & Perry, 1999, p. 243)

As they develop their discussion Peterson and Perry (1999) argue that exercises are one of the three components of preparedness, the other two being planning and training. In this context exercises serve several purposes; to test the procedures and equipment specified under a plan, to validate the plan (Peterson & Perry, 1999) to validate training and to practise carrying out the plan as required (Alexander, 2000).

There are several types of exercises and each has a different purpose and requires different levels of commitment and resources while providing different types of outcome. *Live* or *Functional exercises* involve participants on location who physically run through a scenario in real time as they would in an actual disaster. *Table top exercises* involve participants conducting the exercise within defined boundaries; they *pretend* to manage the scenario (sometimes phone calls are acted out with exercise coordinators playing the various roles required). *Call-out exercises* are usually smaller in nature and exercise only the contact initiation, or activation part of managing a crisis or emergency. One of the first actions designated in many emergency plans is to contact key members of staff, in a call-out exercise; participants make these calls to check the availability of key members and whether or not (if a crisis or emergency were to occur at that time) they would be able to respond. In addition, each of these exercises can be carried out by a single agency or can be multi-agency.

When discussing participation in exercises, McManus (2007) also explains the importance of identifying lessons during post-exercise debriefs and ensuring that they are incorporated into planning arrangements. In the context of her case study organisations McManus (2007) identified potential barriers to participation in exercises including the availability of staff, unwillingness to incur an impact on day-to-day operations, lack of confidence in the quality of plans, and false assumptions about the organisation's ability to rely on past experience.

The definition of participation in exercises adopted for this research is shown in Box 14.

Box 14: Definition of Participation in Exercises

The participation of organisational members in simulations or scenarios designed to enable the organisation to rehearse plans and arrangements that would be instituted during a response to an emergency or crisis.

KV₃ – Capability and Capacity of Internal Resources

Pearson and Clair (1998) review crisis management literature and argue that a lack of resources is one possible cause for organisational failure during crisis. When discussing the community response to the Manchester City Centre bombing in the UK in 1996, Williams et al. (2000, p. 295) note,

“...of central importance to the effective emergency management of a disaster is the quality and extent of a community’s management resource capacity, and the ability of a community to effectively harness, or mobilise, its resource capacity to maximum effect”.

Here Williams et al. (2000) argue that the capability and capacity of a community to manage and mobilise its resources is key to an effective response. They go on to argue, *“Resource capacity is determined by a community’s physical, human and social capital”*. McManus (2007) expands on this when she describes an organisation’s internal resources within three categories; physical, human and process.

When discussing the physical resources of her case study organisations, McManus (2007) notes that very few organisations had organised alternative office space, and that many organisations had unrealistic expectations of their ability to operate remotely. She goes on to argue that organisations’ lack of understanding of the interdependencies and relationships between resources is also a major challenge. Further to this the organisations did not appreciate the human resource difficulties they would face during a response or potential difficulties when recruiting and retaining staff following an emergency or crisis. Other human resource issues highlighted by McManus (2007) include succession planning, lack of on-call staff, lack of formalisation of human

resource planning, and the effect of human resources on the ability to continue business-as-usual functions during a crisis.

McManus (2007) also discusses the *process resources* of an organisation. Here she refers to the procedures and processes that are standardised across the organisation, and notes that despite standardisation, not all organisations conformed to these processes. Many organisations developed their own version of processes that were imposed on them by parent organisations, and some neglected certain processes altogether. The emphasis here then is on flexible and well communicated systems and procedures that are understood by the entire organisation (McManus, 2007).

Woods (2004) reviews the Columbia space shuttle accident and argues that NASA received a number of warning signals which constituted a *drift towards failure*. These signals are described by Turner (1976) as the incubation of disaster. Woods (2004, p. 3) argues,

“The heart of the difficulty is that it is most critical to invest resources to follow up on potential safety risks when the organization is least able to afford the diversion of resources due to pressure for efficiency or throughput”.

The definition of capability and capacity of internal resources adopted for this research is shown in Box 15.

Box 15: Definition of Capability and Capacity of Internal Resources

The management and mobilisation of the organisation’s physical, human, and process resources to ensure its ability to effectively address the organisation’s operating environment as it changes before during and after a crisis or emergency.

KV₄ – Capability and Capacity of External Resources

Crises are characterised by disruption and uncertainty affecting the availability of existing organisational resources (Boin & Lagadec, 2000). In the case of the September 11th terrorist attacks, Kendra and Wachtendorf note how the emergency operations

centre (EOC) of the World Trade Center was destroyed during the attack. They go on to discuss the need for responders to *access external resources* from the city,

“...which substituted for redundancy of personnel, equipment and space... (and was one of) the factors that contributed to resilience following the attack”.

(Kendra & Wachtendorf, 2003b, p. 37).

Here Kendra and Wachtendorf (2003b) show how organisations’ internal resources can be disrupted during a crisis which requires the organisation to access external resources from outside of the organisation to enable their response. Mallak (1998a) supports this and identifies *ensure adequate external resources* as one of his resilience principles. He goes on to argue that access to external resources also influences organisations’ ability to perceive threats, develop potential responses to threats, and their ability to cope (Mallak, 1998a).

McManus (2007) discusses emergency service organisations e.g. police, fire and ambulance, noting that all of her case studies had expectations of the services that these organisations would provide. This was also indicative of the assumption that they would be able to access resources and services from other organisations during and after a disaster.

The definition of capability and capacity of external resources adopted for this research is shown in Box 16.

Box 16: Definition of Capability and Capacity of External Resources

Systems and protocols designed to manage and mobilise external resources as part of an interdependent network to ensure that the organisation has the ability to respond to crises and emergencies.

KV₅ – Organisational Connectivity

McManus (2007) discusses organisational connectivity as the strength of the relationships the organisation has with other organisations or groups that are critical to both its business-as-usual and crisis operations. She goes on to describe it as a clear understanding of the relationships between related organisations (McManus, 2007), not just in a business-as-usual context but also taking into account connections and links that may emerge during a crisis. However, this emergence and the existence of links with organisations that are not connected through business-as-usual arrangements, requires organisations to plan in advance.

Granatt and Paré-Chamontin (2006) discuss social networks and the importance, for organisations, of understanding networks. They argue, “...*the ability to map and to exploit the network is vital to resilience*” (Granatt & Paré-Chamontin, 2006, p. 54). They go on to describe the *structure* of a network with its network location (its place in wider society), its *hubness* (the number of points linking through it), and the *richness* and *reach* of its influence. Despite the importance of this understanding, Granatt and Paré-Chamontin (2006) argue that no one organisation has this awareness (described by McManus (2007) as Connectivity Awareness). Granatt and Paré-Chamontin (2006, p. 54) go on to discuss *superhubs*; “*A number of very closely coupled hubs*”. These superhubs are not necessarily connected by geographical proximity but “...*the effects on or produced by each component hub must be very similar and similarly dependent*” (Granatt & Paré-Chamontin, 2006, p. 54). Granatt and Paré-Chamontin reflect the ideas of emergence when they argue that superhubs may not even exist until a crisis. They state,

“Where great energy or change affects the network, superhubs’ resilience depends on the ability to remap the network continually, and/or to act pragmatically and rapidly to reconnoitre new pathways”.

(Granatt & Paré-Chamontin, 2006, p. 55)

Granatt and Paré-Chamontin highlight the difficulties of achieving this awareness on a large scale e.g. for an organisation wide crisis. In response they suggest *hubmasters*; expert observers and reporters at as many hubs as possible. Planning and arrangement of

these roles, dedicated to maintaining connectivity awareness, would increase organisational connectivity, but could also create silos.

The definition of organisational connectivity adopted for this research is shown in Box 17.

Box 17: Definition of Organisational Connectivity

The management of the organisation's network interdependencies and the continuous development of inter-organisational relationships to enable the organisation to operate successfully and to prevent or respond to crises and emergencies.

KV₆– Robust Processes for Identifying and Analysing Vulnerabilities

Robust processes for identifying and analysing vulnerabilities was identified as an indicator of management of keystone vulnerabilities through the indicators workshop. Participants discussed the importance of analysing keystone vulnerabilities, managing interdependence and systemic risks, and the identification of early warning signs and triggers of crisis.

Weick and Sutcliffe (2007) discuss high reliability organisations (HROs) and argue that their reliability stems from a preoccupation with failure which involves asking four questions; what needs to go right, what could go wrong, how could things go wrong, and what things have gone wrong? Weick and Sutcliffe (2007, p. 151) summarise this as “...actively searching for weak signals that the system is acting in unexpected ways”. One way of searching for these weak signals suggested by Weick and Sutcliffe is *Creating an Awareness of Vulnerability*. This involves reminding people that “...even though they think they understand their system and the ways in which it can fail, surprises are still possible” (Weick & Sutcliffe, 2007, p. 152).

Processes that organisations can use to identify and analyse vulnerabilities, such as risk management and business impact analysis, are well established. This is evident by the number of standards and guidelines available such as AS/NZ Risk Management standard 4360 (AS/NZ, 2004), ISO 31000 (ISO, 2009), the National Fire Protection Association's NFPA 1600 (NFPA, 2007), the American National Standards Institute

organisational resilience standard (ANSI, 2009) and the British 25999 Business Continuity Management standard (BSI, 2006). These are discussed in more detail in Section 2.4.2.1.

The definition of robust processes for identifying and analysing vulnerabilities adopted for this research is shown in Box 18.

Box 18: Definition of Robust Processes for Identifying and Analysing Vulnerabilities

Processes embedded in the operation of the organisation that identify and analyse the emerging and inherent vulnerabilities in its environment and enable it to effectively manage vulnerabilities to further the networks' resilience.

KV₇– Staff Engagement and Involvement

Staff engagement and involvement was identified by participants at the indicators workshop when participants discussed the importance of managing vulnerabilities across an organisation. Participants also discussed the importance of ownership and staff training for embedding resilience. These points are again emphasised by Carthey et al. (2001) when they provide a checklist for assessing institutional resilience in healthcare systems. In particular they include;

- *“Patient safety is recognised as being everyone’s responsibility, not just that of the risk management team.*
- *Meetings relating to patient safety are attended by staff from a wide variety of departments and levels within the institution.*
- *Policies are in place that encourage everyone to raise patient safety issues.*
- *The institution recognises the critical dependence of a safety management system on the trust of the workforce, particularly in regard to reporting systems”.*

(Adapted from Carthey, et al., 2001, p. 31)

Friedman (2005, p. 24) argues *“Both leaders and employees need to be involved in ensuring that organisations are flexible enough to sustain themselves”*. Here Friedman

suggests a link between the organisation's ability to be flexible and the involvement of staff. Mallak (1998b) discusses *front line* workers in healthcare organisations, and argues, "...*resilient behaviours help workers meet customer needs on the spot*" (Mallak, 1998b, p. 149). Mallak's recognition of the role that front line staff play in crises, also leads to the conclusion that they have a critical role to play in the management of vulnerabilities. In a separate conference paper Mallak (1999) proposes a model of organisational resilience comprising of six components; vision, values, elasticity, empowerment, coping and connections. When discussing empowerment Mallak (1999, p. 5) argues,

"The resilient organisation provides employment having meaning for the individual, tapping their competencies, building self-determination, and having detectable positive impact on operations. Empowered employees exercise bricolage and high levels of self-efficacy".

The definition of staff engagement and involvement adopted for this research is shown in Box 19.

Box 19: Definition of Staff Engagement and Involvement

The engagement and involvement of organisational staff so that they are responsible, accountable and occupied with developing the organisation's resilience through their work because they understand the links between the organisation's resilience and its long term success.

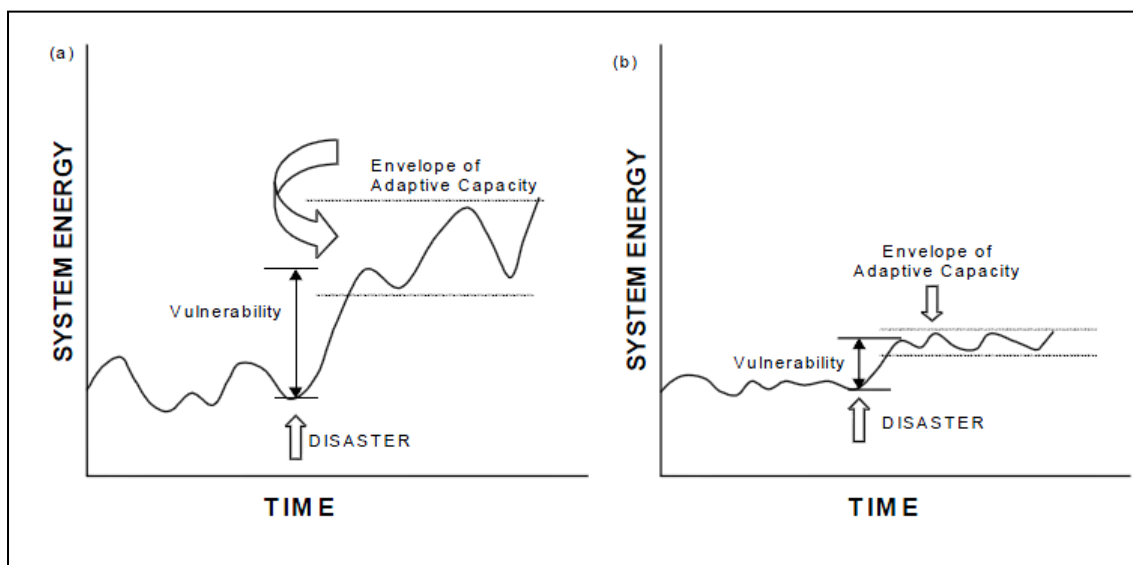
3.3.4 Adaptive Capacity

Adaptive capacity is addressed in the literature through two approaches; socio-environmental, and organisational (McManus, 2007). An organisation's ability to adapt is at the heart of their ability to display resilient characteristics. Starr et al. (2003b, p. 3) discuss the importance of adaptation and note that the aim is to "...*create advantages over less adaptive competitors*". This suggests that adaptive capacity is also linked to competitiveness. Dalziell and McManus (2004, p. 6) define adaptive capacity as,

“...the ability of the system to respond to changes in its external environment, and to recover from damage to internal structures within the system that affect its ability to achieve its purpose”.

Dalziell and McManus (2004) go on to use the diagrams, shown as Figure 3.22, to demonstrate the difference between adaptive capacity and vulnerability, which they argue are often used interchangeably because of the inclusion of adaptation in definitions of vulnerability. In Figure 3.22 vulnerability is the amount of deviation from the organisation’s original state to the point at which it experiences significant change or impacts as a result of the disaster. Adaptive capacity then, is the *envelope* or space in which the organisation’s performance or management of the disaster fluctuates until it reaches an equilibrium.

Figure 3.22: The Distinctions between Adaptive Capacity and Vulnerability in a Disaster Context



(Dalziell & McManus, 2004, p. 7)

The definition of adaptive capacity adopted for this research is shown in Box 20.

Box 20: Definition of Adaptive Capacity

Strong leadership and a culture which enables clear communication, good working relationships, and a shared vision across the organisation. The organisation is innovative and creative and people are able to constantly and continuously act to match or exceed the needs of the organisation’s operating environment in anticipation of, or in response to change.

The seven proposed factors of management of keystone vulnerabilities are shown below. Indicators AC₁ to AC₅ are McManus's (2007) indicators of adaptive capacity within her Relative Overall Resilience (ROR) model, and indicators AC₆ and AC₇ have been added as part of the updated model.

- AC₁ – Minimisation of Silo Mentality
- AC₂ - Communications and Relationships
- AC₃ - Strategic Vision and Outcome Expectancy
- AC₄ - Information and Knowledge
- AC₅ - Leadership, Management and Governance Structures
- AC₆ - Innovation and Creativity
- AC₇ - Devolved and Responsive Decision Making

AC₁ Minimisation of Silo Mentality

Silo mentality is a social phenomenon that can affect individuals, communities, business units, teams or functions within any group or organisation. It can be created by geographical proximity, by being spatially far away from something or someone, but it can also occur between people or groups that share the same office space. It is also true that the presence of interest communities, groups that convene purely because they share a common goal, interest or need, may also experience silo mentality (McCormack, 1999).

Fenwick et al. (2009, p. 3) discuss the term silo mentality arguing that “...it is used to describe inwardly focused organisational units where external relationships are given insufficient attention”. McCormack (1999, p. 15) discusses silo mentality at a bank and focuses on how,

“Each division operated as a self-contained unit, hunkered deep in its own silo, with no regard for anything beyond the silo walls”.

Here McCormack is describing an organisation whose subcultures are misaligned (Fenwick, et al., 2009), with hierarchical communications (Goh, 2002), which are weakened by competing agendas and personalities (Stone, 2004). One example is the silo mentality experienced between employees of an organisation working in the same

building and apparently living similar lives. If their daily job does not require them to be in contact with each other they may not do it of their own accord; as a result, they may be unaware of each other's roles, work, activities and projects. This awareness is critical to creating an adaptive environment where weaknesses and threats are identified and strengths and opportunities used to enact resilient behaviour.

Silo mentality is intertwined, created by, and feeds into, organisational culture. Davis (2004, p. 15) describes this as, "...*the way we do things around here in our organisation*". Wisner discusses how an organisation with silo mentality will "...*look to their own...interests rather than that of the...(organisation) as a whole*" (Wisner, et al., 2004, p. 15). Stone (2004, p. 11) supports this when she argues,

"...silos create an environment in which the personal and departmental interests of ambitious managers may take precedence over the well-being of the organisation".

Schein (1996) discusses subcultures and suggests that there are typically three levels of subculture within organisations; operator, engineering and executive. Carroll (1998) argues that "*employees at different levels in the hierarchy can have different understandings...and as a result they may not communicate easily*". Powers (2004) discusses silo mentality as a culture that is opposite to a culture of communication. Although these subcultures may have a significant relationship to the production of silo mentality they are not evidence of silo mentality in themselves. Despite this the relationship between organisational subcultures and the production of silo mentality will have a significant bearing on organisational resilience. However it is also important to note that where silo mentality may exist in some parts of an organisation, it doesn't necessarily exist in all parts of the organisation.

Guelke (2005) discusses *organisational parochialism* and *turf* or *silo mentality*, and argues that silo mentality is a "...*significant barrier to preparedness and can hinder organisations at any level*" (Guelke, 2005, p. 748) . Large organisations tend to be distributed across wide geographic areas and may become fragmented and independent of their component parts. Stone (2004) discusses Karl Albrecht who suggested that "...*silos are symptomatic of organisational dysfunction*" (Stone, 2004, p. 11). Silo

mentality can affect organisations in many ways; silos create barriers within organisations. These barriers block strengths and opportunities such as communication, ideas, innovation, creativity and efficiency, and create weaknesses and threats such as isolation, lack of awareness, duplication, inefficiency and cost. With this in mind it is important to include a measurement of silo mentality when benchmarking organisational resilience.

The definition of silo mentality adopted for this research is shown in Box 21.

Box 21: Definition of Silo Mentality

Cultural and behavioural barriers which can be divisive within and between organisations which are most often manifested as communication barriers creating disjointed, disconnected and detrimental ways of working.

AC₂ Communications and Relationships

Smith (1990) provides an example of how communications are most often discussed in crisis management when he notes that during crises organisations often fail (or the crisis is escalated) because of their lack of effective communication with the public and the media. One example of the importance of crisis communications is the Valdez oil tanker spill. During this spill Exxon were late to communicate about the disaster and then employed a series of poor communications strategies including down-playing the scale and potential effects of the spill, blaming other organisations, and blaming individual members of Exxon staff (Williams & Treadaway, 1992). In addition to the environmental consequences, the Valdez spill had a number of long term effects including policy change and increased public pressure on oil companies.

McManus (2007) discusses communications and relationships within and between organisations as they contribute towards resilience and argues that,

“...there is a link between effective communications pathways, respectful relationship development and the ability to acquire, transfer and retain critical information in a crisis”.

(McManus, 2007, p. 70)

Here, McManus makes links between communications and relationships, information sharing and situation awareness. She goes on to discuss communications and relationships as she observed them in her case study organisations, arguing that organisations often failed to realise the full potential impact of poor relationships in a crisis. She also notes that internal communications were often viewed as problematic by staff, but successful by management (McManus, 2007).

Gittell et al. (2006) emphasise the importance of employee relationships during a crisis to maintain commitment and productivity. In the context of the airline industry in response to the September 11th terrorist attacks, they go on to argue that positive employee relationships contribute to organisational success during business-as-usual, as well as crisis situations. Starr et al. (2003b) also note the variety and complexities of networks involved in business and argue that communications and managing relationships is central to managing the inherent risks involved.

The definition of communications and relationships adopted for this research is shown in Box 22.

Box 22: Definition of Communications and Relationships

The proactive fostering of respectful relationships with stakeholders to create effective communications pathways which enable the organisation to operate successfully during business-as-usual and crisis or emergency situations.

AC₃ Strategic Vision and Outcome Expectancy

Organisational vision is addressed in the literature in three ways; vision as a common trait of the effective leader, how to define and write visions which inspire and motivate, and the role of vision in achieving organisational goals (Testa, 1999). Larwood et al. (1995) note the difficulty in defining vision which is a construct and a strategic process intended to cope with uncertainty. McManus (2007, p. 71) argues that organisational vision has three critical aspects; how well articulated and communicated it is, how well day-to-day operations represent the vision, and whether or not the vision provides useful direction when engaging in the response to an emergency or crisis.

A well articulated vision is one that is clear and concise, which can be understood by all staff and which can be easily communicated. Valle (1999) argues that public organisations are subject to continuous crises and need to restructure their culture to achieve a better fit with their environment. He advocates an *adaptive culture* and identifies characteristics of adaptive culture within an organisation. Some of these characteristics are relevant to organisational vision; these are shown in Table 3.10. Some of these characteristics are also similar to elements of mindfulness discussed by Weick and Sutcliffe (2007).

Table 3.10: Valle's (2009) Characteristics of an Adaptive Culture

Characteristic	Relevant Indicator of Organisational Resilience
Understand the design and use of forums. Forums allow organisational members the chance to discuss ideas and plans in an attempt to develop shared meanings. Many leaders underestimate the value of these informal discussion sessions.	<ul style="list-style-type: none"> • Information and Knowledge (AC₄)
Seize opportunities to provide interpretation and give direction in difficult and uncertain situations. This is your chance to change the interpretation of crises, threats and problems into challenging tasks for the organisation. It is at these times that visionary leadership is most in demand.	<ul style="list-style-type: none"> • Strategic Vision and Outcome Expectancy (AC₃)
Reveal and name real needs and real conditions. Make sense out of difficult problems by framing issues in terms that organisational members can understand.	<ul style="list-style-type: none"> • Understanding and Analysis of Hazards and Consequences (SA₂)
Help followers frame and reframe issues and strategies. Name and explain the “what” of the problems, but let the followers suggest the “how” part of solving problems.	<ul style="list-style-type: none"> • Creativity and Innovation (AC₆)
Offer compelling visions of the future. Give organisational members a scenario of how the problem will unfold and how it will eventually be solved.	<ul style="list-style-type: none"> • Strategic Vision and Outcome Expectancy (AC₃)
Champion new and improved ideas. Gather ideas from many sources. Foster an environment which values innovation and experimentation.	<ul style="list-style-type: none"> • Information and Knowledge (AC₄) • Creativity and Innovation (AC₆)
Detail actions and expected consequences. Explain what the consequences of the difficulties are and give the members a plan of action for solving those problems.	<ul style="list-style-type: none"> • Strategic Vision and Outcome Expectancy (AC₃) • Understanding and Analysis of Hazards and Consequences (SA₂) • Robust Processes for Identifying and Analysing Vulnerabilities (KV₆)

Weick (1993) and Horne and Orr (1998) emphasise the importance of shared vision to an effective crisis response. Kendra and Wachtendorf (2003b) support this and utilise Weick's (1993) *virtual role systems* resilience factor when they argue,

“Each person ‘mentally takes all roles’, so that even in situations of peril and disruption everyone is able to maintain a shared vision of risks, goals and possible actions”.

(Kendra & Wachtendorf, 2003b, p. 42)

In the context of organisational vision, McManus (2007) also discusses a fire fighting mentality which she observed in her case study organisations. The organisations' crisis response was reactive, with a narrow scope, and was characterised by a focus on short term operability without consideration of long term implications. McManus (2007, p. 72) goes on to note,

“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”.

The definition of organisational vision and outcome expectancy adopted for this research is shown in Box 23.

Box 23: Definition Organisational Vision and Outcome Expectancy

A clearly defined vision which is understood across and between organisations and empowers stakeholders to view the organisation's future positively.

AC₄ Information and Knowledge

McManus (2007) argues that information and knowledge is related to communications and relationships (the second adaptive capacity indicator) and roles and responsibilities (the second situation awareness indicator). Information and knowledge are also related to the minimisation of silo mentality because information and knowledge must be gathered and shared across silos. McManus (2007) goes on to argue that the critical

knowledge held by key members of staff, and the nature and format of information are key considerations within this indicator.

Smith (2005) notes how loss of key staff can erode an organisation's *corporate memory*, which can lead to the accumulation of unnoticed events and the incubation of disaster (Turner, 1976). Smith (2005) explains that the problem of eroding corporate memory has been linked with re-engineering and restructuring in organisations. Loss of an organisation's corporate memory can also affect whether they are able to retain and learn lessons from past crises. Carmeli and Schaubroeck (2008, p. 179) emphasise the importance of,

“...learning from experience in smaller-scale failure (precrisis) situations, where participants can identify faulty assumptions and when necessary unlearn the behaviours deriving from these assumptions, instead incorporating more appropriate behaviour patterns that can make the organisation less vulnerable to future crises”.

Despite the importance of learning from disruptions and crises, many organisations rush into producing post-crisis debrief reports which purport to identify lessons learned (Birkland, 2009), but which in reality contain few real lessons and are more symbolic (Clarke, 1999). Mitroff (2005) discusses survey research which has focused on whether New York organisations have learnt anything since the September 11th attacks and argues,

“We are back where we started—seemingly not taking the lessons of this tragic event seriously. September 11th may have changed our national psyche, but it has not changed our long-term attitudes toward the importance of crisis management in the day-to-day course of business”.

(Mitroff, 2005, p. 376)

The nature and format of information is also important during a crisis. This involves the type of information required during a crisis, how it is stored, where is it stored, how it will be accessed, and how it will be shared (McManus, 2007). Tarn et al. (2008) discuss

man-made disasters such as the Challenger and Columbia space shuttles, Chernobyl, and the September 11th terrorist attacks and identifies evidence of a *common path to catastrophe*. They go on to argue, “*These functional failures resulted from the information gaps that eventually contribute to the development of a tragedy*” (Tarn, et al., 2008, p. 256). Comfort et al. (2001) identify considerations for information and knowledge including, quality, indexing, searching, flow, coordination, variety, dissemination, infrastructure, processing, timeliness, accuracy, access and validity.

Manoj and Baker (2007) discuss communication and information in the emergency response and identify three categories of communication challenges; technological, sociological and organisational. Table 3.11 shows each of these challenges and provides a description and example of each.

Table 3.11: Communication Challenges in the Emergency Response Identified by Manoj and Baker (2007)

Challenge	Description	Examples
Technological	Technological challenges where a lack of infrastructure or interoperability prevents responders from communicating and sharing information effectively	<ul style="list-style-type: none"> • Deployment of a communications system where there is little surviving infrastructure • Ensuring that different radio networks and technologies used by first responders are robust and compatible
Sociological	Design of communication and information sharing networks and processes which are secure and sensitive to the nature of information on victims of disaster and emergency operations	<ul style="list-style-type: none"> • Difficulty of communicating sensitive information relating to loss of life or injury • Security of communications given the sensitivity of personal and cultural information
Organisational	Ability to enable a shift from the hierarchical communication structures that characterise emergency responders during business-as-usual to the flatter more autonomous structures that emerge during a response, whilst also ensuring a process for sorting through the mass of information once it becomes available	<ul style="list-style-type: none"> • Use of collaborative technologies such as mobile applications to enable working across boundaries • Recording, indexing and storing information in a way that contributes to the situation awareness of responders

Dawes (2004) discusses the role of information in the response to the September 11th terrorist attacks and argues that the disruption of communications during the initial

stages of the response required many individuals and groups to act without information, coordination or higher leadership. He goes on to discuss the impact of organisational silos on information and argues that,

“Long-standing organizational and policy barriers to information sharing and coordination across organizational boundaries... manifest themselves in incompatible data that cannot effectively be shared even when the principals desperately want to share it”.

(Dawes, et al., 2004, p. 56)

Here Dawes is arguing that organisational silos stop organisations from sharing information across boundaries during business-as-usual and that this problem is only magnified during the emergency response.

The definition of information and knowledge adopted for this research is shown in Box 24.

Box 24: Definition of Information and Knowledge

The management and sharing of information and knowledge across and between organisations to ensure that those making decisions in crises or emergencies have as much useful information as possible.

AC₅ Leadership, Management and Governance Structures

McManus (2007) discusses leadership management and governance in terms of the structures that they utilise such as decision making, emergency communications systems, the visibility and availability of leadership, and the transparency and accountability of governance. Decision making has been incorporated into the informed decision making indicator (SA₇) and emergency communication systems have been incorporated into the information and knowledge indicator (AC₄). Visibility and availability of leadership, and the transparency and accountability of governance have not been addressed by other indicators.

There are many different types of leadership discussed in the management and crisis literature; transformational and transactional (Harland, et al., 2005), charismatic (Gardener & Avolio, 1998), strategic (Richardson, 1994) and ethical (Smith, et al., 2005). Leadership is often identified as a critical component of successful crisis management (Smith, et al., 2005). This is partly because crisis management is an executive or management level function which has a strategic focus, and partly because of the traditional command and control, homeland security and civil defence models employed in this area as a result of its military origins.

Hamel and Välikangas (2003) and Friedman (2005) agree that business strategies based on past success cannot provide successful crisis management or organisational resilience. Friedman (2005, p. 24) argues,

“...strategy and the information gained from retrospective research can no longer be regarded as relevant, because change is no longer incremental and predictable”.

This is also reflected by Quarantelli (1996) when he argues that past disaster, crisis, and emergency trends cannot be extrapolated to predict the future. Pariès (2006) discusses the role of leaders as facilitators of collective resilience. Westrum (2006) echoes this when he discusses NASA and the Columbia space shuttle accident, he argues,

“...they key point is the climate of operation...There are individuals who personally can serve as major bottlenecks to decision processes and groups who become agents of rapid or thoughtful action. It all depends on leadership, which shapes the climate and thus sets the priorities”.

(Westrum, 2006, p. 61)

Here Westrum argues that one possible cause of failure is a failure of leadership, a single person or unit who is able to influence, through culture and climate, the ability of other team members to be resilient. Westrum (2006) goes on to ask how the outcome of the Columbia mission might have been different if the Flight Director (a person much more preoccupied with safety) was in charge of assessing the shuttles airworthiness

rather than the Mission Management Team. Boin and McConnell (2007) argue that political and organisational leaders must try to avoid traditional leadership pathologies in a crisis. Instead they advocate “...a realistic understanding of the limited range of tasks that do make a difference” (Boin & McConnell, 2007, p. 55).

Dekker (2006, p. 86) discusses leadership and management in conjunction implying that it is the job of managers to provide leadership, but that leaders are not necessarily managers. Management is most commonly used within crisis management, business continuity and risk management paradigms which recognise that it is management who control resources and organisational activities. Smith (1990) discusses management as both a source of potential crisis generation and an organisational process which works to restore a state of equilibrium to the organisation and its stakeholders. As a source of crisis generation Smith (1990) presents a model of crisis management which includes three stages; a crisis of management, an operational crisis, and a crisis of legitimisation. This has been discussed previously in Section 2.2.

Groves (2005) discusses the links between leaders skills and follower attributes and various models that have been used to measure it. These include House’s (1977) theory of charismatic leadership, Shamir et al’s. (1993) self-concept based theory, Gardner and Avolio’s (1998) model, and Conger and Kanungo’s (1994) behavioural model. De Pree (1998, p. 130) argues that “*The signs of outstanding leadership appear primarily among the followers*”. Within this research then, items designed to measure leadership will be answered by all survey participants.

The definition of leadership, management and governance structures adopted for this research is shown in Box 25.

Box 25: Definition of Leadership, Management and Governance Structures

Inspirational organisational leadership which successfully balances the needs of internal and external stakeholders and business priorities, and which would be able to provide good management and decision making during times of crisis.

AC₆ Innovation and Creativity

Innovation and Creativity was not included in McManus's (2007) indicators of organisational resilience in her original ROR model. Creativity was identified through recent literature on the response to the September 11th terrorist attacks (Kendra & Wachtendorf, 2003a) and creativity in management decision making (Ford & Gioia, 2000). Innovation was identified through literature on continuous change (Brown & Eisenhardt, 1997), organisational agility (Plant & Murrell, 1997) and emergent behaviour during the crisis response (Quarantelli, 1995). Innovation and creativity was also suggested as an indicator during the workshop when participants felt that it was not sufficiently covered.

Kendra and Wachtendorf (2003a) discuss creativity in the response to the September 11th terrorist attacks and argue that it is a critical skill for disaster, emergency and crisis professionals. Through this they observe a number of elements that seemed to enhance, enable or accompany creativity in the emergency response. The first of these is emergence, which Kendra and Wachtendorf (2003a, p. 3) define as “...*the development of processes that did not exist before*”. Secondly, Kendra and Wachtendorf (2003a) discuss improvisation, arguing that it is post-crisis, emergent, and inherent in the definition of a disaster because disasters disrupt existing patterns making improvisation both necessary and inevitable. They go on to discuss evidence of improvisation in changing organisational structures, resources, and roles and responsibilities. Here creativity is differentiated from improvisation because it is important in both pre-disaster and post-disaster activities (Kendra & Wachtendorf, 2003a).

Guimaraes and Langley (1994) argue that company innovativeness is important for long-term growth and survival. This is supported in the context of resilience by Hamel and Välikangas (2003) who argue that an organisation's survival is dependent on the extent to which it has mastered three types of innovation; revolution, renewal and resilience.

The definition of innovation and creativity adopted for this research is shown in Box 26.

Box 26: Definition of Innovation and Creativity

An organisational system where innovation and creativity are consistently encouraged and rewarded, and where the generation and evaluation of new ideas is recognised as key to the organisation's performance during crises or emergencies.

AC₇ Devolved and Responsive Decision Making

Cho (1996) identifies three ways in which organisations use information; they use information to make sense of their operating environment, they generate new knowledge through organisational learning, and they search for and evaluate information to make important decisions. Cho (1996) argues that in theory, decisions are made rationally. Organisations collect all of the relevant information, assess their options and then select an option based on rational logical thought and comparison (Eisenhardt & Zbaracki, 1992).

One of the most well known models of decision making is Simon's (1957) model of bounded rationality. In this model Simon argues that the ideal of rational choice, while desirable, is rarely achievable. In response he proposes a model where decisions are made according to the boundaries of their specific context and limitations. These limitations could include the cognitive abilities and experience of the decision maker, a lack of information, pressure from stakeholders, conflicting values (e.g. production vs. safety) and time criticality. Therefore it is important that crisis decisions are made by those qualified to make them rather than those with the authority to make decisions as a result of their hierarchical position within the organisation. Weick and Sutcliffe (2007) refer to this as deference to expertise and include it in their research as an element of mindfulness within organisations. However, in reality it is important that both senior managers and front line experts are involved in making decisions which could have implications at operational, tactical and strategic levels.

Mallak (1998a) includes the *expansion of decision making* in his discussion of organisational resilience in health care organisations. The expansion of decision making refers to the delegation of authority to staff to make decisions relating to their work. This concept is very similar to *deference to expertise* as discussed by Weick and Sutcliffe (2007). Mallak (1998a, p. 11) notes that expansion of decision making is closely linked with ensuring adequate external resources, and argues that it is "*Often*

considered a critical element of empowerment... (and that it is) a key resilience concept”.

Smits and Ally (2003, p. 15) argue “*Crisis management calls for timely, often hurried...decision making*”. Here they emphasise how the characteristics of crisis situations can affect decision making. They continue,

“While decision speed in many types of business situations may be positively correlated with developing as many alternatives as possible and comparing them simultaneously...crisis situations require up-front work so that the development phase is greatly abbreviated”.

(Smits & Ally, 2003, p. 15)

Here Smits and Ally (2003) note how the speed, and responsiveness, of decision making during crisis situations can be improved by including decision making, e.g. structures, authority and delegations, in crisis planning. The definition of devolved and responsive decision making adopted for this research is shown in Box 27.

Box 27: Definition of Devolved and Responsive Decision Making

An organisational structure, formal or informal, which evolves during the response to an emergency or crisis, where people have the authority to make decisions directly linked to their work and where, when higher authority is required, this can be obtained quickly and without excessive bureaucracy.

3.4 Summary and Use of the Indicators

Section 3.3 provided a review of literature and a definition for each of the 23 indicators included in McManus’s (2007) model and the updated model of organisational resilience.

Each indicator is defined in an emergency or crisis context and these definitions will form the basis of the questions that are generated and presented in Chapter 5. These definitions are provided as a list in Appendix A7.

Chapter 4 – Thesis Methodology

This chapter discusses the methods used, the hypotheses that will be tested through this thesis, and the development of the scales, or measurement tool, to measure organisational resilience.

4.1 Methods

This section discusses the methods used to develop the resilience measurement tool including why they were chosen and their limitations. The application of each method is discussed in the relevant chapter or section as indicated.

4.1.1 Unit of Analysis

When measuring organisational resilience, the organisation is the primary unit of analysis. However to provide a useful measurement of organisational resilience, it is important that data collected represents the organisation, and not just one member of staff such as the CEO or emergency manager (except in the case of sole traders). Bryman and Bell (2007, p. 197) support this when they state,

“...it can also be argued that it is unwise to rely on a single respondent to know everything about the organisation...if the respondent is a senior manager they may also be inclined to represent organisational practises in a way that portrays their own role and responsibilities more favourably”.

In addition Rogelberg and Stanton (2007) suggest that involving a wide range of employees from across the organisation will foster commitment to the survey and encourage more individuals to take part.

The intention of this research was to collect a representative sample of data from each organisation, and then to aggregate their data to create the submission for the organisation. The simplest way to achieve this would be to set a threshold of

participation, for example 51% of staff from the organisation so that over half of the staff is represented. However there are no accepted rules about what threshold of participation should be used.

Hofstede (1990) investigates organisational subcultures across twenty business units within ten organisations and achieves a response of 87% within each unit. Within this sample, roughly one third was managers, one third was professionals and one third was non-professionals. Singer et al. (2003) measured safety climate in 15 California hospitals and also used a stratified sample within each hospital to ensure representation of senior executives, attending physicians and other staff. Miller (1993) investigated industry and country effects on managers' perception of environmental uncertainty and surveyed between 1 and 3 managers per organisation.

While a stratified sample might be desirable, the management of a stratified sample or a high participation threshold represents a considerable commitment of resources and could discourage organisations from taking part. Instead, invitations to take part in the research were sent to a senior manager from each organisation who was then asked to forward it to all staff within the organisation's Auckland location. The research team then asked the senior managers to encourage 'as many staff as possible' to take part. The assumption was that once the senior manager had agreed to take part, the invitation for staff to take part in the research (sent by the senior manager) would be more successful.

While for some organisations, this resulted in a very high response rate, for others, only one member of staff took part. Rather than discount these organisations from the research, it was decided to include them, with a caveat that their results, while important for the research, would not necessarily provide a wholly accurate measure of their resilience. If the tool were adopted as a leading indicator for organisations to monitor and evaluate their resilience over time, the minimum threshold of participation and the use of a stratified sample would need to be investigated; this is discussed in Chapter 9.

4.1.2 A Web-based Self-assessment Survey

Disaster research has traditionally been dominated by qualitative approaches (Bourque, et al., 2002). As an example of this, Coleman (2004) notes how crisis management literature has traditionally focused on case studies. These usually investigate large scale or well-known events such as the Columbia space shuttle disaster (Mason, 2004), particular response methods or tools such as incident management skills (Crichton, et al., 2005), or individual organisations such as business continuity at Boeing (Castillo, 2004). Bourque et al. (2002, p. 157) note,

“Disaster researchers’ reluctance to...use of well-designed, standardised population-based surveys reflects both realistic and unrealistic barriers to their use...the availability of new, technologically sophisticated methods for conducting surveys make many of these historical barriers obsolete”.

This is reflected by Stallings (2002) who argues that disaster researchers are increasingly looking towards survey research.

The resilience measurement tool for this thesis was created as two versions of a web-based self-assessment survey; a senior manager version and an all-staff version. The all-staff version contains the resilience measurement questions and the senior managers’ version contains the resilience measurement questions as well as an extra section of reflective organisational performance questions. This approach enables the researcher to compare senior manager and staff perceptions and knowledge, and to limit the length of the all-staff version to include only those questions that most staff would be able to answer.

Simsek and Veiga (2001) identify three benefits of web-based surveys; cost, data collection speed, and media richness. The resilience benchmarking tool is hosted by www.surveymonkey.com which was chosen because it provides a customisable format for web-based surveys, offers a variety of question and page formats, is inexpensive, and includes full technical support. A more detailed discussion of the survey and its format, including screen shots of features and questions is included in Chapter 5. Costs involved in the survey included the hosting of the web-based survey (NZ\$600 for three

years), production of the invitation and follow-up letters, and the completion of follow-up phone calls. The majority of these costs were funded by the Auckland Civil Defence Emergency Management (CDEM) Group. The speed of data collection can be discussed on two levels; individual and organisational. At the individual level Simsek and Veiga (2001) note a number of examples where using a web-based survey significantly reduced the response time, making the data collection process much faster. Table 4.12 shows the median time taken by individuals to complete the resilience measurement survey. In total the data collection took nine months, from March to November 2009. This was considerably longer than originally planned and was due to the difficulties of getting organisations to take part in the research; this is discussed in more detail in Sections 4.3 and 6.1.

Table 4.12: Time Taken to Complete the Survey

	Median Time	10 th Percentile	90 th Percentile
Individuals Completing the Senior Managers Version	24 minutes	16 minutes	1 hour 55 minutes
Individuals Completing the All Staff Version	20 minutes	11 minutes	55 minutes

Note: Times are rounded to the nearest minute. When taking the survey, some respondents minimised the screen while they were busy and came back to the survey at a later time.

Web-based surveys also return a richer set of data and have a higher capacity to process information. For the purposes of this study the coding was integrated into the design of the survey and data was downloaded into Excel spreadsheets. While some coding was still necessary, this significantly reduced the time that it would have taken.

Some sample organisations were unable to complete the web-based survey, because not all potential participants had access to computers at work e.g. garden centre staff. These organisations were invited to take part using a paper copy of the survey. This version contained exactly the same questions, in the same order as the web-based version and every effort was made to replicate colours and placement. In total 8 senior managers and 8 staff members used paper versions of the survey to take part in the study.

4.1.3 Semi-structured Interviews

Semi-structured interviews were used in this research to gather feedback from each of the pilot study participants about the survey. This formed part of the scale development process discussed in Chapter 5 however is discussed here as a methodology employed within the research. Bryman and Bell (2007, p. 474) define semi-structured interviews as when,

“The researcher has a list of questions on fairly specific topics to be covered...but the interviewee has a great deal of leeway in how to reply”.

The questions used for the semi-structured interviews are discussed in more detail in Chapter 5, however they broadly address:

- Ease of accessing the survey;
- survey introduction, instructions and ethics;
- content and face validity of the questions themselves;
- format and layout of the survey; and
- time taken to complete the survey.

The semi-structured interviews were either conducted in person through a face-to-face interview, or through a telephone interview. Notes were made and all participants were given the opportunity to review their transcripts.

4.1.4 Sampling

This research focuses on measuring the resilience of organisations in the Auckland region of New Zealand using a random sample. Auckland was chosen because it is the powerhouse of the New Zealand economy and is also New Zealand’s largest population centre. A map of the Auckland region can be found in Appendix B1.

Simsek and Veiga (2001) identify two main issues when discussing sampling error; representativeness and control. In the context of this research representativeness means

trying to identify a sample of organisations from the Auckland region which represents the characteristics of the region as a whole. In order to achieve a representative sample, the sampling frame must be unbiased and complete, however this is very difficult when surveying multiple organisations (Simsek & Veiga, 2001) as no complete list is available. The sampling frame used in this research is presented and discussed in Section 4.1.4.1.

Sampling control refers to control over a kind of fraud within the survey. It covers issues such as participants forwarding the survey links to people who should not be in the sample, or submitting more than one response to influence their results (Simsek & Veiga, 2001). It is unlikely that an individual from outside of the sample will respond to the survey without the researcher knowing, or respond more than once, because participants are asked to provide the name of their organisation and their job title, and each survey link has a unique identifying code which relates to a particular organisation.

4.1.4.1 Sampling Frame

The purpose of this section is to demonstrate and discuss the representativeness of the sampling frame of Auckland organisations for this thesis.

A sampling frame is the starting list from which a sample is drawn (Scheaffer, et al., 1995). Simsek and Veiga (2001) argue that sampling frames should be unbiased, however they also note that no such unbiased list exists for organisational populations. To address this they recommend that researchers use multiple data collection methods, e.g. postal surveys, email surveys, questionnaires on notice boards etc. In this research every effort was made to ensure that the list used was representative and web-based and paper-based surveys were used.

The sampling frame chosen for this research was the Veda Advantage organisational database which lists 31,285 organisations. Veda Advantage is a business directory service based in New Zealand that provides information on credit for organisations. All of the industry sectors used by Statistics New Zealand (2009) to classify organisations in their business statistics are represented within the sampling frame. Table 4.13 shows

the composition of the sampling frame before the random sample had been drawn. It shows the number of organisations in the sampling frame within each industry sector in comparison to the number of organisations in Auckland as a whole within each industry sector. Table 4.13 also shows the percentage of all Auckland organisations in each industry sector that are represented in the sampling frame.

Table 4.13: Composition of the Veda Advantage Database by Industry Sector

Industry Sector	Organisations in Sampling Frame	All Organisations in Auckland	Sampling Frame As a Percentage of All Auckland Organisations Per Industry
Accommodation and Food Services	900	5637	16%
Agriculture, Forestry and Fishing	345	4949	7%
Communication	345	2516	16%
Construction	1612	17282	9%
Education and Training	1278	2628	49%
Cultural and Recreation Services	873	3221	27%
Electricity, Gas, Water and Waste Service	95	317	30%
Financial and Insurance Services	1063	12961	8%
Government Administration and Defence	568	878	65%
Health and Community Services	2653	6523	41%
Manufacturing	5130	8153	63%
Mining	27	88	31%
Property and Business Services	3230	55310	6%
Personal and Other Services	1428	6811	21%
Retail Trade	6474	11739	55%
Transport, Postal and Warehousing	1815	5689	32%
Wholesale Trade	1640	9235	18%
Other Services	1809	7167	25%
Total	31285	161104	19%

Note: Data from the Statistics New Zealand website (Statistics New Zealand, 2009) was used to calculate the percentage of organisations represented in the Veda Advantage database within each industry sector.

In seven industry sectors shown in Table 4.13, less than 20% of all Auckland organisations in the sector are represented in the sampling frame. In eight industry

sectors, more than 30% of all Auckland organisations in the sector are represented in the sampling frame. Overall, the sampling frame represents 19% of Auckland organisations from all industry sectors.

4.1.4.2 Sample

Veda Advantage was asked to draw a random sample of 1000 organisations from the Auckland region from their database. The following data fields were provided for each organisation:

- Organisation name
- Street address
- Postal address
- Contact details for a senior decision maker (name and email)
- ANZSIC
- ANZSIC alpha description
- Organisation size (number of staff)
- How many sites or locations they have
- Whether or not the organisation was a head office or branch

Note: The ANZSIC (Australia New Zealand Standard Industrial Code) is used to label and define industry sectors.

Table 4.14 shows a composition of the random sample including the number of organisations per industry sector that were randomly selected, the total number of Auckland organisations within each industry sector, and the percentage of all Auckland organisations represented by the sample organisations within each industry sector. This shows that two industry sectors (Mining and Other services) were not represented in the random sample; these sectors will be omitted from future tables.

Table 4.14: The Composition of the Random Auckland Sample by Industry Sector

Industry Sector	Number of Organisations	All Organisations in Auckland	As a Percentage of All Auckland Organisations Per Industry
Accommodation and Food Services	20	5637	0.35%
Agriculture, Forestry and Fishing	7	4949	0.41%
Communication	9	2516	0.35%
Construction	32	17282	0.19%
Cultural and Recreation Services	12	3221	0.37%
Education	54	2628	2.05%
Electricity, Gas, Water and Waste Service	2	317	0.63%
Financial and Insurance Services	47	12961	0.36%
Government Administration and Defence	10	878	1.14%
Health and Community Services	10	6523	0.15%
Manufacturing	245	8153	3%
Mining	0	88	0%
Personal and Other Services	21	55310	0.04%
Property and Business Services	314	6811	4.6%
Retail Trade	66	11739	0.56%
Transport, Postal and Warehousing	41	5689	0.72%
Wholesale Trade	119	9235	1.29%
Other Services	0	7167	0%
Totals	1009	161104	

Table 4.15 shows the composition of the random sample that was drawn according to organisation size (number of employees). When reviewing the sample of 1000 organisations that had been randomly selected, it was found that large organisations (those with more than 700 employees) were unrepresented (the largest organisation in the random sample had 620 employees). As suggested by Jordan and Musson (1998) the random sample was stratified to provide a better representation of organisational size. Veda Advantage was asked to supply further details of organisations employing more than 700 staff. This matched 9 organisations employing more than 700 staff in the Veda Advantage database which was added to the random sample making the total sample 1009 organisations. These organisations are also included in Table 4.15.

Table 4.15: The Composition of the Random Auckland Sample by Organisation Size

Industry Sector	Organisation Size (Number of Staff)						
	Number of Organisations						
	1-5	6-9	10-19	20-49	50-99	100-699	700+
Accommodation and Food Services	4	1	8	5	1	1	0
Agriculture, Forestry and Fishing	2	1	3	1	0	0	0
Communication	1	1	0	3	0	4	0
Construction	4	7	11	4	3	3	0
Cultural and Recreation Services	1	1	1	3	3	2	1
Education	1	3	10	27	7	6	0
Electricity, Gas, Water and Waste Service	1	0	0	0	0	1	0
Financial and Insurance Services	24	3	7	6	3	1	3
Government Administration and Defence	1	2	2	2	2	1	0
Health and Community Services	5	0	2	2	0	1	0
Manufacturing	65	42	67	41	16	10	4
Personal and Other Services	10	6	0	5	0	0	0
Property and Business Services	151	44	53	47	6	12	1
Retail Trade	28	11	12	9	5	1	0
Transport, Postal and Warehousing	10	5	10	7	4	5	0
Wholesale Trade	31	14	32	21	12	9	0
Totals	339	141	218	183	62	57	9

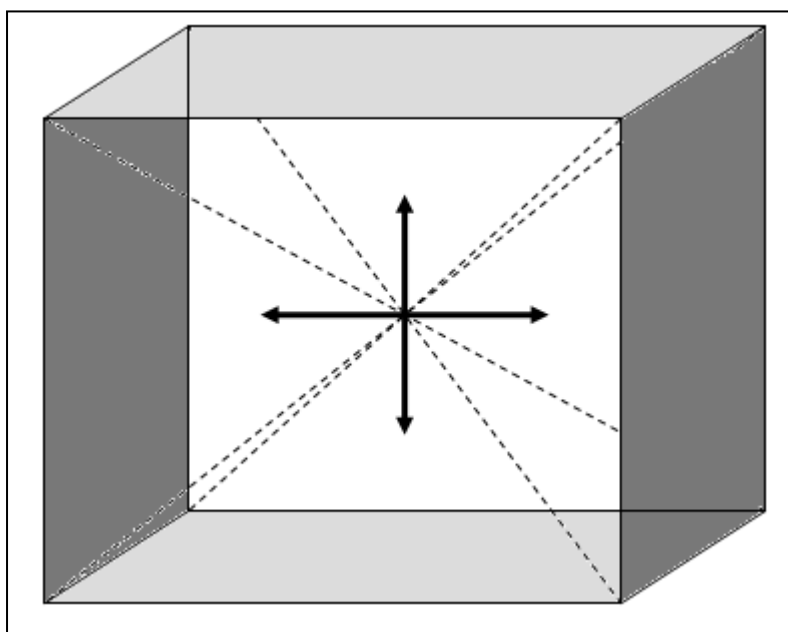
Note: The 9 larger organisations are also included in this table in the 700+ column.

4.1.5 Factor Analysis

This section discusses the factor analysis methods used in this thesis. At this stage it is helpful to define a few key terms which will be used throughout this discussion; item, factor, and rotation. Factor analysis is usually performed using raw data. In this thesis the raw data is comprised of each individual respondent's answer to each survey question. The term *item* is used to refer to a single question; as an example 73 questions, or items, were generated to measure the indicators of organisational resilience in this thesis. The hypothesised models of organisational resilience that are tested in this thesis discuss resilience as composed of a number of dimensions. In this section these

dimensions are referred to as *factors*. They are the groups of items which are identified during the factor analysis. One of the processes involved in factor analysis is *rotation*. Figure 4.23 shows the axis of a graph suspended in a space and free to move around its central point. The idea behind rotation is that there are an infinite number of possible combinations of items and factor structures (and therefore an infinite number of positions for the axes). The process of rotation rotates the axes around until the most efficient solution is found.

Figure 4.23: Factor Analysis Rotation



Now that key terms have been defined, the factor analysis methods used in this thesis can be described. Factor analysis is the process of identifying patterns in collections of correlations in order to identify and define variables and constructs. Factor analyses can be classified into two broad approaches; exploratory or confirmatory.

Exploratory factor analysis (EFA), also known as classical factor analysis, is concerned with the initial exploration and reduction of items following the collection of data (Hinkin, 1998). Hinkin (1998, p. 112) explains, “*This creates a more parsimonious representation of the original set of observations providing evidence of construct validity*”. Through EFA a researcher uses factor analysis to investigate trends within the data. They may start with a very broad data set in order to capture as much of the

construct as possible, but Hinkin (1998) suggests that by reducing the factor structure of a construct down to its simplest possible explanation, the validity of the construct is improved. Baird (1987, p. 323) discusses the advantages and disadvantages of EFA and argues that it “...takes only the matrix of test-score correlations as input...Thus, it proceeds in a virtual vacuum of substantive theory”. Despite the lack of theoretical input into the EFA process, theory is incorporated into the development of items and into decisions on whether to accept the factor structures.

In contrast, confirmatory factor analysis (CFA) “...allows researchers to stipulate in advance as many constraints, motivated by substantive theory, as desired” (Baird, 1987, p. 322). To do this researchers narrow their use of factor analysis to confirm or deny specific hypotheses about the composition of the factors and the relationships between them. CFA should not be used to test models using the same sample that was used during the development process. Hinkin (1995, p. 980) suggests that this is because of *common source error*; essentially a model developed using a set of data will most likely be confirmed by an analysis which uses exactly the same set of data. Therefore to properly test and confirm a model or measurement tool, a new sample should be used.

In this research CFA was used to test McManus’s (2007) model of organisational resilience consisting of three dimensions and fifteen indicators. This was possible because McManus’s model was developed using a sample of 10 case study organisations, and the organisations taking part in this research therefore provide a new data set which can be used for CFA without experiencing common source error. EFA, and specifically principal axis factor analysis, was then used to test the updated model proposed in this thesis.

The factor analyses were conducted using the statistics software package SPSS 17 to investigate the factor structure of the items developed to measure organisational resilience. This follows Hinkin (1998) who includes initial item reduction in his scale development process which is adopted by this thesis and is discussed in Chapter 5 and presented in Chapter 6.

It was outside the scope of this Ph.D. research to obtain another sample so that CFA could be used to re-test and confirm the results of the EFA that was used to test the

updated model. However a confirmatory study is discussed in Chapter 9 as the next stage of this research.

4.1.5.1 Principal Axis Factor Analysis

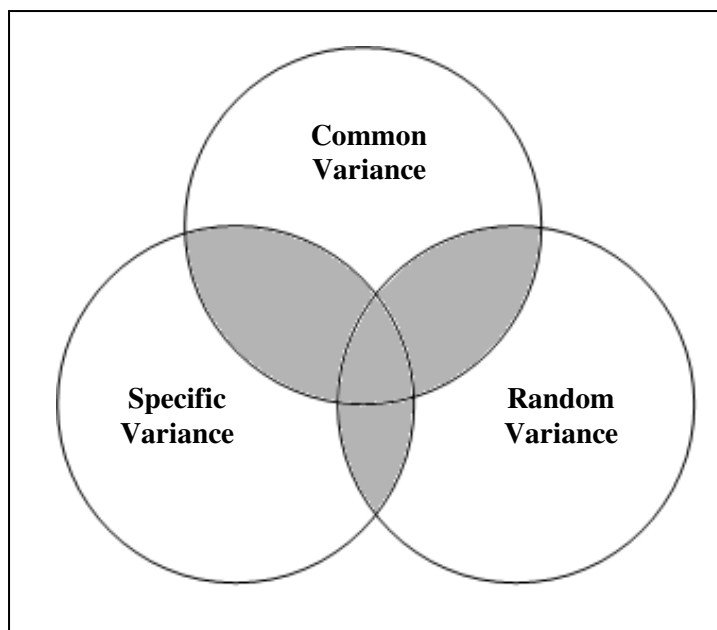
The two most common factor models that researchers use are principal components and principal axis. Principal axis factor analysis (PAF), with a varimax rotation was used in this research; its application is discussed in Chapter 6. Hinkin (1998) discusses scale development and argues,

“Because the principal-components method of analysis mixes common, specific, and random error variances, a common factoring method such as principal axis is recommended”.

(Hinkin, 1998, p. 112)

Here, Hinkin notes that principal components factor analysis does not differentiate between the types of variance, therefore when the data is analysed, some variance may be accounted for more than once. This is demonstrated in Figure 4.24 in which the three types of variance are grouped together (mixed) and the shaded areas represent variance which would be included in the factor analysis more than once. As a result, principal components factor analysis can produce unreliable estimates of variance. Ford et al. (1986) suggest that mixing common, specific and random error variance results in convenient factor structures as opposed to ones that identify theoretical or latent constructs.

In support of principal components factor analysis, Ford et al. also acknowledge that the principal components method does not assume that a factor structure exists within the data (Ford, et al., 1986). However the models tested through this thesis are based on qualitative case study research and literature review and assert that a factor structure is likely to be present.

Figure 4.24: Variance in Principal Components Factor Analysis

In contrast to principal components factor analysis, principal axis factor analysis does not mix types of variance. Instead it estimates the proportion of variance that is likely to be shared (or accounted for more than once) and then corrects the analysis as a result. This means that principal axis factor analysis is able to investigate the factor structure of data more reliably.

In factor analysis using SPSS, data is entered into the data editor, the researcher selects the appropriate criteria, and the factor analysis is performed. The results are presented as a series of tables which show the suggested factor structure. In exploratory factor analysis (EFA) this involves a degree of trial and error, as the researcher is required to ask SPSS to identify a certain number of factors. In this research, structures of 5, 4, 3 and 2 factors were investigated. There are two main methods for deciding whether to retain or drop items from the factor model; Kaiser's criterion and factor loadings. Kaiser's criterion retains items with Eigen values of 1 or more which indicates that the item explains a significant amount of the total variance (Pallant, 2007). In this research, this would have resulted in an overly complex model consisting of 18 factors or dimensions of organisational resilience, some of which were measured using very few items.

Instead, individual items achieving a loading of 0.4 or above on any factor were retained, and items loading below 0.4 (where they would not load on a factor) were dropped, as suggested by Hinkin (1998). A factor loading represents a correlation between the item and the factor that it loads on to. Hinkin (1998, p. 112) also argues, “*The researcher should have a strong theoretical justification for determining the number of factors to be retained*”. This relates to the concerns identified by Baird (1987) and discussed in Section 4.1.5 about the lack of theory incorporated into EFA. For these reasons, items identified with loadings lower than 0.4 in this research were examined through the literature before being ‘dropped’ from the factor model.

As part of the factor analysis, SPSS also rotates the factor solution to find the optimal factor structure. Ford et al. (1986, p. 295) discuss this and state, “*Factor rotation is used to improve the psychological meaningfulness, reliability, and reproducibility of factors*”. In this research, varimax rotation was used. This is a type of orthogonal rotation, which focuses on the statistical correlation between factors.

4.2 Hypotheses

This section presents the models and hypotheses that will be tested through this thesis; two proposed models of organisational resilience will be tested:

McManus’s (2007) ROR model of organisational resilience, comprised of three dimensions and fifteen indicators, will be tested. In Figure 4.25 and Figure 4.27 in Section 4.2.1 below, dimensions and indicators from this model will be shown as white. An updated model of organisational resilience comprised of four dimensions and twenty three indicators will also be tested. In Figure 4.25 and Figure 4.27 in Section 4.2.1 below, dimensions and indicators from this model will be shown as shaded grey.

If neither of these models is supported by the factor analysis, a new model of organisational resilience will be proposed which is grounded in the data.

4.2.1 Relative Overall Resilience

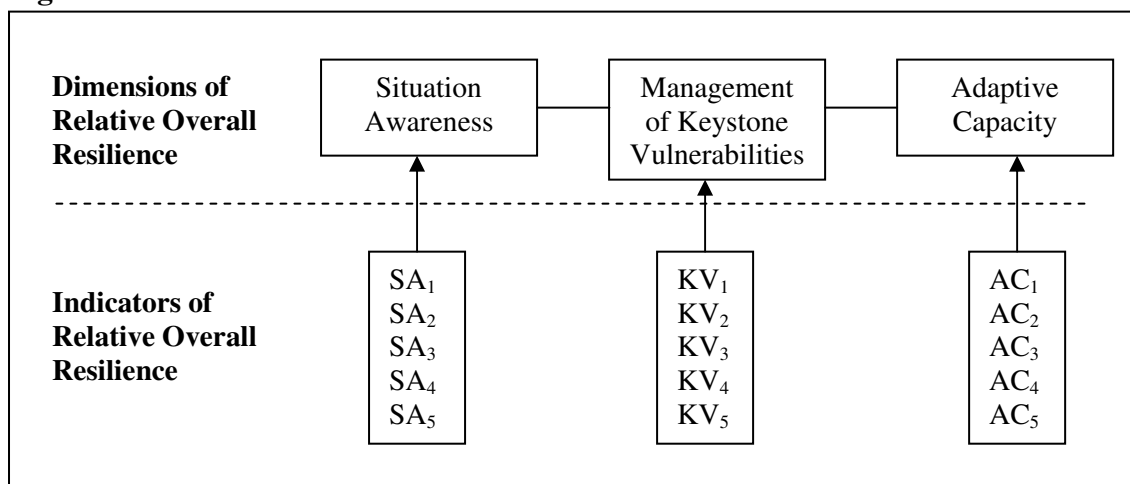
McManus (2007) proposes three dimensions and fifteen indicators of relative overall resilience (ROR); these can be seen in Table 4.16. She goes on to suggest that the dimensions and indicators relate together, as shown in the model of organisational resilience shown in Figure 4.25.

Table 4.16: McManus's Indicators and Dimensions of Organisational Resilience

Organisational Resilience Dimensions and Indicators					
Situation Awareness		Management of Keystone Vulnerabilities		Adaptive Capacity	
SA ₁	Roles & Responsibilities	KV ₁	Planning Strategies	AC ₁	Silo Mentality
SA ₂	Understanding & Analysis of Hazards & Consequences	KV ₂	Participation in Exercises	AC ₂	Communications & Relationships
SA ₃	Connectivity Awareness	KV ₃	Capability & Capacity of Internal Resources	AC ₃	Strategic Vision & Outcome Expectancy
SA ₄	Insurance Awareness	KV ₄	Capability & Capacity of External Resources	AC ₄	Information & Knowledge
SA ₅	Recovery Priorities	KV ₅	Organisational Connectivity	AC ₅	Leadership, Management & Governance Structures

(McManus, 2007, p. 18)

Figure 4.25: Relative Overall Resilience Model



McManus relates the dimensions and indicators of ROR using the equations shown in Figure 4.26. These equations are used as hypotheses for testing the ROR model; the

hypotheses formed are also shown as bullet points below, and relate to the research questions presented in Section 2.6.

Figure 4.26: Relative Overall Resilience Equation

Each of the three dimensions has five indicators:

$$\text{Collated Situation Awareness} = SA_{i_1} \times SA_{i_2} \times \dots \times SA_{i_5}$$

$$\text{Collated Keystone Vulnerabilities} = KV_{i_1} \times KV_{i_2} \times \dots \times KV_{i_5}$$

$$\text{Collated Adaptive Capacity} = AC_{i_1} \times AC_{i_2} \times \dots \times AC_{i_5}$$

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

Together the three dimensions represent ROR:

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

Situation Awareness = SA
 Management of Keystone Vulnerabilities = KV
 Adaptive Capacity = AC

(Adapted from McManus, 2007, p. 56)

- *Hypothesis 1:* Organisational resilience is a function of situation awareness, management of keystone vulnerabilities, and adaptive capacity.
- *Hypothesis 2:* Each of the dimensions of organisational resilience will comprise of the five indicators identified.

The equations in Figure 4.26 show that McManus (2007) intended the ROR model to be multiplicative. That is, she suggested that the indicators be multiplied to create composite scores for each dimension, and then that those be multiplied to create an overall ROR score. Although McManus does not comment on the reasons for this suggestion, it is most likely that she intended to preserve the distribution of each indicator and its impact on the overall outcome. Multiplying individual indicators which are being combined to create a composite score, avoids averages and means that the

researcher can look back through the model and see clearly how each indicator has contributed to the overall result. Further discussion of this approach and how it was changed in this study is included in the next section.

4.2.2 Adjusted Relative Overall Resilience

The Adjusted Relative Overall Resilience (AROR) model includes McManus's (2007) original dimensions and indicators as well as the additions identified through Chapter 3 as shown in Table 4.17.

Table 4.17: Dimensions and Indicators in the Updated Model of Organisational Resilience

Resilience Ethos					
RE ₁	Commitment to Resilience				
RE ₂	Network Perspective				
Organisational Resilience Factors					
Situation Awareness		Management of Keystone Vulnerabilities		Adaptive Capacity	
SA ₁	Roles & Responsibilities	KV ₁	Planning Strategies	AC ₁	Silo Mentality
SA ₂	Understanding & Analysis of Hazards & Consequences	KV ₂	Participation in Exercises	AC ₂	Communications & Relationships
SA ₃	Connectivity Awareness	KV ₃	Capability & Capacity of Internal Resources	AC ₃	Strategic Vision & Outcome Expectancy
SA ₄	Insurance Awareness	KV ₄	Capability & Capacity of External Resources	AC ₄	Information & Knowledge
SA ₅	Recovery Priorities	KV ₅	Organisational Connectivity	AC ₅	Leadership, Management & Governance Structures
SA ₆	Internal & External Situation Monitoring & Reporting	KV ₆	Robust Processes for Identifying & Analysing Vulnerabilities	AC ₆	Innovation & Creativity
SA ₇	Informed Decision Making	KV ₇	Staff Engagement & Involvement	AC ₇	Devolved & Responsive Decision Making

(Adapted from McManus, 2007, p. 18)

Figure 4.27 shows how the 23 indicators, which are labelled as RE₁ to AC₇, are related together. The equations related to this model are shown in Figure 4.28; the hypotheses

formed through this are also shown as bullet points below and relate to the research questions presented in Section 2.6.

Figure 4.27: Adjusted Relative Overall Resilience Model

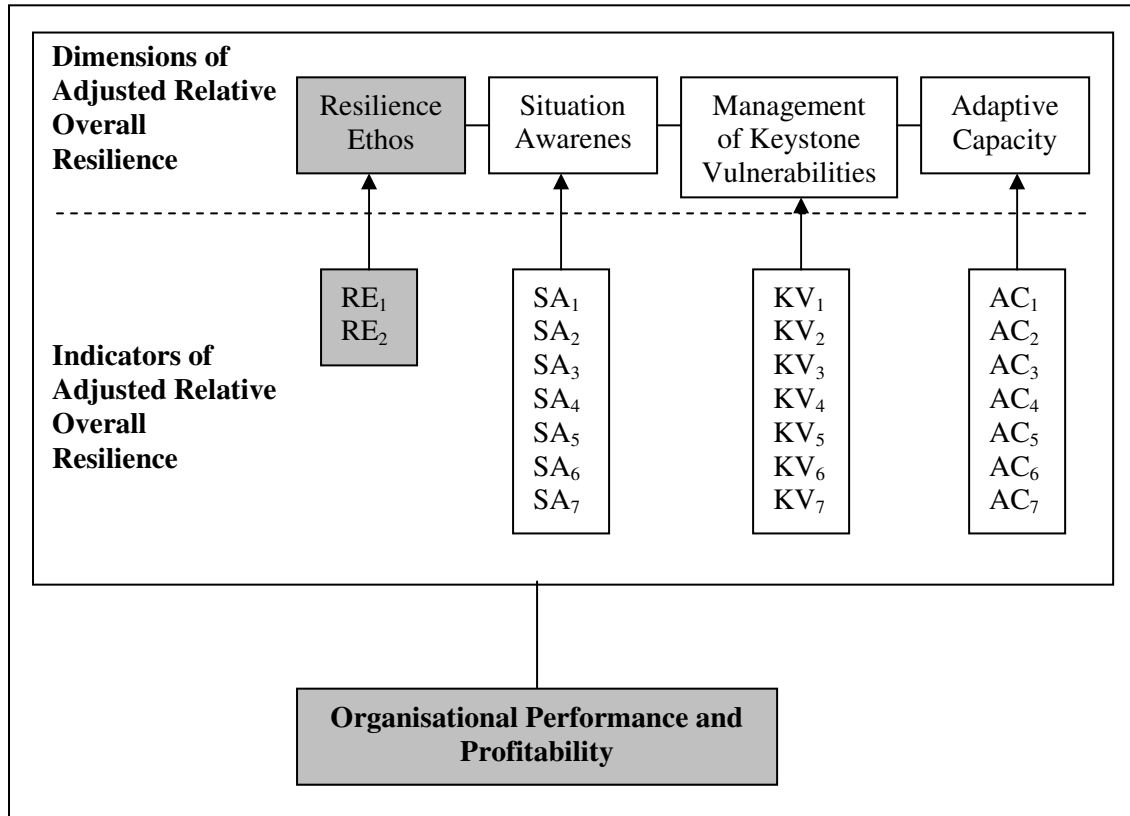


Figure 4.28: Adjusted Relative Overall Resilience Equation

The Resilience Ethos dimension has two indicators, and the Situation Awareness, Management of Keystone Vulnerability and Adaptive Capacity dimensions each have seven indicators:

$$\text{Collated Resilience Ethos} = (RE_{i_1} + RE_{i_2})/2$$

$$\text{Collated Situation Awareness} = (SA_{i_1} + SA_{i_2} + \dots + SA_{i_7})/7$$

$$\text{Collated Keystone Vulnerabilities} = (KV_{i_1} + KV_{i_2} + \dots + KV_{i_7})/7$$

$$\text{Collated Adaptive Capacity} = (AC_{i_1} + AC_{i_2} + \dots + AC_{i_7})/7$$

i = resilience indicator

RE = Resilience Ethos

SA = Situation Awareness

KV = Keystone Vulnerabilities

AC = Adaptive Capacity

Together the four dimensions represent AROR:

$$\text{Adjusted Relative Overall Resilience (AROR)} = (RE + SA + KV + AC)/4$$

- *Hypothesis 3:* Organisational resilience is a function of resilience ethos, situation awareness, management of keystone vulnerabilities, and adaptive capacity.
- *Hypothesis 4:* Each of the dimensions of organisational resilience will comprise of the indicators identified.

Hypothesis 3, which relates to the adjusted model of relative overall resilience (AROR), discusses organisational resilience as a function of the dimensions. McManus's (2007) original ROR model, as discussed in Section 4.2.1 is multiplicative. This means that the scores for each of the dimensions are multiplied to create the organisation's overall resilience score. In contrast, the AROR model is additive; the scores for each of the dimensions are added and averaged to create the organisation's overall resilience score. While McManus's research was qualitative, this thesis is quantitative, and as a result it is important to ensure that it does not imply significance to mathematical relationships without sufficient evidence. It is possible that the multiplication McManus suggests in her ROR model is correct, and for reasons discussed earlier in Section 4.2.2, in the long term development of the measurement tool, a multiplicative model would be preferable. However, this thesis has not been able to quantitatively investigate the relationships or any possible weighting between the indicators or dimensions of organisational resilience. This means that each of the indicators and dimensions must be treated as equal in all calculations. To achieve this, as shown in Figure 4.28, an additive model has been chosen, which clearly shows that each indicator and dimension is averaged and treated as equal in the development of resilience.

As discussed in Chapter 9, further research and specifically structural equation modelling, will enable investigation and identification of which indicators have the most influence. As a result of further study, weightings may be applied to the indicators to account for the influence they have over an organisation's resilience, and in that instance a move towards a multiplicative model is recommended. However in this thesis, it is important that all indicators and dimensions are calculated as having equal influence on organisations' resilience.

4.2.3 Additional Hypotheses

This section presents additional hypotheses, that are not specifically related to the above models, but that will be tested through this thesis. These hypotheses address existing questions within the literature, which can be addressed through the data gathered for this research.

Each hypothesis will be posed as a null hypothesis; a negative statement of the relationship between two variables, which the thesis will look to disprove or reject.

Organisational Size

Mitroff et al. (1989) discuss reasons and excuses that organisations use for their lack of crisis management planning, which they refer to as *faulty assumptions and beliefs*. According to Mitroff et al. (1989) some organisations argue that their large size will protect them from the effects of crisis. This could be attributed to a variety of reasons including; larger organisations have more resources which enables their response, larger organisations are more likely to have larger cash reserves, and larger organisations are more complex systems that require management of interdependencies and risks to remain competitive, and this has positive effects on their resilience. Fowler et al. (2007) assess perceived organisational preparedness using a 21-item scale and include a hypothesis which argues that organisations employing more staff will have a high perception of their preparedness. However, this hypothesis was only partially supported; they found that the relationship between organisation size (number of employees) and perceived preparedness was only significant with organisations that employ 500 or more employees. This indicates that smaller organisations are generally less prepared.

In contrast, Sheaffer and Mano-Negrin (2003, p. 583) identify several characteristics which they argue make large organisations more predisposed to crisis. These therefore support investigation into the link between organisation size and resilience and include:

- A tendency to constantly reorganise and restructure making the organisation more susceptible to resistance to change
- Negative connotations attached to risk-taking and openness which in turn discourage innovation and creativity

- An inherent complexity which inhibits information processing
- A high likelihood of illegal behaviour

- *Null Hypothesis 5*: Larger organisations will not achieve higher resilience scores.

The Value of Plans

Practitioners and academics vary in the value that they ascribe to emergency or crisis plans. Many authors emphasise the importance of developing plans (Fowler, et al., 2007). However many also argue that the value of plans is not in the documents themselves, but in the learning gained through the planning process (Crichton, et al., 2009). This is also evidenced by Dawes (2004) who notes how planning completed for the Y2K challenge helped organisations to recover their data following the September 11th attacks in 2001. The Business Continuity Institute (BCI) in the UK (2010, p. 4) note that, in their survey of business continuity practitioners, 25% said that their organisation was able to recover from a disruption more quickly as a result of their plan. In her study of disaster preparedness at Boeing, Castillo (2004) acknowledges the important role played by well developed plans in organisations' temporary relocation and long term recovery following the September 11th terrorist attacks. Discussing business continuity planning at the time of Hurricane Andrew in 1992, Cerullo and Cerullo (2004, p. 70) draw on FEMA data and note that of those organisations lacking a business continuity plan, 80% failed within 2 years of the storm.

In contrast to the positive view of plans, Clarke (1999) argues that plans are fantasy documents, and Boin and McConnell (2007, p. 53) argue that “...*they signal a state of preparedness that bears little relevance to the challenges that emerge with a crisis*”. Crichton et al. (2009) also suggest that despite developing plans, organisations should avoid overly rigid response arrangements because flexibility and adaptability are critical to the response.

- *Null Hypothesis 6*: Organisations that have a plan will not be more resilient.

Crisis Experience and Resilience

Carmeli and Schaubroeck (2008) argue that although crises can cause organisations to fail, they also present an opportunity for organisations to innovate, restructure and redefine their performance. Seeing experience of crises as a potential positive for organisations, they surveyed 106 executives to investigate whether an organisation's experience of crisis had a positive impact on their preparedness. Despite indications found within the literature, Carmeli and Schaubroeck's (2008) results show no significant relationship between crisis experience and organisational preparedness. Hurley-Hanson (2006, p. 489) investigated whether organisations had increased their crisis planning in response to the September 11th terrorist attacks. She found that, prior to the attacks, 53% of New York firms surveyed believed that their companies had identified available resources to meet the costs associated with the safety and security of their employees. After the attacks this percentage decreased to 30%.

In contrast when studying long term business recovery from the Loma Prieta earthquake and hurricane Andrew, Webb et al. (2002, p. 47) found that "*Previous disaster experience also appears to be associated with higher levels of preparedness among business*". Pearson and Mitroff (1993) develop a typology of crisis based on four quadrants which encompass technical/economic, and human/social crises along one axis and a continuum from normal to severe on the other. Using this typology as a basis, they found that organisations were better prepared for a crisis if they had previously experienced another crisis of the same type.

Given that these studies have focused on preparedness, the issue will be investigated again here in the context of resilience. Resilience is a much more chaotic, emergent and adaptive phenomenon than preparedness, and so might have a stronger relationship with situations that force organisations to confront their weaknesses and to rapidly adapt new behaviours.

- *Null Hypothesis 7: Organisations that have experienced a crisis and survived will not be more resilient.*

The Role of Exercises in Resilience

Alexander (2000) discusses the use of scenario methodologies, including emergency exercises, for teaching the principles of emergency management. He argues that exercises are useful for training emergency responders, testing students, and illustrating the limitations of current planning assumptions. T'Hart (1997) notes that exercises can enable organisations to test and validate plans, translate plans into organisational knowledge, and increase the range of responses available. However he also explains that exercise planners often fall into the trap of developing *perfect* exercises which do not adequately reflect the organisation's policy environment, provide a challenge and opportunity to learn, or align with the organisation's goals and needs. Borodzicz and van Haperen (2002) argue that in some crisis simulations, the facilitators and designers learn more than the players. They go on to suggest that players' learning is significantly increased if they are involved in the design and facilitation of the exercise.

The models being tested through this thesis already include an indicator which measures organisations' participation in exercises. However hypothesis 8, shown below, will test whether there is a direct correlation between participation in exercises and organisations' resilience as opposed to participation in exercises as part of the management of keystone vulnerabilities dimension of organisational resilience.

- *Null Hypothesis 8:* Organisations that achieve a higher score for the participation in exercises indicator will not achieve a higher resilience score.

Organisational Resilience and Organisational Performance

The assumption is that organisations who achieve high scores for indicators of profitability and organisational performance will also achieve high scores for organisational resilience. Mitroff et al. (1989, p. 280) make this link when they argue that crisis management skills,

"...are also the very same set of skills that are needed to gain a competitive advantage...those organisations which are not prepared to handle crises well are not prepared to perform well those activities which are now critical to success".

Starr et al. (2003b, p. 3) also make the link between competitive advantage and resilience arguing that resilient organisations can “...*create advantages over less adaptive competitors*”. Starr et al. (2003b) also go further and link earnings consistency and shareholder value to organisations’ ability to prepare and respond effectively to increasing levels and complexity of risk. Casey and Bartczak (1985) provide a link between resilience and business-as-usual success and suggest that cash flow and an organisation’s ability to withstand adverse changes in its operating environment are closely linked.

- *Null Hypothesis 9: Organisations achieving a high resilience score will not achieve a high score for indicators of organisational performance.*

4.3 Survey Administration and Approaching Organisations

Data collection through the web-based resilience measurement tool took nine months (March-November 2009). However this was not due to technical problems with the survey or the hosting service, but with the difficulty of getting sample organisations to take part. Rogelberg and Stanton (2007, p. 195) identify five ways in which non-response can affect survey research, it:

- Can cause smaller samples resulting in reduced statistical power;
- increase the size of confidence intervals;
- limit the types of statistical techniques that can be used;
- undermine the perceived credibility of the data; and
- undermine the generalisability of the data.

To address this, Simsek and Veiga (2000, p. 102) suggest ways in which non-response to electronic surveys can be reduced. Each of these suggestions were used in this research, they include:

- Check the e-mail address for accuracy – *researchers telephoned each organisation to check email addresses.*

- Check for temporary local and non-local system wide email problems – *where emails were not delivered researchers were able to direct organisations to add our email address to their accepted list to prevent emails being sent into SPAM boxes. No other email problems were found.*
- Use prior email notification – *introduction letters were sent.*
- Attempt to convince the respondent of the value of the research and his or her participation – *the introduction letters and the booklet that were sent to sample organisations included information on the value of the research and participation.*
- Ensure anonymity and confidentiality – *participation was anonymous and confidential and this was stated on the invitation letters and emails.*
- Increase credibility through sponsorship manipulation – *the Auckland Civil Defence Emergency Management Group helped to fund and promote the research.*
- Offer some incentives such as gifts or money to motivate – *participating organisations were offered a full results report.*
- Shorten the questionnaire when possible – *the survey was kept as short as possible during the development and participants automatically skipped questions that were not relevant to either them or their organisation.*
- Use an email follow-up – *all participating organisations were emailed at least twice during the follow-up.*

Sample organisations, discussed in Section 4.1.4.2, were approached and invited to take part in the research through a series of steps including two mail-outs and email invites and a series of follow-up phone calls. The first mail-out was sent on 16th March 2009 and included the initial invitation letter which can be seen in Appendix B2. The purpose of this was to provide organisations with advanced notice of the research so that when they later saw emails about the research they already had an awareness of the topic and an understanding of its value and how their participation would help. At the same time, the research team worked with the Auckland Region Civil Defence Emergency Management Group to produce a media release and a television interview was given. One week after the first mail-out, organisations were sent an email inviting them to take part in the research which included a link to the survey.

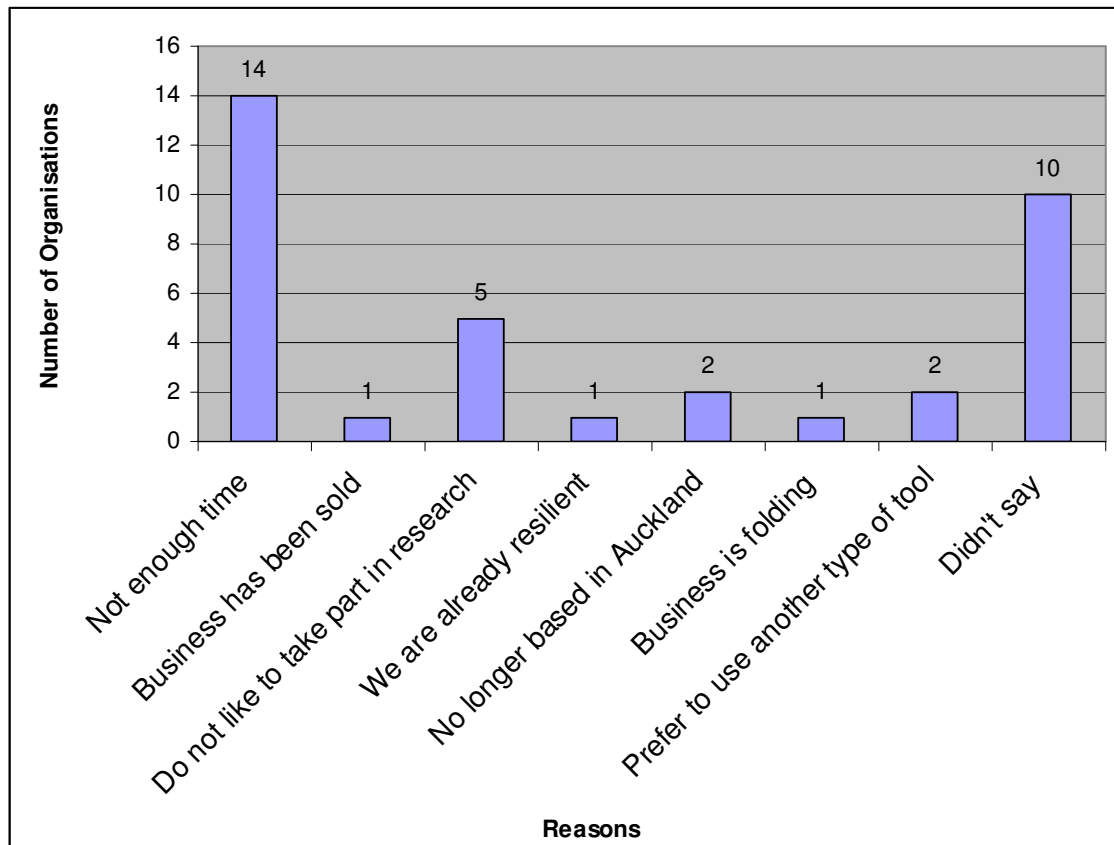
A review of progress was conducted on 30th March 2009 and at this time only 1 organisation from the random sample had decided to take part. To investigate this, the first round of follow-up phone calls was completed from 4th-15th April 2009. The follow-up phone calls were made by the researcher and a research assistant (Mrs. Hilary Sutton) using the script shown in Appendix B3. Researchers checked the accuracy of email addresses, in some cases staff had left the organisation and new email addresses were obtained. In total 106 organisations were contacted during this time; Table 4.18 shows the results. During these follow-up phone calls, 36 organisations that said they would not like to take part in the research and were asked why this was the case; the results of this are presented in Chart 1.

Table 4.18: Progress Approaching Organisations

Stage	Date	Organisation Decisions as a Result		
		Yes	No	More Information
1 st Mail-out	16 th March 2009	0	0	0
1 st Email Invite	23 rd March 2009	1	0	0
1 st Round Follow-up Phone Calls	4 th – 15 th April 2009	12	36	57
2 nd Mail-out	17 th April 2009	13	22	16
2 nd Email Invite	24 th April 2009	1	6	0
2 nd Round Follow-up Phone Calls	27 th April – 28 th October 2009	41	370	88
Total		68	434	161

Note: In addition to the 663 organisations that replied yes, no or asked for more information, a further 57 organisations were unreachable and 289 organisations did not respond to mail-outs, email invites or follow-up phone calls.

By 16th April 2009 individuals had taken the survey, but only 122 had fully completed it. However, this does not account for people that may have come back to take the survey again when they had more time. To address this, the instructions at the beginning of the survey were changed to tell participants that if they minimised their screen they could come back to the survey later in the day without losing their answers.

Chart 1: Reasons Given for Not Taking Part

A second mail-out was sent on 17th April 2009; this included the introduction letter (shown in Appendix B2) and a booklet which can be seen in Appendix B4. This booklet was developed using text from the survey and the introduction letter as well as feedback from the initial follow-up phone calls. One week after the 2nd mail-out, a second email invitation was also sent to organisations. A second round of follow-up phone calls started on 27th April 2009 and this continued until the end of data collection. As shown in Table 4.18, a total of 68 organisations took part in the research; a discussion of the response rate is included in Section 6.1.

Once an organisation had agreed to take part in the research they were sent an instruction email for both the senior manager and all-staff version of the survey (sole traders received the senior manager version only). This can be seen in Appendix B5.

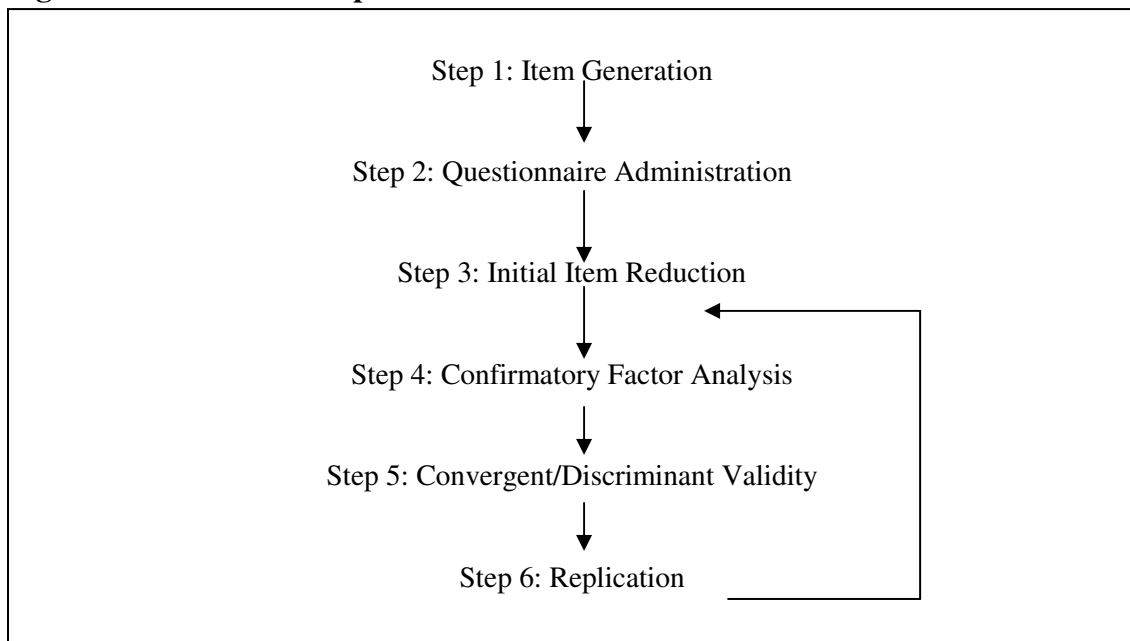
Chapter 5 - Scale Development

This chapter discusses the scale development process including the questions, or items, used to measure organisational resilience and the reflective items used to measure organisational performance in line with the hypothesised models presented in Chapter 4.

5.1 Scale Development Process

To measure resilience using a survey tool it was necessary to develop metrics or scales for measuring organisational resilience. Hinkin (1998) discusses a process for developing scales and provides the diagram shown in Figure 5.29. This thesis focuses on stages 1-3; it generates items to measure organisational resilience, administers the tool, and performs an initial item reduction to propose a suite of indicators to take forward into confirmatory research.

Figure 5.29: Scale Development Process

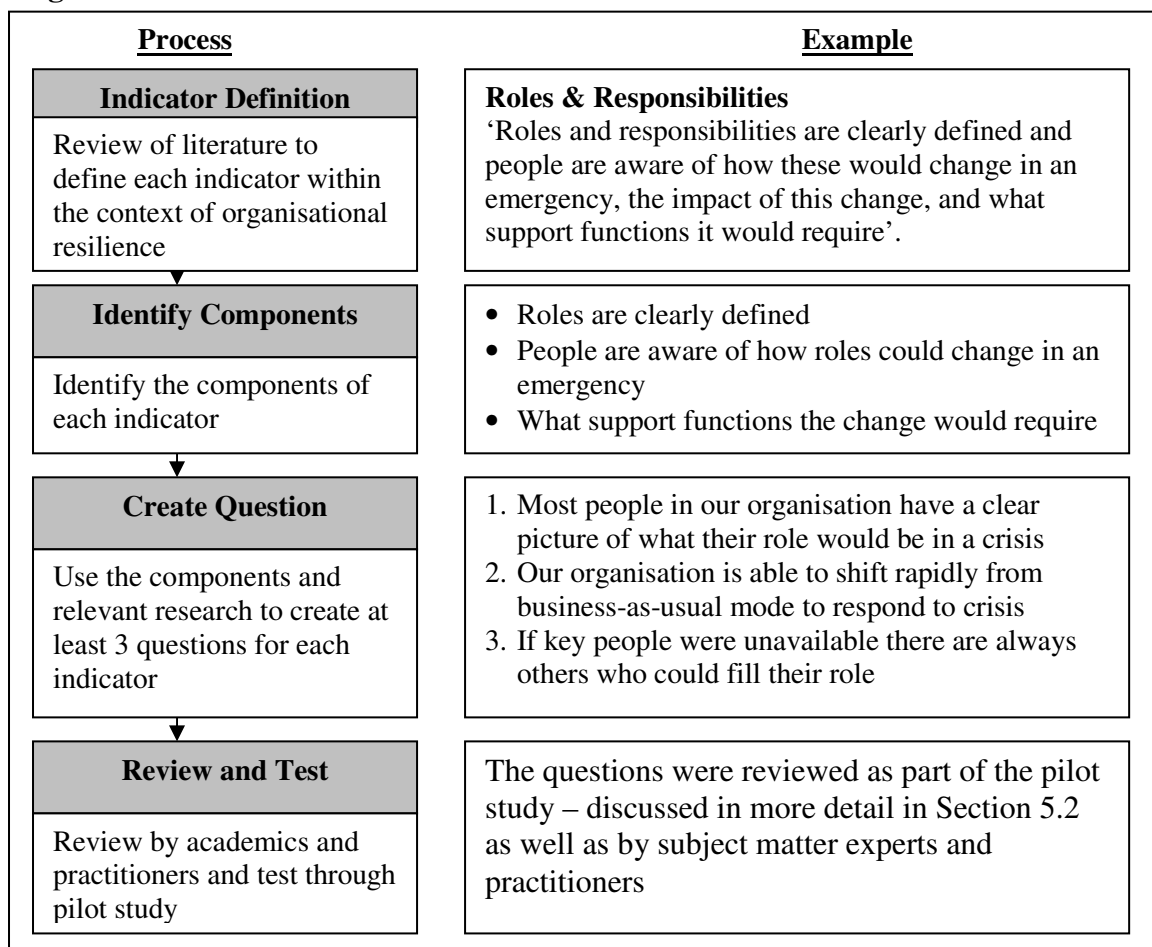


(Hinkin, 1998, p. 106)

5.1.1 Item Generation

The first stage of Hinkin's (1998) scale development process is item generation. This is the generation of the items, or questions, that will come together to form the resilience measurement tool. Hinkin identifies two methods of item generation; deductive and inductive. This research follows the deductive method which focuses on developing a theoretical foundation of the constructs based on a literature review (see Chapters 2 and 3). From this literature, each of the dimensions and indicators are defined and these definitions are used to develop individual items. Chapter 3 developed definitions for each of the proposed dimensions and indicators of organisational resilience; these can be seen in Appendix A7. Figure 5.30 provides an example of how the definition of an indicator was used to develop the items proposed to measure that indicator. The left side of the figure shows the process and the right side of the figure shows an example based on the roles and responsibilities indicator.

Figure 5.30: Process for Developing Questions to Measure the Indicators of Organisational Resilience



5.1.2 Item Development

This section discusses the generation of the original items that were included in the pilot study survey. The pilot study is discussed in Section 5.2 which also presents any changes or additions that were made to the survey items as a result of the pilot study before the survey was used in the Auckland study.

In total, 73 items were generated, using the process outlined in Figure 5.30, to measure the indicators of organisational resilience during the pilot study; 13 items were also developed to measure demographic and background information. The resilience measurement and demographic and background items can be seen in Appendix C1 which provides a copy of the survey used in the pilot study discussed in Section 5.2. The majority of items developed for the tool are Likert scales where participants are asked ‘To what extent do you agree or disagree with the following statements?’ Participants then rated the statements on a 5-point Likert Scale. Hinkin (1998, p. 110) reviews the use of Likert Scale questions and notes that they are most often used in survey research and that they are the most appropriate for research involving factor analysis. The 5 points were marked as shown in the example in Appendix C2 and a ‘Don’t know’ option was also included. Other question types that were used, as indicated in Appendix C1, include open questions and tick boxes.

5.1.3 Organisational Performance Items

As discussed in Section 4.2.3, hypothesis 8 proposes that organisations achieving a higher level of resilience will also score more highly on organisational performance items. This section presents that items that were used to measure organisational performance during the pilot study. Following the pilot study a number of organisational performance items were added to the tool; these are presented in Section 5.2.

Appiah and Abor (2009) focus on predicting corporate failure and suggest that there are significant limitations to using a single ratio to predict the health or risk of failure of an organisation; instead a combination of indicators should be used. Carton and Hofer

(2006, p. 29) review literature on measuring organisational performance in the context of entrepreneurship and strategic management and identify nine categories of performance measures. Many of these categories are duplicates and assess the same things; therefore five of the categories have been identified as relevant to this research. Table 5.19 shows the five categories identified by Carton and Hofer which have been measured as part of this research and the measures that were used within each category for the purposes of the pilot study. In total, 9 items used to measure organisational performance were included in the resilience measurement tool that was used in the pilot study; these can be seen in Appendix C1.

Table 5.19: Measures of Organisational Performance

Category	Measures Adopted
Profitability	Return on investment*
	Profit to sales ratio*
Growth	Sales growth rate*
Liquidity, leverage and cash flow	Income budget increase**
	Operating surplus**
Operational	Staff turnover
	Senior management turnover
Other	External directors on the organisation's Board
	Staff satisfaction

* *These questions were presented to for-profit organisations only.*

** *These questions were presented to not-for-profit organisations only.*

Profitability

Questions on organisations' profitability included in the tool focus on return on investment (ROI) and profit to sales ratio. ROI implies that investments in the organisation will result in a measurable benefit. An understanding of the relationship between investments in resilience and resilience ROI is critical for the business case for resilience. Herrmann (2007, p. 690) discusses ROI in the context of security investments and notes that, although ROI is most often described in financial terms, the return can take several forms such as "...increased operational efficiency, cost avoidance, cost savings, and loss prevention". Luthans et al. (2006) discuss interventions for increasing human psychological capital in organisations and demonstrate a relationship between increasing individual resilience and increased ROI. In this research participants were asked to provide their organisation's average ROI over the last 5 years. In their review of measures of organisational performance Carton and Hofer (2006) note that the majority of researchers focus on financial measures for

either 1 or 3 years. This was extended for this research to match the time horizon that was expressed in relation to organisations' crisis experience where we asked participants whether their organisation had experienced a crisis in the last 5 years.

Sundström and Hollnagel (2006) suggest links between organisational resilience and profit when they discuss profit as a key driver as organisational systems and argue that increasing organisational resilience rests on understanding those systems. In contrast Fletcher and Hilbert (Fletcher & Hilbert, 2007) focus on ecological modelling and argue that, although initially profit and resilience may be positively correlated, there comes a point when “...*resilience decreases rapidly as maximum profit is approached*”. Here they express a trade-off between system resilience and profit. In the context of organisations they add that managers need to be aware of the *costs* of different management strategies so that they can better decide where to accept this trade-off. In this research senior managers were asked to provide their organisation's average annual profit-to-sales ratio over the last 5 years. This is an assessment of how much profit the organisation's sales are making and directly affects their ability to maintain their stakeholders' interests.

Growth

Hamel and Välikangas (2003, p. 5) discuss the need for organisations to “...*anticipate the point at which a growth curve suddenly flattens out or a business model runs out of steam*”. Here they emphasise the importance of organisations being aware of changes in their business environment which could either negatively affect their growth or provide positive opportunities for growth. This provides evidence for a link between organisational growth and resilience. Hill et al. (2008) include economic growth in their discussion of the measurement of regional economic resilience. In this research senior managers were asked to provide their organisation's average annual sales growth rate over the last 5 years.

Liquidity, leverage and cash flow

In this research senior managers of not-for-profit organisations were asked by how much their organisation's average annual income budget and income surplus has increased each year over the last 5 years. An organisation's average annual income is

important because it shows how much money they have available and indicates the health of the organisation.

Operational

Reason et al. (2001) argue that high staff turnover is an early warning sign within organisations. They discuss staff turnover in the context of a hospital and note that it was not addressed because of the continuous drive for efficiency, however in the end,

“The high staff turnover reached such a magnitude that it precluded the ability of the institution to reach both efficiency targets and to operate safely”.

(Reason, et al., 2001, p. ii24)

In this thesis senior managers were asked to provide their organisation’s average annual staff turnover and average annual senior management turnover for the last 5 years.

Other

Gales and Kesner (1994) argue that uncertainty and increased pressure from outside of organisations encourages the appointment of *outsiders* to the board of directors (BOD). They note that reasons for appointment of external directors include; providing outside support, bringing in key skills or resources, and addressing poor performance. Gales and Kesner (1994) discuss bankruptcy and define it as “...an acknowledgement of an organisation’s inability to cope with its environment” and argue that “...conditions forcing a firm into bankruptcy are indicative of an immediate crisis of survival” (Gales & Kesner, 1994, p. 271). Posing bankruptcy as an organisational crisis, they go on to investigate to role of boards of directors, and their structure, in bankruptcy.

Comparing data from 127 organisations that declared bankruptcy, against 127 similarly matched organisations that did not declare bankruptcy Gales and Kesner (1994) find that in the two years prior to declaring bankruptcy, the number of external directors on boards was reduced significantly. While Gales and Kesner do not provide causality, this does provide an indication of some relationships between bankruptcy and the composition of boards of directors (Gales & Kesner, 1994). In this research senior

managers were asked whether their organisation had external directors on its governing board. The assumption here is that organisations with more external directors on their governing board will be more resilient.

The importance of environmental scanning or situation analysis was discussed in Section 3.3.2. Matheus et al. (2003) argue that situation analysis (the process of developing situation awareness) requires organisations to monitor the business environment using mechanical and human sensors, and then use their connectivity awareness to provide a context for the information to be interpreted. In this research senior managers were asked whether their organisation has used a staff satisfaction survey within the last 2 years, and if so to give a description of their score. This provides information on whether the organisation scans its internal environment, and is also significantly related to staff turnover (Mobley, 1977). Staff satisfaction can also provide an early warning of crises such as strike action (Ng, 1991) and (Seashore & Taber, 1975).

5.2 Pilot Study

This section discusses the pilot study that was part of the development of the items and the resilience measurement tool. It describes the purpose, sample, methods and administration of the resilience measurement tool during the pilot study. The results of the pilot study are presented and any changes made to the tool as a result are discussed. The final version of the resilience measurement tool that was administered in the Auckland study is presented in Section 5.2.7.

The purpose of the pilot study was to test the usability and *face validity* of the survey tool, and to identify any technical issues with the SurveyMonkey platform. The term face validity refers to whether an evaluator or expert judges that a measurement instrument measures what it has been developed to measure, based on their knowledge and without the use of statistical analysis (McDavid & Hawthorn, 2006).

5.2.1 Sample

McManus's (2007) original ten case study organisations were invited to take the survey and to provide feedback on the survey itself and their experience via a semi-structured interview. Four of McManus's (2007) case study organisations agreed to take part in the pilot study; Table 5.20 shows those organisations and the number of participants from each one. Each organisation was sent information and a link to the survey via email.

Table 5.20: Pilot Study Sample

Organisation	Description	Number of Participants
CS4 – Public utility provider	A medium sized public utilities provider with locations spread across New Zealand	5
CS5 – Education provider	An education provider that represents a significant community of stakeholders and is a large employer with an international reputation	11
CS7 – Private utility provider	A large public utilities provider with locations spread across New Zealand	11
CS10 – Private technology provider	A small owner/operator run business which provides technology services to clients	7
Total		34

As the surveys were completed, each individual participant was interviewed using the structure provided by the questions and themes shown in Appendix C3.

5.2.2 Ethics Approval

In line with the University of Canterbury's Human Ethics policy, documents and information that would be sent to organisations taking part in this research were submitted to the Human Ethics Committee for review. These included:

- A letter inviting organisations to take part in the Auckland study part of the research (shown in Appendix B3)
- The survey questions and introductory text (shown in Appendix C1)
- The ethics statement which would appear on the survey (shown in Appendix C1)
- The semi-structured interview questions (shown in Appendix C3)

The Human Ethics Committee reviewed these and approval was given on 11th November 2008 and no changes were required.

5.2.3 Building a Resilience Measurement Tool

The resilience measurement tool was created using an online hosting service provided by www.surveymonkey.com. Appendix C4 provides a screenshot which shows some of the features that were used to create the tool. These include:

- Progress bar – this indicates the percentage of the tool that is completed.
- Question number – this provides a reference for anyone with technical problems or queries about a question.
- Logos – the Resilient Organisations Research Program, Auckland Civil Defence Emergency Management, and University of Canterbury logos were used on the survey.
- Colour scheme – Survey Monkey enables the use of a colour scheme which was chosen to match the Resilient Organisations branding as well as define different areas of the screen.
- Skip logic – Although this is not visible to participants, skip logic enables the research to specify that, for example, the answer to question (a) determines whether question (b) will be displayed.

Appendix C4 also shows other types of questions used within the survey.

5.2.4 Interviews

Each of the 34 participants that took part in the pilot study on behalf of the 4 organisations was interviewed using a semi-structured interview; this methodology is discussed in Section 4.1.3. Each interview was guided by the questions shown in Appendix C3, which address the following issues:

- Accessing the survey

- Survey introduction and ethics statement
- Survey questions
- Format and layout

Accessing the Survey

The first group of interview questions asked participants whether they understood the instructions in the link email or whether they had any technical problems accessing the survey. One participant, a member of CS5, commented that it might have been useful to know how quickly they were supposed to respond to the survey. As a result the link email sent to participants was amended to ask them to complete within two weeks.

Survey Introduction and Ethics Statement

The second group of interview questions asked participants whether the survey introduction itself was clear, and whether they understood the purpose of the research and what would happen to their data. One participant was confused about the confidentiality of the research. The survey introduction stated that the pilot study was confidential but not anonymous (to enable researchers to conduct the interviews); the researcher contacted this participant and provided clarification of confidentiality and anonymity.

Survey Questions

The third group of interview questions asked participants for feedback on the survey items themselves. Some participants in CS5, the large education provider, said that they struggled with some of the items which were more appropriate for commercial organisations and that they had to select 'neither agree or disagree' which was the middle point in the scale when they didn't know an answer. As previously discussed a 'Don't know' option was provided for each item however several participants didn't remember seeing it on the survey. To address this, a sentence was added to the survey instructions to highlight that a 'Don't know' option would always be available. Some CS5 staff were also unsure of whether to answer the survey based on the resilience of their whole organisation or just their department. Within CS5 the various departments often act independently, however they were instructed to answer on behalf of their organisation as a whole and clarification of this was added to the instructions.

This group of questions also addressed the face validity of the items and asked participants whether they felt the survey questions were relevant to their organisation's resilience. All participants agreed that the items were relevant and two participants suggested items which might be added. These included more operational questions about emergency plans and IT back-up, and being able to replace key staff that were unavailable during a crisis. In response to this, the following four questions were added to the survey:

1. Does your organisation have a formal written crisis/emergency or business continuity plan?
2. Is your organisation's formal written crisis/emergency or business continuity plan of a sufficient standard to be useful in an emergency?
3. If key people were unavailable there are always others who could fill their role (question answered using a Likert scale)
4. Does your organisation have back-up IT facilities? (added to the senior manager version only)

Format and Layout

The fourth group of interview questions asked participants whether the format and layout of the survey was clear and easy to use. Two participants did not notice the progress bar that was placed at the top of the screen so a sentence was added to the instructions to highlight it. All participants that did notice the progress bar found it useful and none of the participants identified problems with fonts or spacing.

5.2.5 Results of the Pilot Study

This section gives an overview of the results of the pilot study organisations (collected in 2009) and compares them against their results in McManus's (2007) study (collected in 2005-2006). McManus (2007) ranked the case study organisations from the most to the least resilience to provide a more grounded *picture* of how resilient they were. Table 5.21 shows a comparison of the rank of the four organisations that took part in this research in McManus's (2007) study compared with their rank generated through this

pilot study. Table 5.21 shows that the rank order of the organisations according to their resilience has changed significantly.

Table 5.21: Comparison of Pilot Study Organisations' Overall Resilience Rank

Rank	McManus (2007)	Pilot Study
1	CS4	CS4
2	CS10	CS7
3	CS7	CS5
4	CS5	CS10

Note: The organisation ranked number 1 is the most resilient and the organisation ranked number 4 is the least resilient.

CS4, the public utility provider, has remained highly resilient and achieved excellent resilience scores across all of the resilience indicators. Following McManus's (2007) case study, CS4 invested significantly in redeveloping its emergency response plan and in providing emergency response training for all staff, including internal and multi-agency exercises. This is reflected in their results and improvement since the first study.

CS10, the private technology provider, achieved the lowest resilience level during the pilot study for this research which moved it from 2nd to 4th place. Despite this decrease the organisation still achieved a *good* level of overall resilience. The decrease may be the result of cultural changes and conflicts within the organisation which were identified by participants during the survey administration process. Possible causes that were highlighted include conflict, staff leaving, change in working conditions and hours, and decreased staff satisfaction.

CS7, the public utility provider, achieved a higher ranking in this pilot study than in McManus's (2007) study and moved from 3rd to 2nd place. CS7 made a significant effort in the redevelopment of their existing emergency response plan in the intervening period between the two assessments. They also invested in training for senior staff, completed planning for post-disaster reconnaissance in conjunction with a key stakeholder, and took part in several multi-agency exercises; this could account for their improvement.

CS5, the education provider, achieved a higher ranking in this pilot study than in McManus's (2007) study and moved from 4th to 3rd place. This is likely to be the result of considerable work that has gone into planning and emergency management coordination across the organisation. This has included reviewing and formalising the organisation's emergency planning arrangements, validating plans and practicing their response during multi-agency emergency exercises, and establishing an organisation-wide crisis management and crisis communications structure.

5.2.6 Pilot Study Conclusions

The purpose of the pilot study was to test the usability and *face validity* of the survey tool, and to identify any technical issues with the SurveyMonkey platform. Feedback from the semi-structured interviews was also used to amend the introduction and instructions of the survey. Changes made to the survey items as a result of the pilot study are presented in Section 2.5.7.

The interviews highlighted that many participants would most likely not read the introduction or the instructions. To improve this, the introduction and instructions were reviewed to make them as simple and short as possible. This should improve the usability and face validity of the survey.

Throughout the use of the survey, the SurveyMonkey platform performed well and none of the participants identified any usability issues.

The results of the pilot study organisations (discussed in Section 5.2.5) indicate that the tool is sensitive enough to pick up changes in an organisation's resilience over time. It is possible that changes in resilience identified by the tool are a result of measurement error or methodological differences. However the differences in resilience identified through the pilot study reflect the work done by the organisations to improve their resilience in the time between the two studies. The sensitivity and accuracy of the tool will require more investigation once the tool is fully developed.

5.2.7 Changes Made to the Resilience Measurement Tool after the Pilot Study

This section discusses changes made to the items in the resilience measurement tool following the pilot study. The survey, as it was administered to organisations during the Auckland study which is presented in Chapters 6 and 7, is shown in Appendix C5. This can be compared with the version that was administered during the pilot study which is shown in Appendix C1.

5.2.7.1 Changes to Demographic Items

Department or Business Unit

As a result of the pilot study, an item asking participants which department or business unit they belonged to was added to the demographic section of the survey. The purpose of this was to provide another way to identify individual participants who might want to remove their data from the project. Although this didn't occur during the pilot study the issue of removing data was discussed and it was decided that, given that the survey is anonymous, the inclusion of the participants department would help to find the data that needed to be removed.

Industry Sector

After the pilot study, the item relating to the organisation's industry sector was removed. Researchers felt that participants from large or distributed organisations might answer this differently which may create problems during the analysis (where one organisation was assigned to more than one industry sector). Instead organisations were categorised into industry sectors based on their categorisation in the Veda Advantage database which was the sampling frame for this thesis as discussed in Section 4.1.4.1.

Organisation Type

The organisation type item was moved from the demographics section to the reflective section of the survey. Researchers decided to do this because the question only needed to be answered once for each organisation, however it is still counted as a demographic question. Organisation type was not analysed as an indicator of organisational

performance in relation to resilience. The purpose of including this question was to enable future analysis of organisations' resilience by organisation type.

Number of Sites or Locations

The number of sites or locations item was moved from the demographics section to the reflective section of the survey. Senior managers were asked how many sites or locations their organisation has. This was included as an estimation of organisations' possible network of external resources and support and relates to questions of organisational size.

5.2.7.2 Changes to Reflective Organisational Performance Items

Organisation Size

The number of staff (organisation size) was included as potential reflective measure of organisational performance in relation to resilience. Carton and Hofer (2006) note that organisational size has not been found to be predictive of business failure. Despite this it has been included in this study to enable comparisons of results by organisation size and also to investigate whether size has an impact in relation to resilience. This is addressed through hypothesis 5 discussed in Section 4.2.3.

Senior Manager Turnover

The question asking about senior manager turnover was taken out because researchers felt that smaller organisations may not be able to answer this question or it may not be applicable.

Back-up IT Facilities

The importance of back-up IT facilities is emphasised through standards such as the BS25999-1 business continuity standard (BSI, 2006) which suggests that organisations have back-up facilities and arrangements as part of their information strategy. In this research, senior managers were asked to describe the back-up IT facilities that their organisation has.

Relocation

Webb et al. (2002) compare long term business recovery from the Loma Prieta earthquake and Hurricane Andrew and identify making plans for relocation as a key business preparedness action. Beunza and Stark (2004) discuss the relocation of 160 traders following the September 11th terrorist attacks and notes how the organisation's relocation was symbolic to its stakeholders. Although the traders did not have extensive plans made in advance to enable relocation, they were able to use their adaptive capacity to set up an operational trading room (albeit on a limited basis) within just six days of the attack. A wide range of crises can trigger an organisation to relocate such as flooding, earthquakes, social unrest, widespread infrastructure failure etc. In this research senior managers were asked where they would relocate to if their organisation's building, site or location was inaccessible due to physical damage.

Cash Flow

Runyan (2006) interviewed a sample of small businesses following Hurricane Katrina and identified vulnerability to cash flow interruption as one of the factors impeding the speed of recovery. Casey and Bartczak (1985) also support this and suggest that cash flow and an organisation's ability to withstand adverse changes in its operating environment are closely linked. Gittell et al. (2005) discuss airline industry responses to the September 11th terrorist attacks and argue that both cash flow and debt levels play a crucial role in organisations ability to respond effectively to crisis. In this research senior managers were asked how they would rate their organisation's cash flow from excellent to very poor. Venkatraman and Ramanujam (1987) support the inclusion of more subjective measures when they argue that perceptual measures are useful and use managers perception of organisations' performance relative to competitors in their research.

Debt to Equity Ratio and Subjective Debt Rating

While debt in itself is not necessarily positive or negative in terms of organisations' resilience, organisations' ability to manage and service their debt is important to their ability to operate. In this research senior managers were asked to provide their organisation's debt to equity ratio. If senior managers were unable to provide their organisation's debt to equity ratio, they were asked how they felt about their organisation's level of debt ranging from very positive to very negative.

5.2.7.3 Changes to the Survey Instrument

During the pilot study, participants answered the Likert style questions using a 5-point scale. Following the pilot study, this was changed to a 4-point scale because it avoided invalid use of the middle option, it forced participants to include some opinion, and the researcher felt that the middle option did not significantly contribute to the sensitivity of the tool.

Several participants in the pilot study noted that they ticked the middle option (neither agree nor disagree) because they either didn't see the 'Don't know' option, or because they assumed it was something that they should know, but didn't. Given that the middle option was likely to result in inaccurate and skewed data, and that its use was ambiguous, the researcher decided to move to a 4-point scale. In addition, a sentence was added to the survey instructions to clarify that not everyone answering the survey would be able to answer all of the questions, and that they should use the 'Don't know' option if appropriate. In normal survey practises, researchers would be wary of presenting a question to participants that might not know the answer, but in the context of resilience, what people don't know can also add value and provide information on whether or not resilience strategies are communicated, shared, and embedded in the organisation.

Chapter 6 – Evaluating the Resilience Measurement Tool

This chapter presents the results and analysis, and evaluates the resilience measurement tool. It includes an examination of the proposed indicators and models of organisational resilience. The reliability of the tool is also discussed.

Bunderson et al. (2000, p. 374) suggest that the following analyses be conducted to evaluate the psychometric properties of a proposed measurement tool:

- a. An exploratory factor analysis to examine the factor structure of the instrument;
- b. a confirmatory factor analysis to test the fit of the proposed measurement model to the data and to further examine the factor structure;
- c. an analysis of the generalisability of the measurement model across organisational cultures and types; and
- d. an analysis of relationships between these models and other constructs of substantive interest to organisational researchers.

This research focuses on exploratory factor analysis to examine the factor structure of the instrument. It represents the first stage of the development of a resilience measurement tool. Chapter 9 discusses direction for future research, including confirmatory analysis.

6.1 Sample and Response Rate

The sample for this research was 1009 organisations, of which 68 organisations (249 individuals) participated; this represents a response rate of 7%. Table 6.22 shows the composition of participating organisations by industry sector. Organisations from 13 industry sectors participated and 3 industry sectors represented in the random sample are not represented among participants. These are accommodation and food services, electricity, gas and water services, and transport, postal and warehousing. Table 6.23 shows the composition by organisation size.

Table 6.22: Composition of Participating Organisations by Industry Sector

Sector Grouping	Number of Organisations			Number of Individual Responses
	Organisations Participating	Organisations in Sample	Organisations Participating As a Percentage of Sample	
Accommodation and Food Services	0	20	0%	0
Agriculture, Forestry and Fishing	1	7	14.29%	3
Communication	2	9	22.22%	10
Construction	1	32	3.13%	1
Cultural and Recreational Services	1	12	8.33%	2
Education	3	54	5.55%	9
Electricity, Gas, Water and Waste Services	0	2	0%	0
Finance and Insurance	2	47	4.26%	2
Government Administration and Defence	1	10	10%	1
Health and Community Services	2	10	20%	24
Manufacturing	14	245	5.71%	40
Personal and Other Services	4	21	19.05%	14
Property and Business Services	25	314	7.96%	82
Retail Trade	3	66	4.55%	6
Transport, Postal and Warehousing	0	41	0%	0
Wholesale Trade	9	119	7.56%	55
Totals	68	1009		249

Table 6.23: Composition of Participating Organisations by Organisation Size

Organisation Size (Number of People)	Number of Organisations
1-19	46
20-39	10
40-59	4
60-79	4
80-99	1
100-299	3
	68

Note: Organisation size is the number of full time staff.

Out of the 249 individual participants, 61% were male and 39% were female. Participants were also asked the hierarchical position of their job within their organisation; the results of this are shown in Table 6.24. Table 6.24 shows that participants represented an equal proportion of senior, and middle managers and staff. The majority of participants had worked in their industry for 21 or more years and in their organisation for 4-10 years. In addition, 7 participants listed a department or job title which reflects a crisis, emergency, risk or business continuity function.

Table 6.24: Hierarchical Position of Individual Participants

Hierarchical Position	Number of Participants
Senior Management	80 (32%)
Middle Management	36 (14%)
Team Leader/supervisor	51 (20%)
Staff	82 (33%)
	249

Table 6.22 also shows the number of individual participants within each industry sector which provides an indication of how many people from each organisation took part. Participation within organisations ranged from 1-100% and this is likely to have an impact on the results. Where there are low levels of representation, this introduces possible bias or inaccuracy into the resilience results. However, for the purpose of this study, every effort was made to increase response rates and the balance of other characteristics achieved, such as gender, industry sectors and hierarchical position are satisfactory.

While an overall response rate of 7% of organisations seems low, it is important to review this in the context of the methods being used in this research, and in the context of organisational resilience. The methods and the context of organisational resilience are discussed below.

Methods

Anderson and West (1998) develop a survey tool to measure climate for work group innovation within teams in hospitals in the UK. As part of their research they use factor analysis to explore the structure of the data and to identify factors in much the same way as this thesis. They obtain data from 155 individuals from 27 hospitals to use in their factor analysis and argue,

“These analyses were computed at the individual level of analysis in accordance with traditional approaches to item analysis and scale development...examining item statistics at the individual level avoids additional problems of dealing with summed data at the team level. Indeed, combined team-level data can obscure the psychometric characteristics of items by collapsing-down distribution statistics to the team level”.

(Anderson & West, 1998, p. 243)

Here Anderson and West (1998) explain that exploratory factor analysis should be performed at the individual level during an organisation level study. They also argue that analysis at the individual level, avoids introducing errors into the factor analysis through the use of summed data e.g. organisations’ averaged resilience scores.

As a result of this, during the factor analysis discussed in Section 6.2, data was analysed at the individual level (with 249 sets of data) rather than at the organisation level (with 68 sets of data). The sample of 249 also exceeds the minimum sample size suggested by Hinkin (1995) who argues that a sample of 150 observations is suitable for exploratory factor analysis. He also goes on to argue that a sample of 150 should also be the minimum for scale development procedures which are followed in this thesis.

Simsek and Veiga (2001) note that researchers using internet surveys have reported response rates ranging from 7-76%. This thesis used a random sample of organisations, many of whom had not heard of organisational resilience before. Despite efforts made to reduce non-response bias and increase the response rate, participants’ lack of familiarity and awareness of resilience made it very difficult to convince organisations to take part. This difficulty is perhaps one of the reasons why very few studies in disaster or crisis management focus on measuring a random sample of organisations. Hurley-Hanson (2006) uses a survey to measure whether organisations directly affected by the September 11th attacks have addressed their preparedness since 2001, and achieves a response rate of 20%. However, she uses the individual tenants of the World Trade Centres in New York and Long Beach California as her sampling frame. These

individuals have an increased awareness of the importance of resilience (due to their experiences in the attacks), and Hurley-Hanson (2006) does not attribute the results to particular organisations, so it is not clear how many organisations were represented.

Other authors conduct surveys using a small number of case study organisations. Herbane (2010) notes that many of the seminal studies in disaster and crisis management are based on samples of four organisations or less. These studies usually focus on examining an organisations' response to, or progress after, a specific crisis or emergency (Antonsen, 2009; Beunza & Stark, 2004; Herbane, 2010).

When reviewing the results of this research, it is therefore important to remember that a portion of the least resilient organisations is most likely not represented. Non-response error occurs when some members of the chosen sample do not respond to the survey. In this case, even though the sample may be chosen to be representative, the results are not. In this thesis, the fact that a portion of the least resilient organisations most likely did not take part is a source of non-response error. Methods of reducing non-response error were discussed in Section 4.3.

For this research, the response rate achieved means that while there is enough data to perform the factor analysis, detailed conclusions about the resilience of organisations cannot be generalised to organisations outside of the sample.

Organisational Resilience Context

In the context of organisational resilience, the non-response rate, and in particular the reasons given for not taking part, are as important as the response rate. As part of the follow-up phone calls to organisations during the administration of the survey, organisations were asked their reasons for not taking part. Of the 941 organisations from the random sample that did not take part in the research, 363 provided a reason. Appendix D1 provides a graph showing the various reasons, and the percentage of organisations that provided each reason. The reasons included:

- Not enough time or resources
- Organisational change means that it's not the right time

- We're too small to make a difference
- We prefer to use another type of tool
- We are already resilient
- Resilience is not a priority for us
- We do not like taking part in research
- Our head office handles all of that stuff
- It's not relevant to us
- We don't need to be resilient, if something goes wrong we'll just shut up shop
- The key decision maker is away (for a significant time) and no-one else can make a decision
- We are no longer based in Auckland
- The business has been sold
- The business is folding

Many of these reasons are similar to faulty organisational assumptions and beliefs outlined by Mitroff et al. (1989); these are shown in Figure 6.31. Mitroff et al. (1989) argue that organisations use these faulty assumptions and beliefs to justify their lack of investment and action in crisis management. In total, nine of the seventeen assumptions provided by Mitroff et al. (1989) were expressed by sample organisations who decided not to take part in the organisational resilience research; these are shown as the shaded areas in Figure 6.31.

Many of the reasons given for not taking part in the research, amount to a lack of capacity to absorb extra demands on resources. However, none of the organisations linked this to their ability to absorb change or extra demands on resources during a crisis. As a further example, a few of the reasons given by senior managers are quoted in Figure 6.32.

Figure 6.31: Faulty Organisational Assumptions and Beliefs

1	The fallacy of size: our size will protect us
2	The fallacy of protection/resource abundance: another entity will come to our rescue or absorb our losses
3	The fallacy of excellence: excellent/well managed organisations do not have crises
4	The fallacy of location/geography: we don't have to worry about crises here
5	The fallacy of immunity/limited vulnerability: certain crises only happen to others
6	The fallacy of misplaced social responsibility: crisis management is someone else's responsibility
7	The fallacy of unpredictability: it's not possible to prepare for crises because they are unpredictable
8	The fallacy of cost: crisis management is not warranted because it costs too much
9	The fallacy of negativism: crises are solely negative in their impacts on an organisation
10	The fallacy of "the ends justify the means": business ends justify the taking of high risk means or actions
11	The fallacy of discouraging bad news: employees who bring bad news deserve to be punished
12	The fallacy of luxury: crisis management is a luxury
13	The fallacy of quality: quality is achieved through control not assurance
14	The fallacy of fragmentation: crises are isolated
15	The fallacy of reactiveness: it is enough to react to crises once they have happened
16	The fallacy of experience and over confidence: the best prepared organisations are those that have experienced and survived a large number of crises or who have dealt with crises over their history
17	The fallacy of financial/technical quick fixes: it is enough to throw financial and technical quick fixes at crisis management

(Adapted from Mitroff, et al., 1989, p. 275)

Figure 6.32: Senior Managers' Reasons for Not Taking Part in the Research

<ul style="list-style-type: none"> • CEO of a manufacturing organisation: <i>"We already have a good philosophy - we can all do each other's jobs and we don't hire anyone that can only do one job"</i>. • Principal of a primary school: <i>"Reviewing our organisation's resilience is not a priority at this time"</i>. • Manager of a medical laboratory: <i>"We have ISO accreditation etc. so we're satisfied with our resilience"</i>. • Managing Director of a manufacturing organisation: <i>"We're not very resilient at moment – we're fighting the Chinese empire"</i>. • General Manager of a telecommunications provider: <i>"We will not be able to get buy-in from staff to complete the surveys"</i>. • Managing Director of a construction company: <i>"We're already resilient, we just deal with problems as they arise, we don't think about the 'future'. We're doing ok after 29 years"</i>.
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6.2 Exploratory Factor Analysis

The factor analysis discussed in this research, was performed using principal axis factor analysis at item, or question level; this method is discussed in Sections 4.1.5.1 and 6.1. Through factor analysis, items are grouped into factors using patterns of correlations which show that they are statistically related. When this happens, some items will not load highly enough, and will not be incorporated into a factor. For this research, items with a loading of less than 0.4 (Hinkin, 1998) are assessed in relation to their theoretical contribution, and if appropriate they are dropped from the model. The term ‘factor structure’ refers to the number of factors that are being extracted from the data; in other parts of this thesis these are referred to as the dimensions of organisational resilience. The term item refers to each of the individual questions that were developed to measure the indicators of organisational resilience. The result of the factor analysis is a list of items which make up organisational resilience, and which can be combined to serve as indicators, within the factors or dimensions suggested, in the resilience measurement tool.

Pallant (2007) notes that the first step in factor analysis is to assess the suitability of the data collected for factor analysis. She argues that there are two considerations for this; the sample size (discussed in Section 6.1), and the strength of the relationship between the items. Pallant (2007, p. 181) suggests two tests that can be performed using SPSS to check the strength of the relationship between the items; Bartlett’s test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy.

Bartlett’s Test of Sphericity

This test examines the correlation matrix of the data and investigates the hypothesis that the sample data came from a normal population, in which the items were completely unrelated. If this hypothesis were accepted, it would mean that none of the items would group together, and each item would be one factor. A positive outcome is that this hypothesis is rejected, and that the items are shown to be related to each other, i.e. they will join together in groups to become factors (Dziuban & Shirkey, 1974).

Results for Bartlett’s test of sphericity are expressed as a value of p and should be significant ($p < 0.05$) which represents 95% confidence. This means that the p value

should be significant at less than 0.05, i.e. that there is less than a 1 in 20 chance that the p value achieved is random so we can be 95% confident the items will relate together. As shown in Table 6.25, for this research ($p = 0.000$) which is significant and provides evidence that the items are related and are suitable for factor analysis.

Kaiser-Meyer-Olkin (KMO)

This test measures the sampling adequacy of a set of data for the purposes of factor analysis. It checks whether the sample data for each question *belongs to the family* psychometrically (Kaiser, 1970). Results for the KMO range from 0-1. Pallant (2007, p. 181) suggests that 0.6 be a minimum accepted value; in this research the KMO is .88. This suggests that the data collected is suitable for use in factor analysis.

Table 6.25: KMO and Bartlett's Test of Sphericity

Test		Result	Threshold
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.88	> 0.6
Bartlett's Test of Sphericity	Approx. Chi-Square	10725.38	
	df	2701	
	Sig.	.00	$p < 0.05$

As discussed in Section 4.2, this thesis will test two proposed models of organisational resilience. The first, McManus's Relative Overall Resilience (ROR) is composed of 49 items and the second, the adjusted model referred to as Adjusted Relative Overall Resilience (AROR), is comprised of 73 items.

The generation and development of the items is discussed in Section 5.1, however it is useful here to explain why the researcher 'ended up' with this particular number of items. In line with social science norms, and based partly on the idea of triangulation, the researcher looked to generate at least three items for each proposed indicator where possible. This was a cautionary measure to try to ensure that potential indicators would not be discounted on the basis of poor items or measurement error if one of the items was found to be faulty or poorly conceived.

6.2.1 Testing the Relative Overall Resilience Model

McManus's (2007) model of Relative Overall Resilience suggested that organisational resilience is comprised of three dimensions; situation awareness (SA), management of keystone vulnerabilities (KV) and adaptive capacity (AC). In turn each of the three dimensions was comprised of five indicators; this model is discussed in detail in Chapter 3 and Section 4.2. Through the scale development process described in Chapter 5, this model was operationalised as 49 items or questions in the resilience measurement tool.

6.2.1.1 3-Factor Solution

Based on McManus's (2007) model, a 3-factor solution was extracted using principal axis factor analysis with a varimax rotation; this can be seen in Appendix D2. This resulted in a solution where 37 of the items used to measure McManus's indicators were retained and 12 items were dropped due to poor loadings. The dropped items are shown in Appendix D3. The solution had 2 substantial factors and a third factor that was weak with only 4 items (one of which was doubled loaded). This shows that, using the sample and scales developed through this thesis, McManus's (2007) 3-factor model of Relative Overall Resilience is not supported.

Hypothesis 1: Organisational resilience is a function of situation awareness, management of keystone vulnerabilities, and adaptive capacity.

Through the discussion of the 3-factor analysis presented above it is clear that organisational resilience is not a function of only the 3 dimensions identified by McManus (2007). This means that hypothesis 1 is not supported. However while the dimensions identified by McManus are not supported in their current form, indicators from all 3 of McManus's dimensions were incorporated into the 2 substantial factors which were identified during the analysis.

Hypothesis 2: Each of the dimensions of organisational resilience will comprise of the five indicators identified.

Through the discussion presented above it is clear that some of the indicators identified by McManus (2007) do contribute to a measure of organisational resilience however hypothesis 2 is not supported. Only 6 of McManus's (2007) indicators were retained in their original format:

- Factor 1:
 - KV₃ – Capability & Capacity of Internal Resources
 - AC₁ – Minimisation of Silo Mentality
 - AC₄ – Information & Knowledge
 - AC₅ – Leadership, Management & Governance Structures
- Factor 2:
 - SA₅ – Recovery Priorities
 - KV₂ - Participation in Exercises

6.2.2 Testing Adjusted Relative Overall Resilience

The model of Adjusted Relative Overall Resilience is an adjusted version of McManus's (2007) model proposed through this thesis; this is discussed in Chapters 3 and 4. This model suggests that organisational resilience is comprised of four dimensions; resilience ethos (RE), situation awareness (SA), management of keystone vulnerabilities (KV) and adaptive capacity (AC). In this model the resilience ethos dimension is measured using 2 indicators and the other 3 dimensions are measured using 7 indicators each. Through the scale development process described in Chapter 5, this model was operationalised as 73 items or questions in the resilience measurement tool.

6.2.2.1 4-Factor Solution

Based on the adjusted model, a 4-factor solution was extracted using principal axis factor analysis with a varimax rotation; this can be seen in Appendix D4. This resulted in a solution where 57 of the items used to measure the adjusted indicators were retained and 16 items were dropped due to poor loadings. The 16 dropped items from the 4-factor solution can be seen in Appendix D5. The solution again had 2 substantial

factors and 2 factors that were weak with only 8 items in one and 4 items in the other. This shows that, using the sample and scales developed through this thesis, the 4-factor adjusted model of Relative Overall Resilience is not supported.

Hypothesis 3: Organisational resilience is a function of resilience ethos, situation awareness, management of keystone vulnerabilities, and adaptive capacity.

Through the results and analysis presented above it is clear that organisational resilience is not a function of only the four dimensions identified in the Adjusted Relative Overall Resilience model. This means that hypothesis 3 is not supported.

Hypothesis 4: Each of the dimensions of organisational resilience will comprise of the indicators identified.

Through the results and analysis presented above it is clear that some of the indicators identified by McManus (2007) do contribute to a measure of organisational resilience. However in the 4-factor solution some indicators have been pulled apart and different items posited to the 4 factors. The following indicators were retained in their original format:

- Factor 1:
 - AC₁ – Minimisation of Silo Mentality
 - AC₄ – Information & Knowledge
 - AC₅ – Leadership, Management & Governance Structures
 - AC₆ – Innovation & Creativity
 - AC₇ – Devolved & Responsive Decision Making
- Factor 2:
 - SA₅ – Recovery Priorities
 - KV₂ – Participation in Exercises
- Factor 3:
 - RE₂ – Network Perspective

No indicators were retained in their original form in factor 4. Following the results of the 4-factor analysis, and in line with the process of exploratory factor analysis, other possible structures were investigated.

6.2.2.2 5-Factor Solution

Using the adjusted model items, a 5-factor solution was extracted using principal axis factor analysis with a varimax rotation; this can be seen in Appendix D6. This resulted in a solution where 55 of the items used to measure the adjusted indicators were retained and 18 items were dropped due to poor loadings. The 18 dropped items are shown in Appendix D7. The solution had 1 very large factor, 1 large factor, and 3 factors that were weak with only 8 items in one and 4 items each of the other two.

6.2.2.3 3-Factor Solution

Using the adjusted model items, the researcher tried to extract a 3-factor solution using principal axis factor analysis with a varimax rotation; however the rotation would not converge. To address this, the number of iterations was increased however the 3 factor solution still failed to converge. This means that a 3-factor solution, based on the adjusted model, was not possible.

6.2.2.4 2-Factor Solution

When testing McManus's (2007) model of Relative Overall Resilience in other parts of this section, the factor solutions most often provided 2 clear factors and this suggests that it would be useful to try a 2-factor solution with the adjusted model items. A 2-factor solution was extracted based on the adjusted model items using principal axis factor analysis with a varimax rotation; this can be seen in Appendix D8. This resulted in a very clean 2-factor structure where 53 items were retained to measure organisational resilience and 20 items were dropped due to poor loadings. The 20 dropped items can be seen in Appendix D9.

Dropped items were reviewed in relation to the literature and it was found that the majority were covered by other items. In hindsight this was due to the language of the items and reflects how interrelated the concept of resilience is. Despite this the purpose of the factor analysis was to reduce the number of items and seek a parsimonious solution and this was achieved. However, the researcher decided to retain 1 of the

dropped items which asks participants about minimum tolerable periods of disruption, not as part of the measurement instrument, but to provide supplementary information. The 20 dropped items are shown in Appendix D9 alongside the reasons that each was dropped; the item that has been retained is shaded grey.

This solution results in 53 items to measure the indicators of organisational resilience, as well as 14 demographic and supplementary items (including the minimum tolerable periods of disruption item that was retained). It forms the basis for the new model of organisational resilience developed through this thesis which is discussed in Section 6.3.

6.3 A New Model of Organisational Resilience

The purpose of this section is to present the new model of organisational resilience that has been developed through this thesis (based on the 2-factor solution discussed above), and to answer research question 1 - what social or behavioural factors influence and determine organisations' resilience?

Table 6.26 shows the new model of organisational resilience composed of the indicators (social and behavioural factors) developed, within the 2 factors or dimensions, as a result of the analysis. The two factors have been named adaptive capacity (factor 1) and planning (factor 2) to reflect the indicators within each factor. Based on this new model, organisational resilience is comprised of two dimensions or factors, planning and adaptive capacity, and is measured using 13 indicators.

Table 6.26: A New Model of Organisational Resilience

Organisational Resilience Factors	
Adaptive Capacity	Planning
Minimisation of Silo Mentality	Planning Strategies
Capability & Capacity of Internal Resources	Participation in Exercises
Staff Engagement & Involvement	Proactive Posture
Information & Knowledge	Capability & Capacity of External Resources
Leadership, Management & Governance Structures	Recovery Priorities
Innovation & Creativity	
Devolved & Responsive Decision Making	
Internal & External Situation Monitoring & Reporting	

Four of the indicators shown in this table are as they were proposed in Chapters 3 and 5. The other indicators were either added to (4 indicators), only partially retained (5 indicators), or have been created out of various items grouped together according to themes. Sections 6.3.1-6.3.13 discuss each indicator in turn and addresses three questions:

- How was the indicator formed?
- What is the definition of the indicator?
- What is the reliability of the indicator?

Each of the indicators is discussed and redefined to reflect any new items that have been incorporated; a list of these definitions is provided in Appendix D10.

The reliability of each indicator is discussed in the relevant section below and the reliability of the overall measurement tool is discussed in Section 6.3.14. Internal consistency is an estimate of the reliability of a measure, which addresses whether the items are all measuring the same construct. The idea is that all of the items (within any given indicator) should be measuring the same construct, and should display covariance (Henson, 2001). The reliability of each indicator is assessed using Cronbach's Alpha coefficient, which ranges from 0-1. A coefficient of 0.7 or above indicates strong item covariance (Hinkin, 1998, p. 113), which is a measure of internal consistency.

Cronbach's alpha was chosen as a measure of internal consistency for this thesis, because it is suggested as the most suitable for measuring the reliability of scales, in particular those comprised of Likert scale items (Yaffee, 2003). The Cronbach's alpha equation is shown below and shows that alpha measures true variance over total variance.

$$\text{Cronbach } \alpha = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum S_i^2}{S_p^2} \right)$$

6.3.1 Minimisation of Silo Mentality

Silo mentality was one McManus's (2007) original indicators of adaptive capacity. The title of the indicator has been reworded to reflect the idea that silo mentality is a negative characteristic. All 3 items used to measure minimisation of silo mentality were retained; in addition a further item that was measured as part of the communications and relationships indicator has been pulled into this indicator. Table 6.27 shows the items and their factor loadings. The factor loadings are the correlation between each item and the factor that they are loaded to. They were used as a criterion during the factor analysis presented earlier in this Chapter where a loading 0.4 or higher was deemed acceptable. As a 4-item scale the minimisation of silo mentality indicator achieves a Cronbach's alpha of .761.

Table 6.27: Minimisation of Silo Mentality Items

Item Number	Item Loading	Item Wording
AC _{1,1}	.446	People are encouraged to move between different departments or try different roles within our organisation to gain experience
AC _{1,2}	.676	There is an excellent sense of teamwork and camaraderie in our organisation
AC _{1,3}	.616	In our organisation, it is important that there are no barriers which stop us from working well with each other and with other organisations
AC _{2,2}	.643	People in our organisation work with whoever they need to work with to get the job done well, regardless of departmental or organisational boundaries

Item AC_{2,2} which was designed to measure communications and relationships has been incorporated into the silo mentality indicator because it emphasises working across organisational boundaries. This demonstrates one of the overlaps between the silo mentality and communications and relationships indicators. Working across boundaries is a key element of the minimisation of silo mentality within and between organisations (McCormack, 1999).

Minimisation of silo mentality is defined as:

Minimisation of divisive social, cultural and behavioural barriers, which are often manifested as communication barriers creating disjointed, disconnected and detrimental ways of working.

6.3.2 Capability & Capacity of Internal Resources

Capability and capacity of internal resources was one McManus's (2007) original indicators of management of keystone vulnerabilities. However, it was pulled into factor 1 (adaptive capacity) during the factor analysis. All 3 items used to measure capability and capacity of internal resources were retained; Table 6.28 shows the items and their factor loadings. As a 3-item scale the capability and capacity of internal resources indicator achieves a Cronbach's alpha of .719.

Table 6.28: Capability & Capacity of Internal Resources Items

Item Number	Item Loading	Item Wording
KV _{3.1}	.436	I believe that our organisation has sufficient internal resources to operate successfully during business-as-usual
KV _{3.2}	.481	During business-as-usual resources are managed so that we are able to absorb a small amount of unexpected change
KV _{3.3}	.415	When a problem occurs in our organisation, internal resources become more easily available at short notice and there is less red tape to deal with

Capability and capacity of internal resources is defined as:

The management and mobilisation of the organisation's resources to ensure its ability to operate during business as usual, as well as being able to provide the extra capacity required during a crisis.

6.3.3 Staff Engagement & Involvement

Staff engagement and involvement was one of the indicators of management of keystone vulnerabilities in the adjusted model. However, only 2 of the 3 items used to measure the indicator were pulled into factor 1 (adaptive capacity) during the factor analysis; item KV_{7.1} was dropped. Table 6.29 shows the 2 items, and their factor loadings, that were retained in the factor analysis. As a 2-item scale the staff engagement and involvement indicator achieves a Cronbach's alpha of .707.

Table 6.29: Staff Engagement & Involvement Items

Item Number	Item Loading	Item Wording
KV _{7,2}	.526	Most people in our organisation feel responsible for the organisations effectiveness
KV _{7,3}	.456	People in our organisation typically “own” a problem until it is resolved

Item KV_{7,1} which was dropped from this indicator was designed to measure whether management actively try to develop ways to manage problems. Upon further review of these items it was identified that this is also addressed by managers’ answers to the 2 items that were retained. Staff engagement and involvement is defined as:

The engagement and involvement of staff who understand the link between their own work, the organisation’s resilience, and its long term success and are able to use their skills to solve problems.

6.3.4 Information & Knowledge

Information and knowledge was one of McManus’s (2007) original indicators of adaptive capacity. All 3 items used to measure the indicator were retained; in addition 2 items that were used to measure connectivity awareness and informed decision making have been pulled into this indicator. Table 6.30 shows the items and their factor loadings. As a 5-item scale the information and knowledge indicator achieves a Cronbach’s alpha of .749.

Table 6.30: Information & Knowledge Items

Item Number	Item Loading	Item Wording
AC _{4,1}	.542*	In our organisation, it is a priority that people have the information and knowledge they need to respond to unexpected problems that arise
AC _{4,2}	.587	In our organisation, if something out of the ordinary happens, people know who has the expertise to respond
AC _{4,3}	.483	In our organisation, we make a conscious effort to ensure that critical information (e.g. staff contact details) is available in a number of different formats and locations
SA _{1,3}	.493	If key people were unavailable, there are always others who could fill their role
SA _{7,2}	.416	In our organisation, it is generally easy to obtain expert assistance when something comes up that we don’t know how to handle

** This item also loaded on factor 2 (planning) with a loading of .421*

Item SA_{1.3} which was designed to measure roles and responsibilities has been incorporated into the information and knowledge indicator because it emphasises the importance of staff knowing the roles and responsibilities of key roles in the organisation. This demonstrates one of the overlaps between the roles and responsibilities and information and knowledge indicators in McManus's (McManus, 2007) original model. Item SA_{7.2} was designed to measure informed decision making but has been pulled into the information and knowledge indicator because the emphasis on knowledge and deference to expertise is relevant to shared themes across the two indicators. Information and knowledge is defined as:

Critical information is stored in a number of formats and locations and staff have access to expert opinions when needed. Roles are shared and staff are trained so that someone will always be able to fill key roles.

6.3.5 Leadership, Management & Governance Structures

Leadership, management and governance structures was one McManus's (2007) original indicators of adaptive capacity. All 5 items used to measure the indicator were retained; in addition 1 item which was used to measure strategic vision and outcome expectancy has been pulled into this indicator. Table 6.31 shows the items and their factor loadings. As a 6-item scale the leadership, management and governance structure indicator achieves a Cronbach's alpha of .832.

Table 6.31: Leadership, Management & Governance Items

Item Number	Item Loading	Item Wording
AC _{5.1}	.597	I am confident that management would provide good leadership if our organisation was struck by a real crisis
AC _{5.2}	.583	I believe people would accept decisions made by management about how our organisation should manage a crisis, even if they were developed with little consultation
AC _{5.3}	.589	Managers constantly monitor staff workloads and reduce them when they become excessive
AC _{5.4}	.635	Top management think and act strategically to ensure that our organisation is always ahead of the curve
AC _{5.5}	.614	Top management in our organisation are good examples of professionals that we can aspire to learn from
AC _{3.3}	.483	In our organisation we regularly take time from our day-to-day work to re-evaluate what it is we are trying to achieve

Leadership, management and governance structures is defined as:

Strong crisis leadership to provide good management and decision making during times of crisis, as well as continuous evaluation of strategies and work programs against organisational goals.

6.3.6 Innovation & Creativity

Innovation and creativity was one of the indicators of adaptive capacity in the adjusted model. All 3 items used to measure the indicator were retained; Table 6.32 shows the items and their factor loadings. As a 3-item scale the innovation and creativity indicator achieves a Cronbach's alpha of .724.

Table 6.32: Innovation & Creativity Items

Item Number	Item Loading	Item Wording
AC _{6.1}	.672	Our organisation actively encourages people to challenge and develop themselves through their work
AC _{6.2}	.575	People in our organisation are known for their ability to use their knowledge in novel ways
AC _{6.3}	.662	People in our organisation are rewarded for "thinking outside of the box"

Innovation and creativity is defined as:

Staff are encouraged and rewarded for using their knowledge in novel ways to solve new and existing problems, and for utilising innovative and creative approaches to developing solutions.

6.3.7 Devolved & Responsive Decision Making

Devolved and responsive decision making was one of the indicators of adaptive capacity in the adjusted model. All 3 of the items used to measure devolved and responsive decision making were retained, however they were pulled into the adaptive capacity factor. Table 6.33 shows the items, and their factor loadings. As a 3-item scale the devolved and responsive decision making indicator achieves a Cronbach's alpha of .727.

Table 6.33: Devolved & Responsive Decision Making Items

Item Number	Item Loading	Item Wording
AC _{7,1}	.601	Should problems occur, someone with the authority to act is always accessible to people on the front lines
AC _{7,2}	.535	When we need to, our organisation can make tough decisions quickly
AC _{7,3}	.524	In this organisation, the people most qualified to make decisions make them regardless of seniority

Devolved and responsive decision making is defined as:

Staff have the appropriate authority to make decisions related to their work and authority is clearly delegated to enable a crisis response. Highly skilled staff are involved in making decisions where their specific knowledge adds significant value, or where their involvement will aid implementation.

6.3.8 Internal & External Situation Monitoring & Reporting

Internal and external situation monitoring and reporting was one of the indicators of situation awareness in the adjusted model. However, 2 of the 3 items used to measure the indicator were pulled into factor 1 (adaptive capacity) during the factor analysis and 1 of the items was pulled into factor 2 (planning). In addition a further 5 items that were

measured and retained in the factor analysis were identified as fitting within this indicator. Table 6.34 shows the items, and their factor loadings. As a 7-item scale the internal and external situation monitoring and reporting indicator achieves a Cronbach's alpha of .821.

Table 6.34: Internal & External Situation Monitoring & Reporting Items

Item Number	Item Loading	Item Wording
SA _{6,2}	.598	Our organisation proactively monitors what is happening in its industry to have an early warning of emerging issues
SA _{6,3}	.617	Our organisation is successful at learning lessons from past projects and making sure these lessons are carried through to future projects
RE _{1,3}	.532	Our organisation has a culture where it is important to make sure that we learn from our mistakes and problems
SA _{2,1}	.489	During an average day, people interact often enough to know what's going on in our organisation
SA _{2,2}	.685	Managers actively listen for problems in our organisation because it helps them to prepare a better response
SA _{3,1}	.515	In our organisation we are aware of how dependent the success of one area is on the success of another
SA _{7,3}	.579	If something is not working well, I believe staff from any part of our organisation would feel able to raise the issue with senior management

Item RE_{1,3} was pulled into the internal and external situation monitoring and reporting indicator because it includes elements of organisational learning. Items SA_{2,1}, SA_{2,2}, SA_{7,3} and SA_{3,1} were incorporated because they were pulled into factor 1 during the factor analysis and focus on informal monitoring and organisations' understanding of the impact of changes across the organisation. Internal and external situation monitoring and reporting is defined as:

Staff are encouraged to be vigilant about the organisation, its performance and potential problems. The organisation has a culture which values learning from past problems and staff are able to report information that might help the organisation to improve.

6.3.9 Planning Strategies

Planning strategies was one McManus's (2007) original indicators of management of keystone vulnerabilities. In total 3 of the items used to measure planning strategies were

retained and item KV_{1.2} was dropped. In addition a further item that was measured as part of the robust processes for identifying and analysing vulnerabilities indicator has been pulled into this indicator. Table 6.35 shows the items and their factor loadings. As a 4-item scale the planning strategies indicator achieves a Cronbach's alpha of .677. This is below the accepted level of 0.7 suggested by Hinkin (1998). However the planning strategies indicator has been retained because the alpha is only just below the accepted level and because the literature indicates so strongly that planning is a key characteristic of organisational resilience. It is possible that through rewording the items and those items from this indicator that were dropped during the factor analysis, the reliability of this indicator could be improved. This is discussed further in Chapter 9.

Table 6.35: Planning Strategies Items

Item Number	Item Loading	Item Wording
KV _{1.1}	.592	Given our level of importance to our stakeholders I believe that the way we plan for the unexpected is appropriate
KV _{1.3}	.572	Our organisation currently has people who perform the following roles (tick all that apply) – scored 0-4, 1 point for each of risk management, crisis management, emergency management, business continuity
KV _{1.4.1}	.490	Does your organisation have a formal written crisis/emergency or business continuity plan?
KV _{6.1}	.534	People in our organisation understand how quickly we could be affected by unexpected and potentially negative events

Item KV_{1.2} was dropped from this indicator because it had a poor factor loading; the item is shown below:

Our organisation prepares for crisis through: (please tick one)

- Planning
- Insurance
- Combination of planning and insurance
- Our organisation does not prepare
- Don't know

It is possible that item was dropped because of the format and type of the question and this should be re-worded and re-tested in a confirmatory study (this is discussed in Chapter 9). Item KV_{6.1} was pulled into the planning strategies indicator because it

focuses on the organisation's understanding of the speed of impact of negative events. Planning strategies is defined as:

The development and evaluation of plans and strategies to manage risks and vulnerabilities in relation to continuous changes in the organisation's environment and its stakeholders.

6.3.10 Participation in Exercises

Participation in exercises was one McManus's (2007) original indicators of management of keystone vulnerabilities that was retained. Table 6.36 shows the items and their factor loadings. As a 3-item scale the participation in exercises indicator achieves a Cronbach's alpha of .791.

Table 6.36: Participation in Exercises Items

Item Number	Item Loading	Item Wording
KV _{2.1}	.711	Our organisation understands that having a plan for emergencies is not enough and that the plan must be practised and tested to be effective
KV _{2.2}	.505	People are generally able to take time off from their day-to-day roles to be involved in practising how we respond in an emergency
KV _{2.3}	.552	I believe our organisation invests sufficient resources in being ready to respond to an emergency of any kind

Participation in exercises is defined as:

The participation of staff in simulations or scenarios designed to practise response arrangements and validate plans.

6.3.11 Proactive Posture

The proactive posture indicator is a new indicator that was not included in either McManus's (2007) original model or in the updated model proposed in this thesis. It is comprised of items that were designed to measure roles and responsibilities (SA_{1.2}), commitment to resilience (RE_{1.1}), internal and external situation monitoring and

reporting (SA_{6.1}), communications and relationship (AC_{2.1}) and network perspective (RE_{2.2}). Table 6.37 shows the items and their factor loadings. As a 5-item scale the proactive posture indicator achieves a Cronbach's alpha of .703.

Table 6.37: Proactive Posture Items

Item Number	Item Loading	Item Wording
SA _{1.2}	.558	Our organisation is able to shift rapidly from business-as-usual mode to respond to crises
RE _{1.1}	.475	Our organisation is focused on being able to respond to the unexpected
SA _{6.1}	.462	Whenever our organisation suffers a close call we use it as a trigger for self evaluation rather than confirmation of our success
AC _{2.1}	.438	Our organisation is regarded as an active participant in industry and sector groups
RE _{2.2}	.415	Our organisation is able to collaborate with others in our industry to manage unexpected challenges

The proactive posture indicator has been developed to include items which achieved an acceptable loading during the factor analysis and which grouped within a common theme not covered by the other indicators. The items identified in Table 6.37 focus on the organisation's commitment to resilience, mindfulness and self-evaluation (Weick & Sutcliffe, 2007) and collaboration.

Mintzberg (1973) discusses the strategic posture of organisations arguing that an organisation's posture has a significant impact of the strategy that they pursue. Stern (1997, p. 69) discusses organisational learning from crisis events and describes "...a posture of cognitive openness conducive to individual and collective learning". This posture of cognitive openness is also described by Weick and Sutcliffe (2007) as mindfulness in their discussion of high reliability organisations. Miller (1983) argues that to be truly innovative requires more than just copying the actions of competitors, instead innovators are proactive. This is reflected in a crisis context by Fowler et al. (2007, p. 90) who argue, "*When organisations merely respond to crisis, without a proactive posture, more damage seems to prevail*". Smits and Ally (2003, p. 1) also reflect this when they discuss organisations' behavioural readiness to respond, "...when behavioural readiness to respond is absent, crisis management effectiveness is a matter of chance". Proactive posture is defined as:

A strategic and behavioural readiness to respond to early warning signals of change in the organisation's internal and external environment before they escalate into crisis.

6.3.12 Capability & Capacity of External Resources

Capability and capacity of external resources was one McManus's (2007) original indicators of management of keystone vulnerabilities. In total 2 of the 3 items used to measure participation in exercises has been retained. In addition 2 items designed to measure organisational connectivity have been pulled into this factor. Table 6.38 shows the items and their factor loadings. As a 4-item scale the capability and capacity of external resources indicator achieves a Cronbach's alpha of .739.

Table 6.38: Capability & Capacity of External Resources Items

Item Number	Item Loading	Item Wording
KV _{4.2}	.482	Our organisation has agreements with other organisations to provide resources in an emergency
KV _{4.3}	.609	Our organisation has thought about and planned for support that it could provide to the community during an emergency
KV _{5.2}	.478	Our organisation keeps in contact with organisations that it might have to work with in a crisis
KV _{5.3}	.456	Our organisation understands how it is connected to other organisations in the same industry or location, and actively manages those links

Item KV_{4.1} was dropped from the capability and capacity of external resources indicator because it was pulled into the planning dimension which focuses more on formal arrangements and plans than using informal contacts to access resources. Items KV_{5.2} and KV_{5.3} were pulled into the indicator because they encompass formalised relationships between the organisation and other organisations that it might access resources from in a crisis. Capability and capacity of external resources is defined as:

An understanding of the relationships and resources the organisation might need to access from other organisations during a crisis, and planning and management to ensure this access.

6.3.13 Recovery Priorities

Recovery priorities was one McManus's (2007) original indicators of situation awareness. All 3 items used to measure recovery priorities have been retained. In addition 1 item designed to measure organisational connectivity has been pulled into this factor. Table 6.39 shows the items and their factor loadings. As a 4-item scale the recovery priorities indicator achieves a Cronbach's alpha of .819.

Table 6.39: Recovery Priorities Items

Item Number	Item Loading	Item Wording
SA _{5,1}	.694	Our organisation has clearly defined priorities for what is important during and after a crisis
SA _{5,2}	.676	I believe that our organisation's priorities for recovery from a crisis would be sufficient to provide direction for staff
SA _{5,3}	.547	Our organisation clearly understands the minimum level of resources it needs to operate successfully
SA _{3,3}	.549	Our organisation is conscious of how a crisis in our organisation would impact others

Items SA_{3,3} was designed to measure organisational connectivity and the organisation's understanding of how that would impact other organisations; this relates to supply chain resilience and awareness. The item has been pulled into this indicator because an understanding of the impacts across the supply chain is related to how the organisation can recover from crisis. The recovery priorities indicator is defined as:

An organisation wide awareness of what the organisation's priorities would be following a crisis, clearly defined at the organisation level, as well as an understanding of the organisation's minimum operating requirements.

6.4 Evaluating Metrics of Organisational Resilience

This section answers research question 2 which was presented in Section 2.6.

What metrics can be developed to measure the indicators of organisational resilience?

The individual scales discussed in Sections 6.3.1-6.3.13 come together to form the resilience measurement tool developed through this research. In addition to these scales, the demographic and organisational performance questions discussed in Chapter 5 enable an organisation to compare their resilience based on industry sector, organisation size etc.

It is important to provide an estimate of the reliability (internal consistency) of the adaptive capacity and planning dimensions and of the tool overall. Internal consistency is an estimate of the reliability of a measure which addresses whether the items are all measuring the same construct. The idea is that all of the items (within any given indicator) and all of the indicators (within any given factor) should be measuring the same construct and should display covariance (Henson, 2001). Table 6.40 provides the Cronbach's alpha for the overall resilience measurement tool and the factors as well as for each of the indicators. Cronbach's Alpha coefficient ranges from 0-1; a coefficient of 0.7 or above indicates strong item covariance (Hinkin, 1998, p. 113).

The overall measurement tool and the adaptive capacity and planning factors achieve very high alphas suggesting that they have strong item covariance (Hinkin, 1998). This is a very good result indicating the reliability to of tool and means that they vary in relation to each other and all appear to be measuring the same construct.

Within the planning factor, the planning strategies indicator achieves an alpha which is just below the 0.7 recommended minimum level. Despite this, the scale has been retained within the tool because the literature suggests that planning plays a key role in organisations' crisis management (Hurley-Hanson, 2006) and resilience (Carthey, et al., 2001) and (Christopher & Peck, 2004). In this instance it is most likely that while the items used to measure planning strategies do constitute a unique factor, the items are not as closely related (Bunderson, et al., 2000). As discussed in Chapter 9, in future

research it will be important to try to strengthen this indicator and to investigate whether further items could increase its reliability.

Table 6.40: Reliability of the Organisational Resilience Measurement Tool

Factor/Indicator	Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No of Items
Organisational Resilience Measurement Tool	0.950	.954	53
Adaptive Capacity Factor	.945	.907	33
Silo Mentality	.761	.774	4
Capability and Capacity of Internal Resources	.719	.752	3
Staff Engagement and Involvement	.707	.707	2
Information and Knowledge	.749	.754	5
Leadership, Management and Governance Structures	.832	.831	6
Innovation and Creativity	.724	.733	3
Devolved and Responsive Decision Making	.727	.735	3
Internal & External Situation Monitoring & Reporting	.821	.824	7
Planning Factor	.903	.907	10
Planning Strategies	.677	.681	4
Participation in Exercises	.791	.794	3
Proactive Posture	.703	.705	5
Capability and Capacity of External Resources	.739	.739	4
Recovery Priorities	.819	.817	4

Note: An alpha of 0.7 or more indicates an acceptable reliability

6.5 Theoretical Evaluation of the Resilience Measurement Tool

As discussed in Section 6.3, the new model of organisational resilience developed through this thesis defines organisational resilience as comprised of two dimensions; adaptive capacity and planning. This is a simpler structure than was expected based on the literature review, however it pulls together a theme that has run through the research; anticipation vs. resilience, planning vs. adaptation; this was discussed in Section 2.5. In hindsight the link between organisational resilience and a strategy that combines adaptive capacity and planning is not so unexpected. Table 6.41 demonstrates this and summarises a number of studies which measure resilience or related concepts in organisations. It shows that each of the studies incorporates measures of planning or anticipation, adaptation or resilience, or both.

Table 6.41: Incorporation of Adaptation and Planning in the Literature Measuring Organisational Resilience or Related Concepts

Source	Measurement Instrument	Adaptation/ Resilience	Planning/ Anticipation
Mitroff (1989)	Crisis-prone vs. Crisis-prepared Organisations A variety of measurement instruments used to assess four factors – plans, policies and mechanisms, infrastructure, rationalisations, and denial	*	*
Hurley-Hanson (2006)	Organisational Responses and Adaptations After 9/11 A survey measuring five factors – crisis planning and communication, employee safety and security, resilience, descriptors, losses from the terrorist attack	*	*
Wreathall (2006)	Measure of Organisational Resilience A tool which measure seven factors – top management commitment, just culture, learning culture, awareness, preparedness, flexibility and opacity	*	*
Fowler et al. (2007)	Organisational Preparedness for Coping with a Major Crisis A 21 item scale which focuses on planning, security and stability, and access to information		*
Carmelli and Schaubroeck (2008)	Organisational Preparedness and Learning from Crises A 24 item scale measuring seven factors – crisis preparedness, learning behaviours from failures, perceived organisational performance, industry technological risk, organisation size, organisation age and crisis experience		*
Antonsen (Antonsen, 2009)	Safety Culture Survey A 20 item survey used to measure safety culture on an oil and gas platform focusing on open communication of both good and bad news, prioritisation of safety, awareness of risks and ability and willingness to report mistakes or problems	*	
Somers (2009)	Organisational Resilience Potential (ORPS) Scale Six factors – goal-directed solution seeking, risk avoidance, critical situation understanding, ability to fill multiple roles, reliance on information sources, access to resources	*	*

Note: Sources are listed in chronological order. The items or factors of measurement instruments are classified as either adaptation/resilience or planning/anticipation based on which factor they would align to within the new model of organisational resilience developed through this thesis.

In relation to the strategies observed in the organisations that took part in the Auckland study conducted through this thesis, different organisations did appear to pursue different strategies; either anticipation or adaptation. This is discussed in more detail in Chapter 7.

Gown (1991, p. 443) discusses strategic postures and how “*Differences in strategic posture call for different attitudes and behaviour regarding the tracking of environmental information*”. Here Gown suggests that the different strategic approaches result in a variety of different behaviours and emphasises a link between strategic postures and the tracking of environmental information. The hypothesised models of organisational resilience tested through this thesis incorporated the tracking and understanding of environmental information within one of the proposed indicators of situation awareness. During the analysis discussed in Chapter 6, this dimension was not disregarded, but redistributed between the two remaining dimensions; adaptive capacity and planning. This again suggests that the theme of anticipation vs. adaptation is central to organisational resilience. Indicators that were pulled from the situation awareness dimension into either the adaptive capacity or planning dimension included:

- Adaptive capacity
 - Understanding and awareness of hazards and consequences
 - Informed decision making
- Planning
 - Recovery priorities

In addition some of the indicators were split up, with some items being pulled into adaptive capacity and some into planning, these included:

- Roles and responsibilities
- Connectivity awareness
- Internal and external situation monitoring and reporting

In the same way the proposed resilience ethos dimension was also redistributed between the two dimensions. Items referring to organisational culture and learning were pulled

into the adaptive capacity dimension and items referring to commitment and understanding the organisation as part of a network were pulled into the planning dimension. Through this process each of McManus's (2007) original dimensions, as well as the additional dimension of organisational resilience were actually incorporated into the new model, just within a different factor structure.

6.6 Additional Hypotheses Resilience

This section presents the results and discussion of the additional hypotheses outlined in Section 4.2.3.

Pearson's correlation is a measure of the strength of association between two or more variables, and is used a number of times throughout the following sections. The correlation produces two pieces of information which are important for evaluating the strength of the relationship between the two variables; the correlation coefficient, and the significance.

The correlation coefficient (sometimes referred to as Pearson's r) is expressed as a number from -1 to +1, with the extremes representing a strong positive or negative relationship, and values closer to 0 representing a weaker relationship (Bryman & Bell, 2007). As an example, a strong positive relationship between two variables of 0.847 would indicate that a large amount of the variance in variable A, can be explained by variable B. The r value can also identify the percentage of variance in A which is explained by B; this is calculated as $r^2 \times 100$. In the example, this means that Variable B would explain 72% of the variance in Variable A ($0.847^2 \times 100$).

The significance of the relationship is also an important factor, and indicates the level of confidence in the relationship that has been demonstrated. This describes how generalisable the results of the correlation are to the sample population. In this thesis, a high level of confidence means that the result can be generalised to Auckland organisations. Confidence levels are represented by a number and the closer that the number is to 0, the more significant the result. For example a significance of 0.05 means

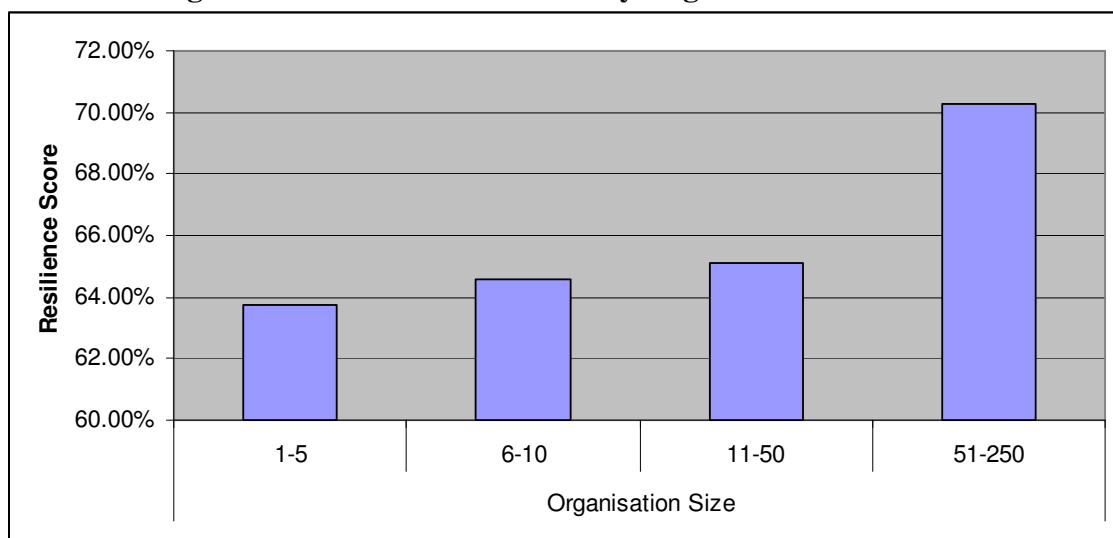
that the results achieve a 95% level confidence and that there is only a 5% chance that the result could have occurred by accident or randomly (Bryman & Bell, 2007).

6.6.1 Resilience and Organisation Size

Hypothesis 5: Larger organisations will not achieve higher resilience scores.

Literature discussed in Section 4.2.3 reviews the argument that larger organisations will achieve a higher resilience score and presents hypothesis 5 as a null hypothesis. Chart 6.2 shows organisations' resilience scores by organisation size (number of employees). This rejects hypothesis 5 and shows that, for the sample of Auckland organisations that took part in this research, larger organisations achieved slightly higher resilience scores. The average resilience score for the organisations employing 1-5 members of staff was 63.72% and the average resilience score for organisations employing 51-250 members of staff was 70.25%. This represents a difference of just 6.53%.

Chart 6.2: Organisational Resilience Scores by Organisation Size



Note: Organisation size refers to the number of employees

Chart 6.2 categorises organisations according to their size and refers to the average resilience score for each size category. When relying on an average value it is possible that results can be misleading. To address this, Pearson's correlation of the relationship between organisations' resilience scores and organisation size is shown in Table 6.42.

Table 6.42: Organisation Resilience and Organisation Size

	Organisational Resilience	
Organisation Size (number of full time staff)	Pearson's Correlation	.298*
	Sig. (2-tailed)	.040
	N	68

* Correlation is significant at the 0.05 level (2-tailed)

Table 6.42 shows that the relationship between organisational resilience and organisation size achieves an r value of .249 which suggests that 6% of the variance of an organisation's resilience can be explained by its size (number of staff). This is a weak relationship but in the context of resilience scores and organisation size, it is expected that other variables, as presented in this thesis, also influence resilience alongside organisation size.

The relationship between resilience and organisation size is also significant to 0.04. This means that the confidence level is 96% and that there is only a 4% chance that the relationship observed happened by accident. This also rejects hypothesis 5 and shows that the relationship, although small, is statistically significant with 95% confidence.

These results do not imply causality or mean that an organisation's size protects it from crises, as described by Mitroff et al (1989) in their discussion of faulty organisational assumptions. However, it does indicate that larger organisations achieve slightly higher resilience scores. Reasons for this could include:

- Larger organisations have more resources and better cash flow planning (Charitou, et al., 2004)
- Larger organisations have access to a wider network of industry connections
- Smaller organisations have a high rate of failure (Richardson, et al., 1994)

6.6.2 The Value of Plans

Hypothesis 6: Organisations that have a plan will not be more resilient.

Literature discussed in Section 4.2.3 reviews the argument that organisations that develop an emergency, crisis or business continuity plan will achieve a higher resilience

score. Table 6.43 shows the results of a Pearson's correlation between organisations' resilience, whether or not they have a plan, and the perceived quality of that plan.

Table 6.43: Organisational Resilience, Having a Plan and Plan Quality

	Organisational Resilience	
	Does your organisation have a written crisis, emergency or business continuity plan?	Pearson's Correlation
Sig. (2-tailed)		.052
N		68
Is your organisations plan of a sufficient quality to be useful during an emergency?	Pearson's Correlation	.539**
	Sig. (2-tailed)	.007
	N	24

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 6.43 shows that there is a weak relationship between organisations' resilience and whether or not they have a plan (.237 or about 6%). However, this relationship is not significant and so cannot be generalised to organisations outside of the 68 participants as it does not have a high enough level of confidence. This supports hypothesis 6 and suggests that organisations that have a plan are not necessarily more resilient. However, the relationship between having a plan and resilience is only 0.002 outside of the 0.05 threshold which would provide a higher level of confidence. Further research with a larger sample may be able to demonstrate a stronger relationship.

Participants in the research, who stated that their organisation did have a plan, were also asked whether those plans were of sufficient quality to be useful in an emergency or crisis. Table 6.43 also shows the Pearson's correlation between organisational resilience and the quality of plans. This achieved an r value of .539 which suggests that 29% of the variance of an organisation's resilience (for those organisations that have a plan), can be explained by the quality of their emergency, business continuity or crisis management plan. This provides support for further research which might reject hypothesis 6, and reflects the literature reviewed in this thesis.

The relationship between the quality of organisations' plans and organisations' resilience is also significant at the 0.05 level with 95% confidence which means that it can be generalised to Auckland organisations.

6.6.3 Resilience and Crisis Experience

Hypothesis 7: Organisations that have experienced a crisis and survived will not be more resilient.

Literature discussed in Section 4.2.3 reviews the argument that organisations that have experienced a crisis will achieve a higher resilience score. In total, 76 participants that took part in this study identified that their organisation had experienced a crisis in the last 5 years. This represents a very small sample and so these results are presented here for exploratory purposes only, and should be investigated further.

Table 6.44 shows the results of a Pearson's correlation between organisations' resilience, and whether or not they have experienced a crisis in the last 5 years. This achieved an r value of .254 which rejects hypothesis 7 and suggests that 6% of the variance of an organisation's resilience is explained by their experience of crisis in the last 5 years. This relationship is also significant at the 0.01 level which means that it has a high level of confidence and could be generalised to Auckland organisations.

Participants were also asked about the severity of the crisis experienced by their organisation and the relationship between resilience and crisis severity was tested. This achieved an r value of .012 which suggests that there is very little, if any, relationship between the severity of crises experienced by organisations and their resilience.

Table 6.44: Organisational Resilience, Crisis Experience and Crisis Severity

	Organisational Resilience	
Has your organisation experienced a crisis in the last 5 years?	Pearson's Correlation	.254**
	Sig. (2-tailed)	.000
	N	206
On the scale shown please rate the severity of the crisis	Pearson's Correlation	.012
	Sig. (2-tailed)	.919
	N	76

** Correlation is significant at the 0.01 level (2-tailed)

6.6.4 The Role of Exercises in Resilience

Hypothesis 8: Organisations that achieve a higher score for the participation in exercises indicator will not achieve a higher resilience score.

Literature discussed in Section 4.2.3 reviews the argument that organisations that achieve a higher score for the participation in exercises indicator will also achieve a higher overall resilience score. Hypothesis 8 is a null hypothesis of this.

Table 6.45 shows the results of a Pearson's correlation between organisational resilience and organisation's score for the participation in exercises indicator (see Section 6.3.1.10 for a discussion of this indicator). This relationship achieved an r value of .723 which suggests that 52% of the variance of an organisation's resilience can be explained by the organisation's score for the participation in exercises indicator. This relationship is also significant at the 0.01 level which means that it can be generalised to Auckland organisations. This rejects hypothesis 8, and in future research it will be interesting to investigate whether this is confirmed, or whether it is the result of the additive model of resilience used in this thesis which produces composite score through averaging.

Table 6.45: Organisational Resilience and Participation in Exercises

	Organisational Resilience	
Participation in Exercises Indicator	Pearson's Correlation	.723**
	Sig. (2-tailed)	.000
	N	68

** Correlation is significant at the 0.01 level (2-tailed)

6.6.5 Resilience and Organisational Performance

Hypothesis 9: Organisations achieving a high resilience score will not achieve high scores for indicators of organisational performance.

Literature discussed in Section 4.2.3 reviews the argument that organisations that achieve a higher resilience score will also achieve a high score for indicators of organisational performance. Table 6.46 shows the Pearson's correlation between organisational resilience, and each of the organisational performance questions that for-profit organisations were asked. The shaded rows on Table 6.46, highlight organisational performance measurements where the level of confidence in the relationship shown means that it can be generalised to Auckland organisations. These include:

- Number of full time staff (organisation size) – this was discussed in relation to hypothesis 5
- Cash flow
- Use of a staff satisfaction survey
- Profit to sales ratio (profitability)
- Return on investment

Table 6.46: Organisational Resilience and Organisational Performance (For-profit-organisations only)

	Organisational Resilience	
Does your organisation have external directors on its governing board?	Pearson's Correlation	.090
	Sig. (2-tailed)	.497
	N	59
How many full time people work for your organisation?	Pearson's Correlation	.298*
	Sig. (2-tailed)	.022
	N	59
How many locations or sites does your organisation have within New Zealand?	Pearson's Correlation	.048
	Sig. (2-tailed)	.718
	N	58
What is your organisation's average annual staff turnover, over the last 5 years?	Pearson's Correlation	-.076
	Sig. (2-tailed)	.572
	N	58
Does your organisation have back-up IT facilities?	Pearson's Correlation	.127
	Sig. (2-tailed)	.338
	N	59
If your building or work area was inaccessible due to physical damage or a hazard, where would you relocate to?	Pearson's Correlation	.126
	Sig. (2-tailed)	.343
	N	59
How would you rate your organisation's cash flow?	Pearson's Correlation	.404**
	Sig. (2-tailed)	.002
	N	59
Has your organisation used a staff satisfaction survey or assessment within the last 2 years?	Pearson's Correlation	.283*
	Sig. (2-tailed)	.030
	N	59
What is your organisation's average annual sales growth rate over the last 5 years?	Pearson's Correlation	.159
	Sig. (2-tailed)	.228
	N	59
What is your organisation's average annual profit to sales ratio over the last 5 years?	Pearson's Correlation	.326*
	Sig. (2-tailed)	.012
	N	59
What is your organisation's average annual return on investment over the last 5 years?	Pearson's Correlation	.384**
	Sig. (2-tailed)	.003
	N	59
What is your organisation's debt to equity ratio?	Pearson's Correlation	.037
	Sig. (2-tailed)	.779
	N	59

*Correlation is significant to 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

The relationship between an organisation's resilience and its cash flow achieved an r value of .404 which suggests that cash flow explains 16% of the variance of an organisation's resilience. The relationship between an organisation's resilience and its use of a staff satisfaction survey achieved an r value of .283 which suggests that use of a staff satisfaction survey explains 8% of the variance of an organisation's resilience. The relationship between an organisation's resilience and its profit to sales ratio achieved an r value of .326 which suggests that profitability explains 11% of the variance of an organisation's resilience. The relationship between an organisation's resilience and its return on investment achieved an r value of .384 which suggests that cash flow explains 15% of the variance of an organisation's resilience.

The r values for these variables are slightly low, but still significant, and the levels of confidence are very high. It is likely that, given a larger sample, the r values would increase to further suggest strong links between organisational resilience and cash flow, profitability and return on investment. This rejects hypothesis 9 and identifies the indicators of organisational performance, within this sample, that are linked to organisational resilience. However, it is important to note that all of these relationships require more investigation to examine the relationship between the r values and sample size, and that a Pearson's correlation and its significance do not imply causality.

Alongside the 59 for-profit organisations that took part (1 for-profit organisation failed to provide results for the organisational performance questions); a further 8 not-for-profit organisations also took part in the research. Table 6.47 shows the Pearson's correlation between organisational resilience and each of the organisational performance questions that not-for-profit organisations were asked. The shaded row highlights that there is a very high r value and a high level of confidence for the relationship between organisational resilience and use of a staff satisfaction survey within not-for-profit organisations. However, given that only 8 not-for-profit organisations took part in this study, more research and testing is needed to support an argument for a significant relationship between organisational resilience and organisational performance in not-for-profit organisations.

Table 6.47: Organisational Resilience and Organisational Performance (Not-for-profit Organisations Only)

	Organisational Resilience	
	Does your organisation have external directors on its governing board?	Pearson's Correlation
	Sig. (2-tailed)	.346
	N	8
How many full time people work for your organisation?	Pearson's Correlation	.487
	Sig. (2-tailed)	.221
	N	8
How many locations or sites does your organisation have within New Zealand?	Pearson's Correlation	.203
	Sig. (2-tailed)	.629
	N	8
What is your organisation's average annual staff turnover, over the last 5 years?	Pearson's Correlation	.199
	Sig. (2-tailed)	.637
	N	8
Does your organisation have back-up IT facilities?	Pearson's Correlation	.295
	Sig. (2-tailed)	.478
	N	8
If your building or work area was inaccessible due to physical damage or a hazard, where would you relocate to?	Pearson's Correlation	.420
	Sig. (2-tailed)	.300
	N	8
How would you rate your organisations cash flow?	Pearson's Correlation	.140
	Sig. (2-tailed)	.741
	N	8
Has your organisation used a staff satisfaction survey of assessment in the last 2 years?	Pearson's Correlation	.875**
	Sig. (2-tailed)	.004
	N	8
By how much on average, has your organisation's income budget increased each year, over the last 5 years?	Pearson's Correlation	-.130
	Sig. (2-tailed)	.759
	N	8
What is your organisation's average operating surplus as a percentage of its total income over the last 5 years?	Pearson's Correlation	-.367
	Sig. (2-tailed)	.418
	N	7

** Correlation is significant at the 0.01 level (2-tailed)

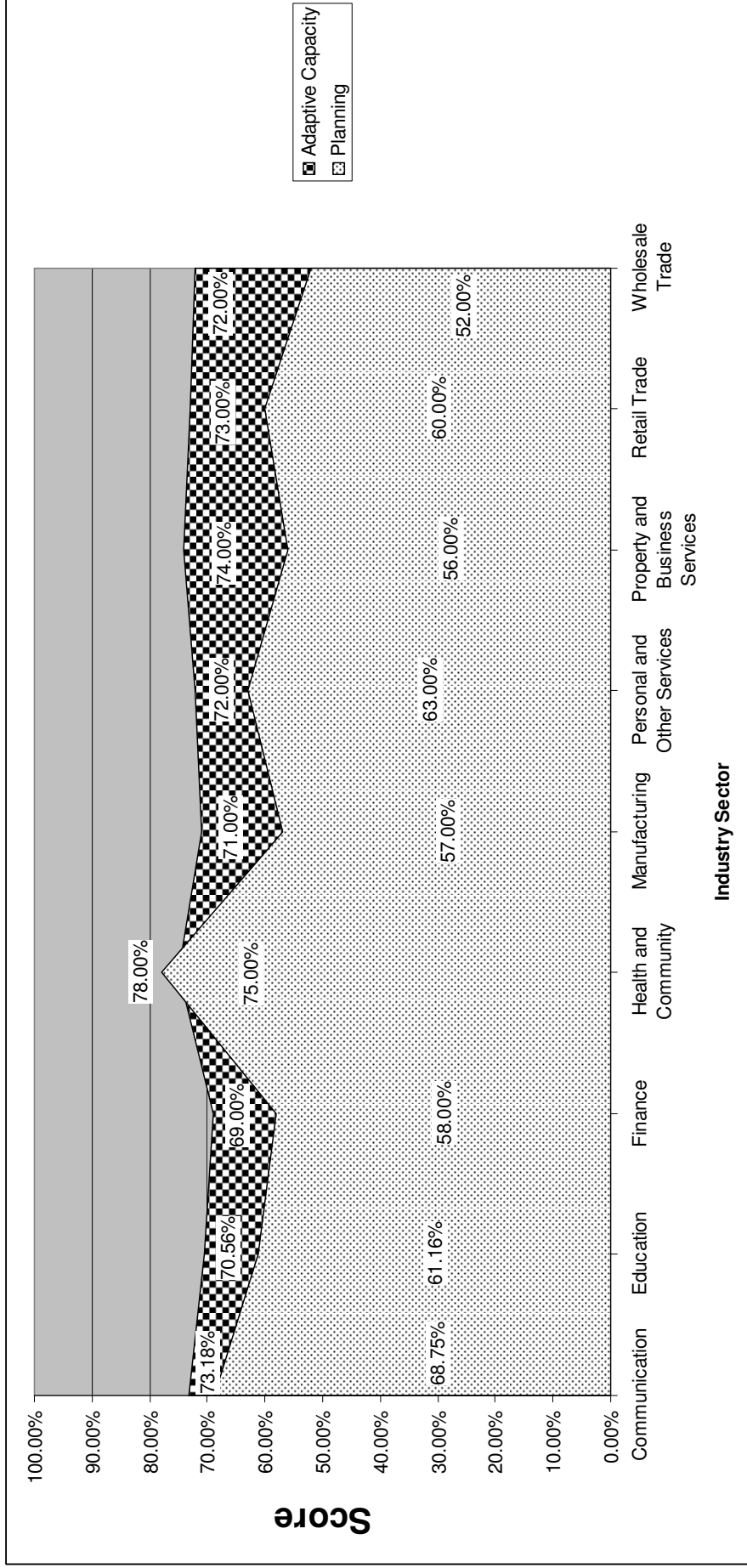
Chapter 7 – Evaluating the Resilience of Organisations in Auckland

This chapter uses the data gathered through the resilience measurement tool to calculate and evaluate the resilience of the Auckland organisations that took part in the study. Results are discussed in relation to the resilience of the community of organisations that took part as a whole, the various industry sectors represented, and the individual organisations that took part. A discussion of the outputs and usefulness of the tool for organisations is also included in this chapter.

7.1 Approaches to Resilience

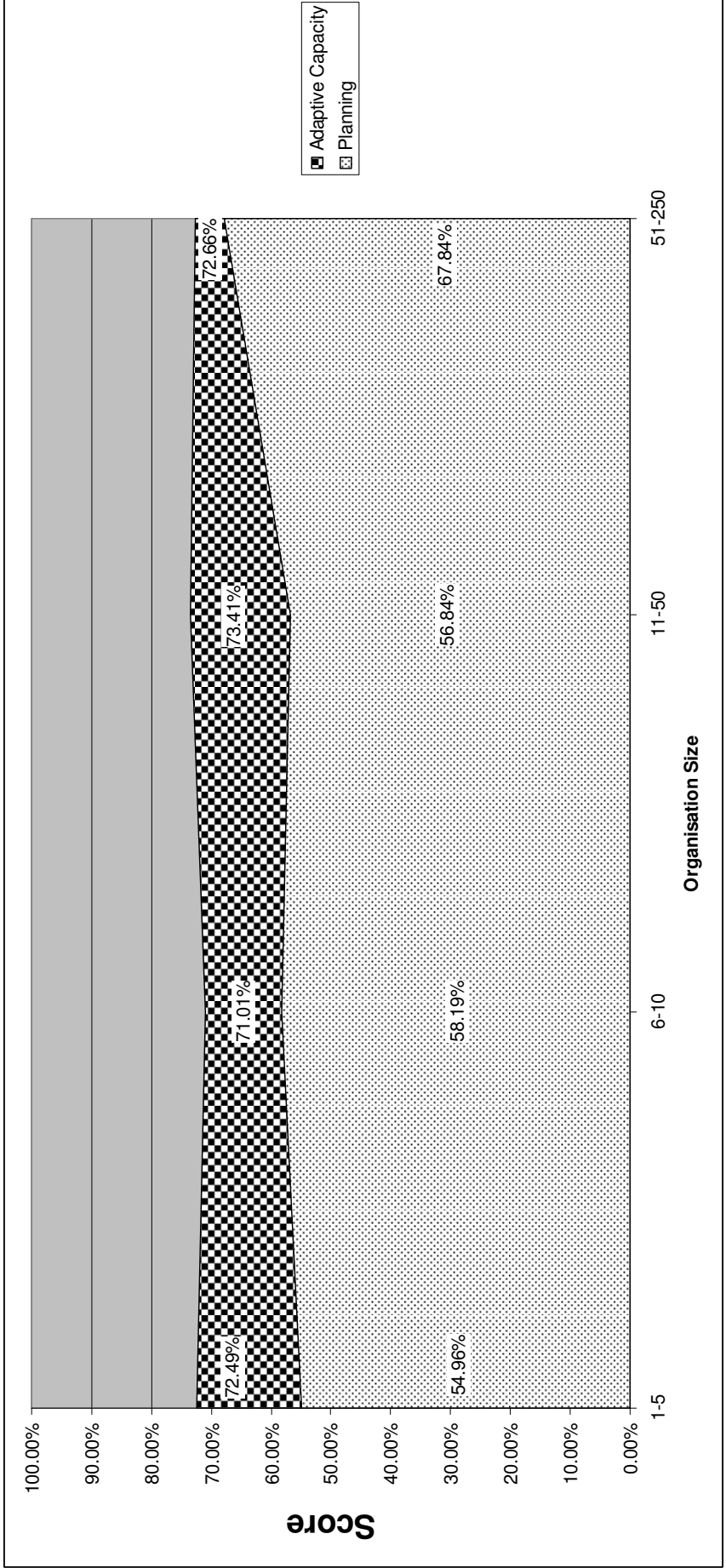
As discussed in Section 6.3 the new model of organisational resilience developed through this thesis suggests that organisational resilience is comprised of 2 dimensions, adaptive capacity and planning. Chart 7.3 shows organisations' approach to resilience by industry sector, i.e. whether industry sectors focus more heavily on adaptive capacity or planning. It shows that the majority of industry sectors focus more heavily on their adaptive capacity than on formal planning activities. The exception to this is the health and community sector that focus much more heavily on planning than any other sector and yet still achieve high adaptive capacity scores. Chart 7.4 shows organisations' approach to resilience by organisation size, i.e. whether different size organisations focus more heavily on adaptive capacity or planning. It shows that the largest organisations focus more heavily on planning than smaller organisations.

Chart 7.3: Approaches to Resilience by Industry Sector



Note: Only those industry sectors where 2 or more organisations took part are shown.

Chart 7.4: Approaches to Resilience by Organisation Size



Industry sector scores for the adaptive capacity and planning dimensions, and scores by organisation size are averages of the scores for organisations within each industry sector or size category. Averaging these results may remove subtle differences between the organisations and is affected by extreme values. To examine this, Chart 7.5 and Chart 7.6 show scatter graphs of all organisations' scores for adaptive capacity and planning. Table 7.48 also provides the mean, maximum, minimum and standard deviation for each dimension. Chart 7.5 shows that the majority of organisations' scores for adaptive capacity fall between 60-90%. However Chart 7.6 shows that organisations' scores for the planning dimension fall between 40-80%; this is also shown in Table 7.48.

Chart 7.5: All Organisations' Scores for Adaptive Capacity

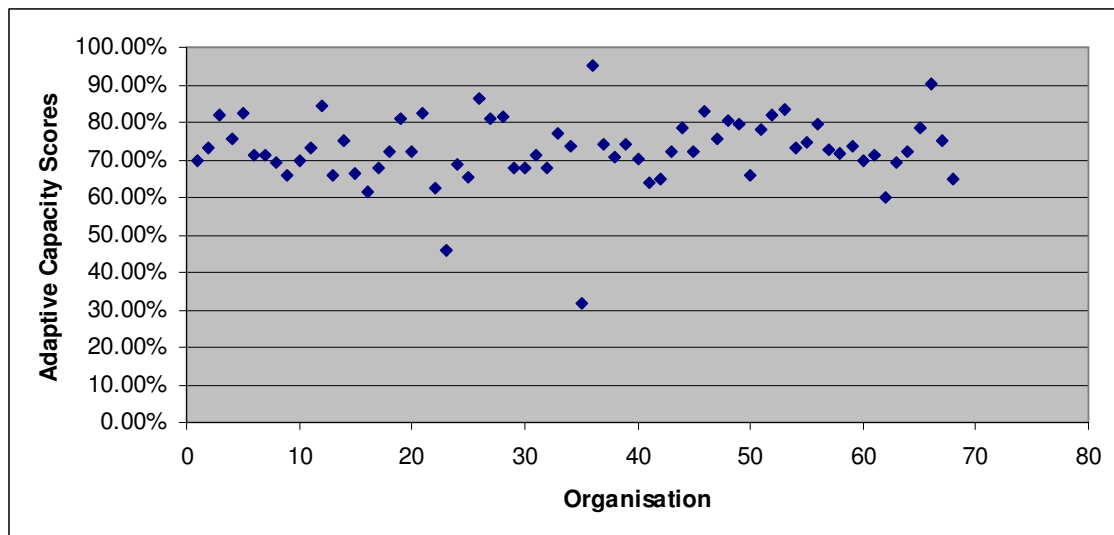


Chart 7.6: All Organisations' Scores for Planning

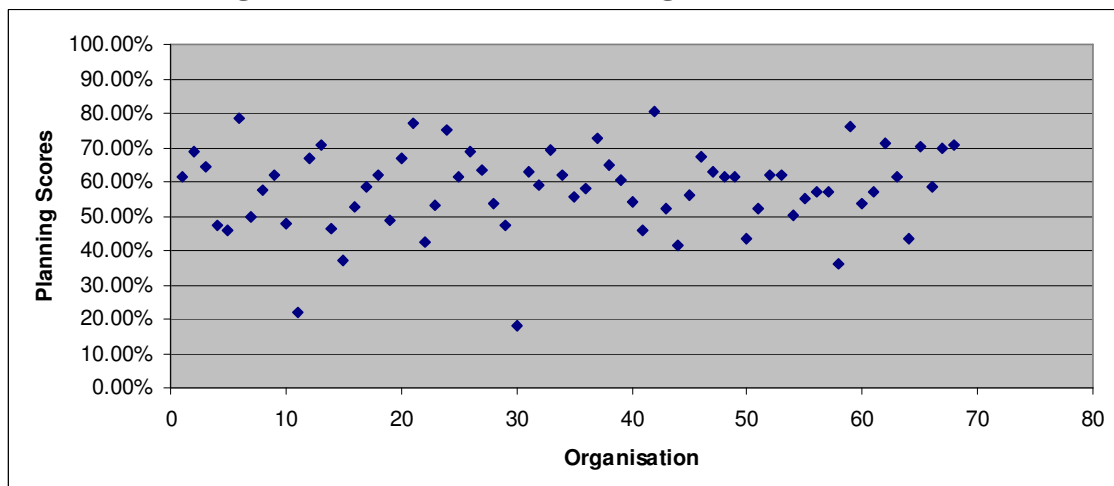


Table 7.48: Descriptive Statistics for the Dimensions of Organisational Resilience

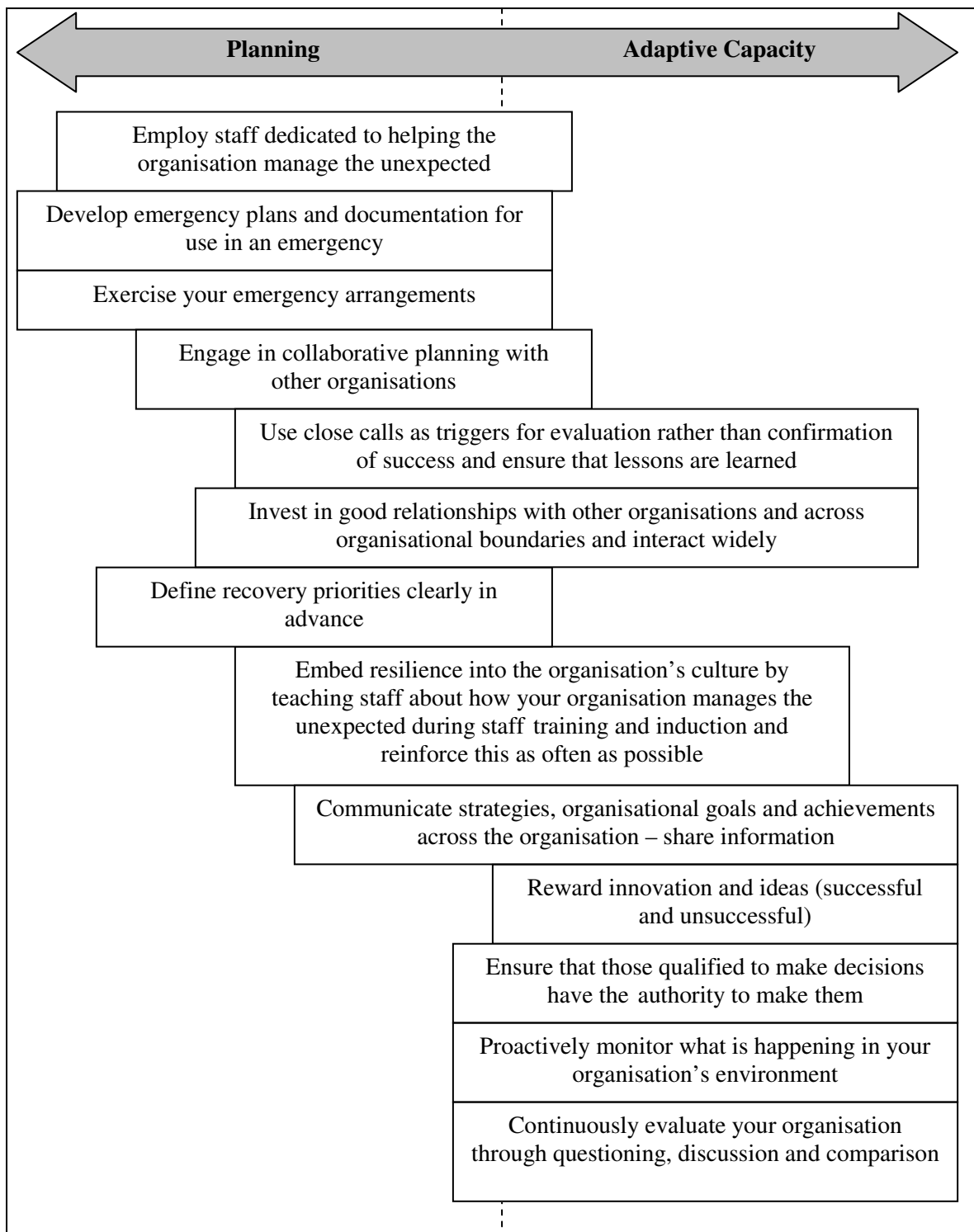
Statistic	Adaptive Capacity	Planning
Mean	72.66%	57.80%
Maximum	95.07%	80.34%
Minimum	31.47%	17.92%
Standard Deviation	9.22%	12.06%

This supports the conclusion that, within this sample, organisations' adaptive capacity is relatively consistent between organisations in comparison to their planning. The data presented above also supports the conclusion that organisations in Auckland generally focus more heavily on their adaptive capacity than on their planning. However it is not yet known whether this is a conscious decision or whether this is a natural tendency.

Government organisations traditionally focus their advice on encouraging businesses to plan for crises and emergencies. However if organisations draw more heavily on their adaptive capacity for resilience, government organisations may benefit from adjusting the advice that they offer. If some organisations connect more and cope better with adaptive capacity driven strategies, then perhaps promoting adaptive capacity strategies is most likely to encourage them to address their resilience.

From this research it is unclear whether there is a causal relationship between planning and adaptive capacity, i.e. whether planning itself can actually increase adaptive capacity in some cases. Despite any possible link between the two dimensions, resilience strategies can be classified along a continuum from planning approaches to more adaptive capacity orientated approaches. Figure 7.33 provides some examples of this.

Figure 7.33: Approaches to Resilience and their Associated Strategies



Note: The strategies shown as planning orientated or adaptive orientated have been developed from the indicators and model of organisational resilience. This does not mean, for example, that an adaptive organisation does all adaptive strategies well.

7.2 Overall Resilience in Auckland

The average Auckland scores for the dimensions and indicators of organisational resilience and overall resilience are shown in Table 7.49; definitions for the indicators are shown in Appendix D10. Table 7.50 shows the number of organisations that scored within each score boundary. These boundaries were developed as relative levels to help organisations gauge or benchmark their resilience scores in relation to the others that took part, and are defined in Appendix E1. Table 7.50 shows that only 1 organisation achieved an *excellent* overall resilience score and the majority of organisations achieved a *fair* score.

Table 7.49: Average Auckland Scores for the Dimensions and Indicators of Organisational Resilience

Indicator		Mean (SD)
Adaptive Capacity	Silo Mentality	73% (12%)
	Capability & Capacity of Internal Resources	71% (12%)
	Staff Engagement & Involvement	72% (13%)
	Information & Knowledge	71% (11%)
	Leadership, Management & Governance Structures	70% (12%)
	Innovation & Creativity	72% (15%)
	Devolved & Responsive Decision Making	75% (13%)
	Internal & External Situation Monitoring & Reporting	77% (10%)
	Overall Adaptive Capacity	73% (9%)
Planning	Planning Strategies	46% (18%)
	Participation in Exercises	57% (18%)
	Proactive Posture	70% (13%)
	Capability & Capacity of External Resources	52% (14%)
	Recovery Priorities	65% (14%)
	Overall Planning	58% (12%)
Overall Organisational Resilience		65% (8%)

Note: Percentages are rounded to the nearest whole number

Table 7.50: Number of Organisations Scoring within each Score Boundary

Organisational Resilience Score Boundaries	Number of Organisations
Excellent (81-100%)	1
Good (73-80%)	11
Fair (57-72%)	46
Poor (49-56%)	7
Very Poor (0-48%)	3
Total	68

Note: This is based on organisations' overall scores and many organisations did achieve excellent scores in individual indicators.

7.2.1 Resilience Strengths in Auckland

Two particular strengths which came out in the overall Auckland results were internal and external situation monitoring and reporting (77%), and devolved and responsive decision making (75%).

The **internal and external situation monitoring and reporting** indicator is designed to measure how an organisation learns about the world around it. This could include market research, evaluation of competitors, political and regulatory awareness, and financial trends. Through monitoring internal and external environments, organisations can pick up on weak signals. Weak signals are the early warning signals that occur as a crisis begins to evolve. The signals are referred to as weak because they can often be misinterpreted or overlooked. These signals are often picked up by ‘front line’ staff but are rarely reported and this can lead to a crisis developing undetected. Mitroff (2001, p. 102) describes this and notes,

“...in many cases, the signals are weak and filled with noise. Nonetheless, it usually turns out that there is at least one person in every organisation who knows about an impending crisis. The problem is that those who often know most about it are the ones who have the least power to bring it to the attention of the organisation”.

Here Mitroff emphasises not only the importance of detecting the signals but also of importance of enabling the organisation to distribute and share that information. Within the Auckland organisations taking part in this study, the ability to monitor the business environment and report critical information is a particular strength. To maintain this strength it is important that organisations prioritise environmental and business landscape scanning and that all staff are encouraged (and rewarded) to report potentially critical information.

The **devolved and responsive decision making** indicator is designed to measure how flexible the decision making structure and process is within an organisation. This flexibility and responsiveness plays a key role in the organisations adaptive capacity. Weick and Sutcliffe (2007) refer to this as deference to expertise and argue that the

person most qualified to make a decision should make it regardless of seniority. Bigley and Roberts (2001) discuss a fire department and describe how an incident command structure enables firemen to oscillate between pre-planned and improvised responses during crisis situations. Devolved and responsive decision making that is applicable to both crisis and business-as-usual situations works in the same way. During business-as-usual, controls on decision making may be more centralised and hierarchical. However once the organisation moves into 'crisis mode' the decision making structure should morph into one which clarifies which 'experts' (this could include front line staff) should be involved in that decision making based on expertise and knowledge rather than rank. This flexible decision making structure is then a tool which the organisation can use under a variety of different circumstances such as responding to rapid market changes, or addressing systemic problems in organisations' customer relations.

7.2.2 Resilience Weaknesses in Auckland

Two particular weaknesses which came out in the overall Auckland results were planning strategies (46%) and capability and capacity of external resources (52%).

Of the 68 organisations that took part in this study, 53 scored *poorly* or *very poorly* on the **planning strategies** indicator; the Auckland average for this indicator is 46% (very poor). The planning strategies indicator is designed to measure how an organisation plans for crises and the approach taken to this planning. Questions relating to this indicator focus on whether or not organisations have an emergency, crisis or business continuity plan and the quality of plans, as well as their general approach to planning.

Organisations also scored poorly on **capability and capacity of external resources** with only 3 organisations scoring *good* or *excellent*. This indicator is designed to measure organisations' ability to access and mobilise resources from outside of their organisation in the event of a crisis. Questions relating to this indicator focus on the ability of staff to access external resources, whether or not the organisation has agreements in place which will facilitate access or sharing of resources between organisations, and whether or not an organisation sees itself as a source of resources for the community during and immediately after a crisis.

7.3 Resilience of Industry Sectors in Auckland

Table 7.51 provides a summary of organisations' scores for the dimensions and overall resilience by industry sector. Graphs showing the average scores for the individual indicators of organisational resilience for each of the industry sectors can be seen in Appendix E2.

Table 7.51: Organisations Score for the Dimensions and Overall Resilience by Industry Sector

	Adaptive Capacity Mean (SD)	Planning Mean (SD)	Overall Resilience Mean (SD)
Communications	78% (6%)	69% (0%)	73% (3%)
Education	71% (1%)	61% (6%)	66% (4%)
Finance and insurance	68% (3%)	58% (4%)	63% (1%)
Health and community	75% (13%)	78% (4%)	76% (5%)
Manufacturing	71% (11%)	57% (12%)	64% (11%)
Personal and other services	72% (7%)	63% (12%)	68% (7%)
Property and business services	74% (11%)	56% (12%)	65% (11%)
Retail trade	73% (1%)	60% (13%)	66% (7%)
Wholesale trade	72% (9%)	52% (14%)	62% (10%)

Note: Percentages are rounded to the nearest whole number

7.3.1 The Most Resilience Sector – Health and Community

The health and community sector includes organisations such as hospitals, doctors' surgeries, clinics, aftercare services and community care providers; 24 individuals from 2 of these organisations took part in this research. This sector achieved the highest overall average resilience score (76%); however organisation scores for individual indicators within this sector ranged from 59-96%. The health and community sector provides a good example of a set of organisations that draw more equally from the planning (78%) and adaptive capacity (75%) dimensions. However the strongest indicators within this sector are planning strategies (86%) and proactive posture (80%) which are both planning indicators. This reflects earlier discussion in Section 7.1 of how the health and community sector focuses more heavily on a planning orientated approach to resilience. This sector has a strong ability to develop formalised emergency plans and arrangements as well as a commitment to resilience and an awareness of resilience issues.

The weakest indicators for the health and community sector are capability and capacity of external resources (69%) and innovation and creativity (72%). Despite these being the lowest scores for this sector they are still rated as *fair*. The capability and capacity of external resources indicator is designed to measure how well an organisation can access external resources during a crisis. One of the characteristics of an organisational crisis is being overwhelmed and having a lack of resources; this makes the ability to access external resources critical for response and recovery. Innovation and creativity is also an important factor in navigating challenges during the response. This could include developing new ways of working at short notice to achieve objectives such as cutting through red tape to access resources, thinking of new solutions to existing problems, and developing ways to apply existing processes to new situations.

7.3.2 The Least Resilient Sector – Wholesale Trade

The wholesale trade sector can include organisations such as wholesale commercial premises and warehouses; 55 individuals from 9 of these organisations took part in this research. This sector achieved the lowest overall resilience score (62%); however organisations scores for individual indicators within this sector ranged from 8-100%. The wholesale trade sector provides a good example of a set of organisations that show a very sharp contrast between their planning (52%) and adaptive capacity (72%) indicators. The strongest indicators within this sector are internal and external situation monitoring and reporting (78%) and devolved and responsive decision making (77%) which are both indicators of adaptive capacity. This means that they are relatively good at scanning their business environment for signals of potential crises and distributing this knowledge across the organisation. This is a significant strength as it should help to ensure that organisations are able to deal with problems before they escalate into crises.

The weakest indicators within this sector are planning strategies (43%) and capability and capacity of external resources (46%) which are both indicators of planning. Overall the planning dimension represents a significant weakness for the wholesale trade sector and they should be encouraged to engage in collaborative planning and to assess their supply chain resilience and interdependencies.

7.3.3 The Property and Business Services Sector

The property and business sector includes organisations such as computer repairs and servicing, real estate, internet service providers and other corporate services; 82 individuals from 25 of these organisations took part in this research. Results for this sector are discussed in this section because they achieved the highest response rate (25 organisations); it is also the largest industry sector in Auckland (Statistics New Zealand, 2009).

In general this sector focuses more heavily on its adaptive capacity than its planning. This was reflected in the sectors' results which are shown in Appendix E2; however they also achieved a better balance between the two dimensions than other sectors such as wholesale trade. The strongest indicators within this sector are internal and external situation monitoring and reporting (78%), minimisation of silo mentality (76%), and devolved and responsive decision making (76%) which are all adaptive capacity indicators. This means that the property and business services sector are relatively good at developing and maintaining situation awareness across their business environment and are able to use and share the information to make decisions responsively.

The weakest indicators within this sector are planning strategies (44%) and capability and capacity of external resources (50%) which are both planning indicators. This means that although organisations in the sector may have thought about the resources they might need to access during a crisis they have not yet planned to ensure that access is available. This sector also lacks clear planning strategies because existing planning arrangements have not been properly formalised or validated.

7.4 Resilience of Organisations

This section presents the resilience profile of the most and least resilience organisations to take part in the Auckland study.

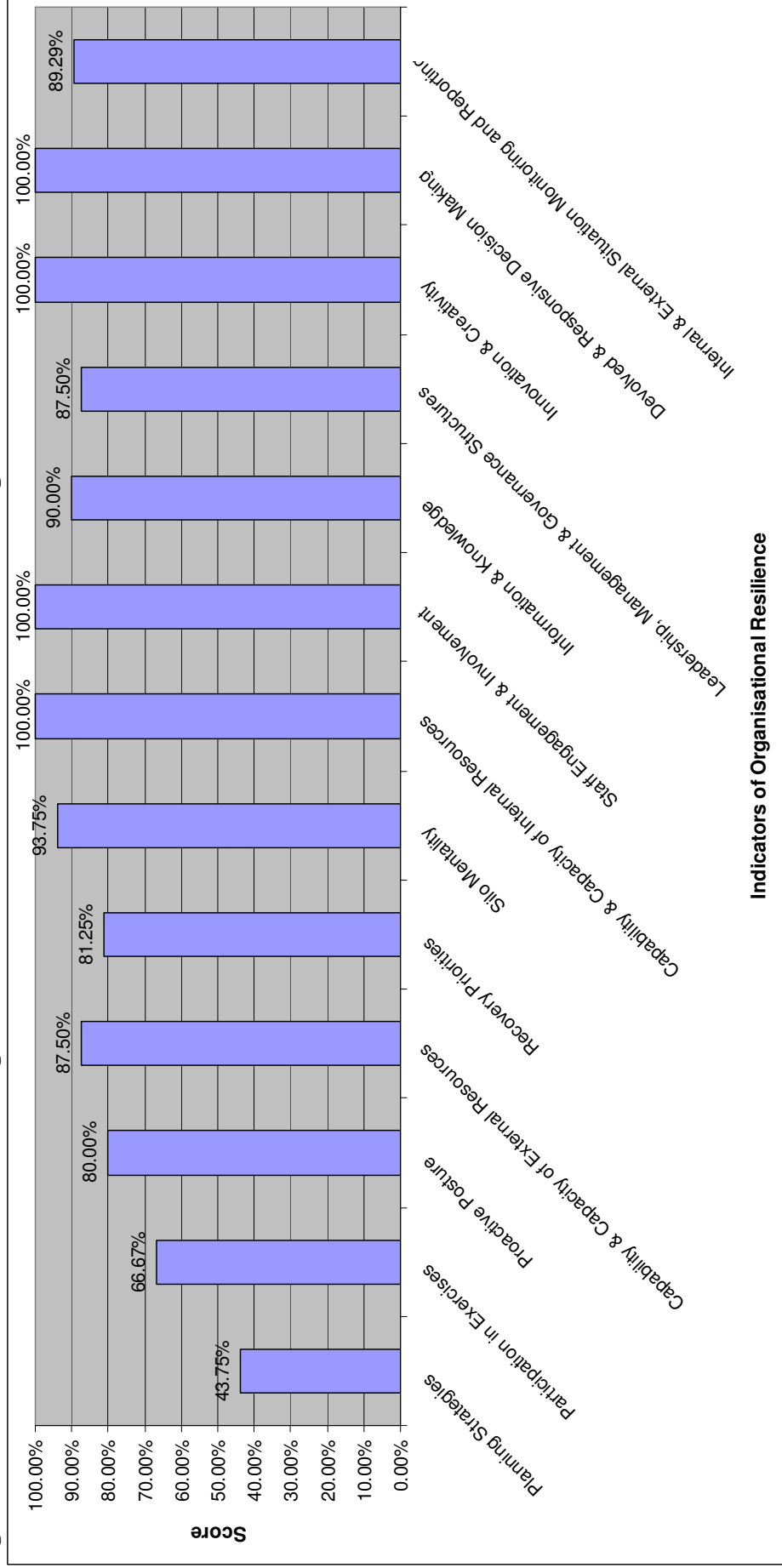
The Most Resilient

The most resilient organisation (referred to as MR) was a branch of a property and business services organisation employing 20 full-time staff. They were the only organisation to achieve an excellent overall resilience score; Figure 7.34 shows their scores for each of the indicators of organisational resilience. MR achieved high scores across the full range of indicators demonstrating that they take a broad holistic approach to resilience.

MR is a highly adaptive organisation which relies on engaged and skilled staff to develop its resilience capabilities. The organisation's resource allocation processes can be adapted to crisis situations and this makes the organisation more agile and responsive. Staff develop innovative solutions to complex problems based on their expertise and creativity. This enables the organisation to respond more effectively to crises and could also help the organisation to remain more competitive during business-as-usual. The organisation's decision making structure values expertise and decisions are made based on knowledge and experience as opposed to hierarchical position. This means that MR staff are more likely to address problems before they escalate, however it is important to ensure that all staff have an appreciation of other decision making criteria such as business goals, mission and values. Staff are also able to communicate across organisational, social and cultural barriers, or silos. This is important because it means that the organisation can work more effectively, that information is shared more equally, and that the organisation's culture is an asset for the organisation.

MR's weaknesses stem from a relative lack of formal planning, including the development and documentation of response arrangements. While MR's planning is still classified as good, the organisation should further involve staff in developing and documenting response arrangements and workarounds. This can provide benefits including integrating existing response arrangements across the organisation, and identifying potential gaps, conflicts and key dependencies. The organisation does not test or exercise its response arrangements. This means that staff do not have the opportunity to practice their response to crises and that the organisation's plans are not evaluated in the context of lessons learned. This could mean that the organisation's existing response arrangements are not 'fit for purpose' or that staff have not received the necessary training to action existing response arrangements.

Figure 7.34: Scores for the Indicators of Organisational Resilience for the Most Resilience Organisation



Indicators of Organisational Resilience

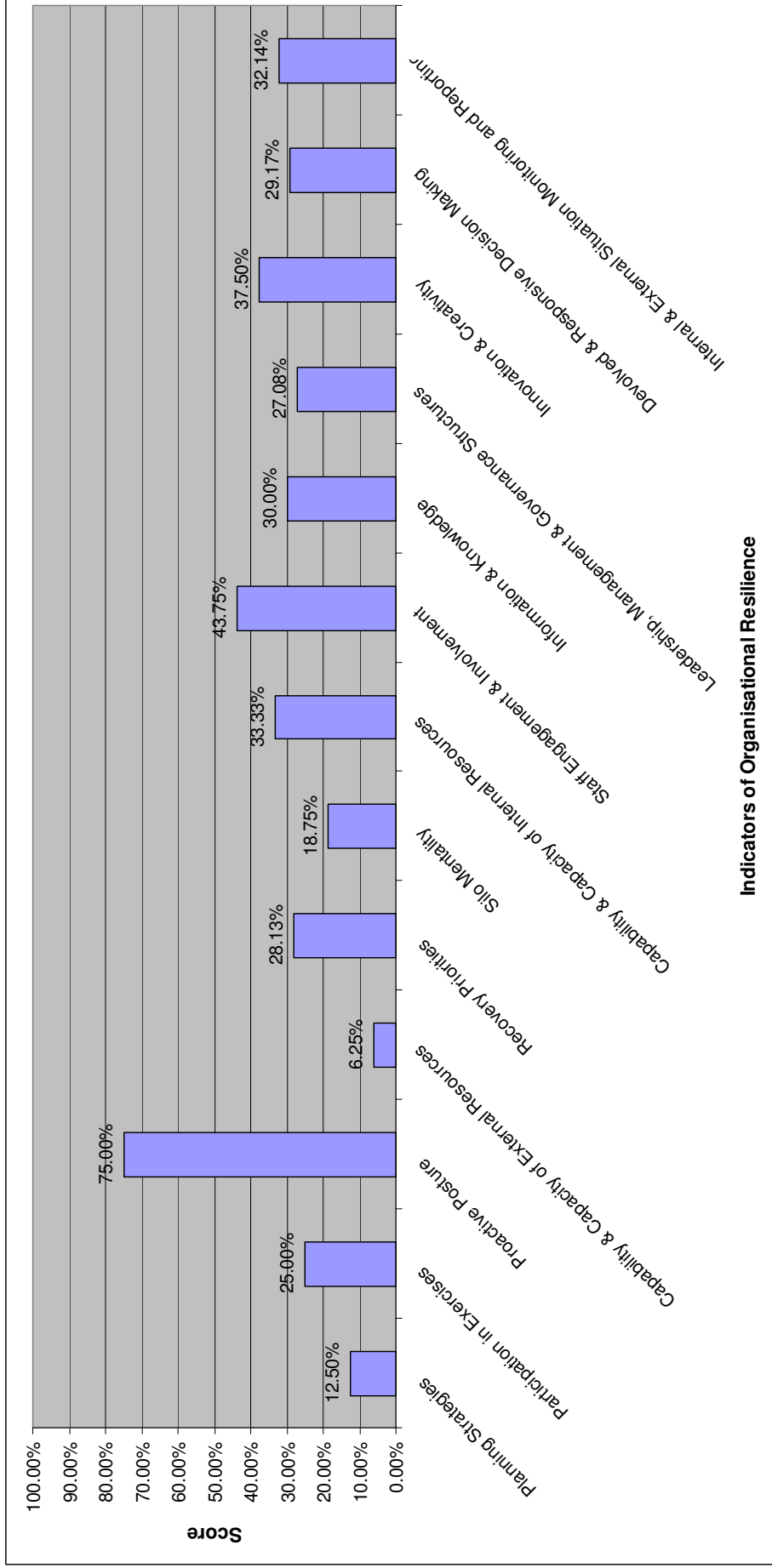
The Least Resilient

The least resilient organisation (referred to as LR) was a small property and business services organisation employing 5 people. Figure 7.35 shows their scores for each of the indicators of organisational resilience. LR achieved low scores across the majority of indicators with the exception of the proactive posture indicator. This suggests that while the organisation is focused on being resilient, they have yet to invest the resources or commitment required to achieve this.

LR's resilience strengths lie in its focus on responding to the unexpected. However scores for the other indicators show that staff over estimate the organisation's ability to plan, adapt and respond. The organisation lacks formalised plans and arrangements and relies on the adaptive capacity of staff to help it to respond. However this adaptive capacity is lacking and the organisation needs to try to develop a balanced strategy of both formal planning and increasing adaptive capacity and agility.

The organisation's resilience weaknesses stem from a lack of awareness of resilience issues including the organisation's resource needs. There is also evidence of silos within the organisation. This means that there are organisational, cultural and social barriers which stop staff from communicating and sharing effectively. During business-as-usual these silos can create crises as they stop information about potential threats from being shared or escalated. Silos can also cause the organisation to miss out on opportunities where staff are able to bring potentially positive outcomes to the attention of organisational leaders. During a crisis silos make organisations slow and disable decision making processes. This suggests that silos are not limited to larger organisations. Even in smaller organisations, individuals perform different functions and have different priorities or agendas, and therefore have the potential for silos. It sounds reasonable to assume that people in smaller organisations would find it easier to communicate across boundaries. However, this is determined by organisational culture, and not by size. To address silos, LR could focus on engaging staff, increasing awareness of resilience issues and identifying minimum operating requirements and resources. Once the organisation is aware of its resource needs and interdependencies, they could also choose to develop memorandums of understanding with suppliers to ensure supply of resources during and after a crisis.

Figure 7.35: Scores for the Indicators of Organisational Resilience for the Least Resilient Organisation

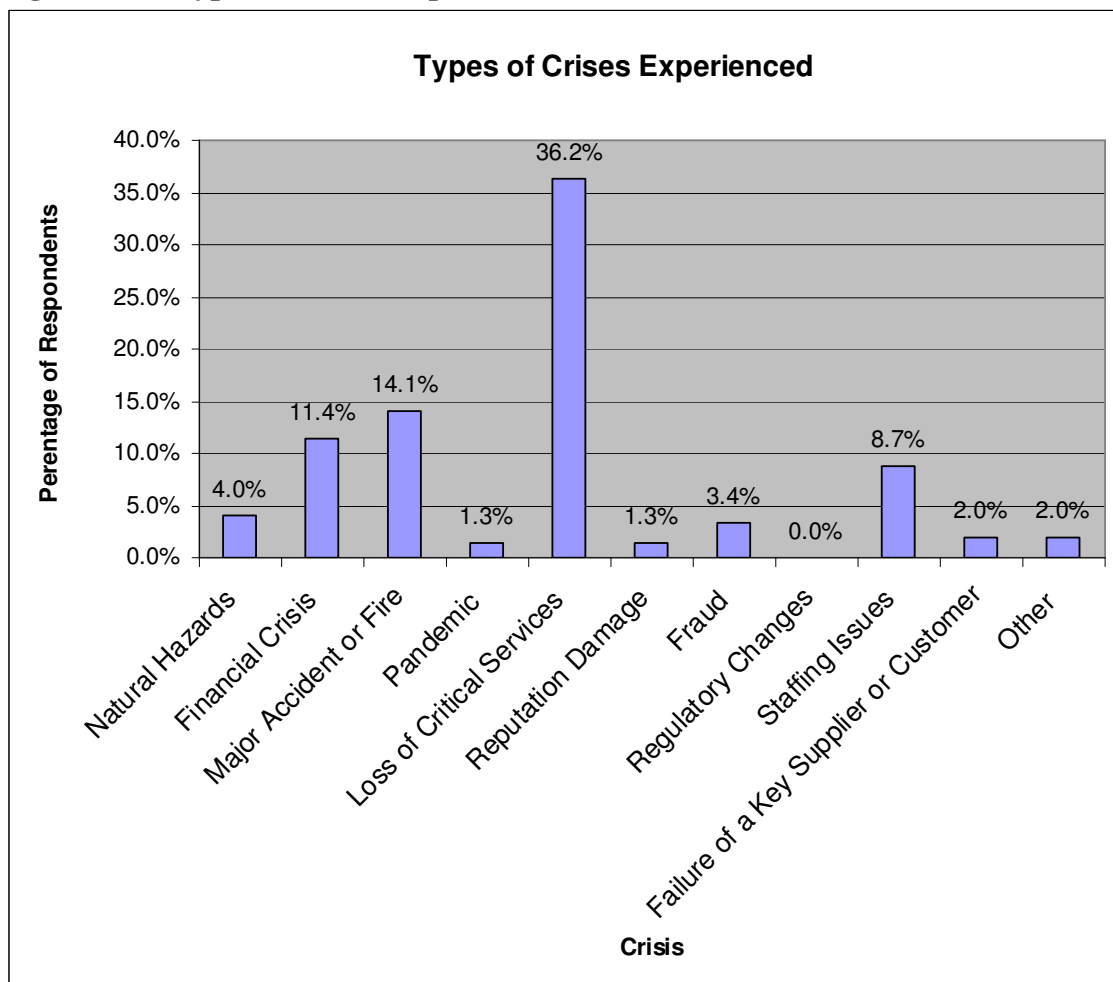


Indicators of Organisational Resilience

7.5 Crises in Auckland over the Last 5 Years

The resilience measurement tool also asks individuals whether their organisation has experienced a crisis within the last 5 years. Employees from 28 (41%) of organisations said that their organisation had experienced a crisis within the last 5 years. The types of crisis experienced are shown in Figure 7.36 which shows that most crises experienced were critical infrastructure failures, namely power cuts. Perhaps more surprisingly, major accidents and fires were also identified.

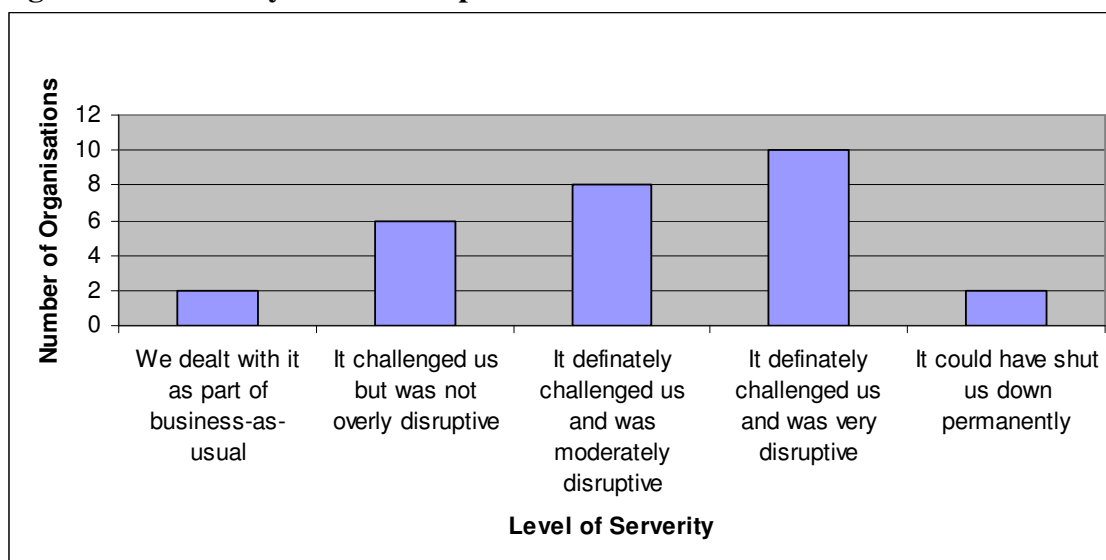
Figure 7.36: Types of Crises Experienced



Note: Some organisations had experienced more than 1 crisis over the last 5 years – this is included in this figure.

Participants were then asked about the severity of the crises they experienced; Figure 7.37 shows these results. The majority of organisations were challenged but not significantly disrupted by the crises they experienced.

Figure 7.37: Severity of Crises Experienced



NB: Where an organisation experienced more than one crisis, the severity rating given by the senior manager is shown.

7.6 Anecdotal Evidence

The last question in the resilience measurement tool gives individuals the opportunity to pose a question they felt was not addressed in the survey and then answer it. Many participants used this feature to voice their concerns about the way their organisation plans for and manages uncertainty; these are summarised in the list below.

- A lack of succession planning
- A lack of discussion and knowledge of emergency roles and responsibilities
- A lack of training in emergency roles and responsibilities
- A lack of understanding of the organisation's strategic and tactical emergency management, planning and structures
- A lack of information sharing about emergency management activities across the organisation
- How the organisation will communicate with their staff during emergencies

- How the organisation will communicate with other organisations (e.g. customers, suppliers, Government) during emergencies
- Job security during and after crisis
- Lack of consultation on emergency management issues – a top down approach
- What would happen in our community in an emergency – what would they want from us?
- If we had to relocate, where would we go?
- Role conflict in an emergency
- Lack of access, for general staff members, to emergency plans and arrangements – we've been told they exist but nobody has shown them to us

7.7 Improving Resilience in Auckland

Organisations play a critical role in communities planning for, responding to and recovering from disasters. Without resilient organisations, communities are less resilient.

The differences in approaches to resilience between organisations should be considered when developing resilience advice. The results of this research indicate that the majority of organisations in this study draw more heavily on adaptive capacity for their resilience. This is important because the majority of organisations approached through this research had difficulty prioritising resilience or allocating resources to addressing resilience issues. Given these different adaptive capacity and planning focused approaches, organisations' motivation for addressing resilience is also likely to be driven by these different orientations.

For organisations that do not have a legal duty to plan for emergencies, making a business case for resilience and understanding how resilience issues relate to business-as-usual is critical. Communicating with organisations about resilience should focus on what resilience is, why it is important, and what organisations of all types and sizes can do to address their resilience. This information should be tailored according to whether an organisation is likely to be planning orientated or adaptive capacity orientated.

While a focus on formalised planning and exercising should be maintained, the Auckland Civil Defence Emergency Management (CDEM) Group should also encourage organisations to leverage their adaptive capacity strengths. There are eight indicators of adaptive capacity as shown in Table 6.26 which are defined in Appendix D10. Although adaptive capacity often goes unnoticed within an organisation, it is not necessarily effortless, easy or natural. It is therefore important that organisations address their adaptive capacity proactively.

When identifying whether or not their organisation had an emergency plan, participants in this study often disagreed. This indicates silo mentality which means that many staff and managers are not aware that their organisation has plans, or that staff believe that their organisation has plans when it does not. Silo mentality is a social phenomenon that can affect individuals, communities, business units, teams or functions within any group or organisation. It can be created by geographical distance, by being spatially far away from something or someone, but it can also occur between people or groups that share the same office space. Silos are created when physical, cultural, social, or communication barriers isolate or separate people, processes or information in a way that prohibits effective working. In a disaster or crisis situation these barriers rarely disappear as we might hope, but are more often magnified and can cause significant problems (Seville, et al., 2006). Silos cause organisations to lose control and awareness, and they can make organisations slower to respond to information. It is important for organisations to address silos because they significantly impact an organisation's adaptive capacity. While many organisations may have experienced the effect of silos, they may not understand how these could become part of the generation of crises within their organisation.

Many organisations taking part in this study rely on a small group of people with very specific knowledge to 'get the job done'. This is especially true in smaller organisations. Many organisations rely on arrangements developed to manage business-as-usual or small disruptions for also managing larger scale problems and crises. They often assume that their arrangements will scale up and will be applicable to any problem; however this is not necessarily true. Quarantelli (2005) argues that routine emergencies, disasters and catastrophes are qualitatively different. Quarantelli (2005, p. 1) goes on to identify four differences between routine emergencies and disasters at the organisation level:

- In disasters compared to everyday emergencies, organisations have to quickly relate to and communicate with a wider variety of individuals, organisations and groups within a short space of time.
- Organisations have to adjust to a new decision making process, either because they are required to make decisions faster using less information, or because they lose some of their autonomy and control.
- Crisis and disaster situations require faster, more efficient performance. An example of this could be the difference between treating an injury during business-as-usual compared with treating injuries following an earthquake.
- The links between organisations for mobilisation of resources are expected to be quicker in crises and disasters. Organisational stakeholders and the public will expect the organisation to make their response to the crisis or disaster their top priority regardless of what was *planned* for that day.

Organisations should be encouraged to think about how their business-as-usual coping methods would work during a large scale emergency, or during a crisis that lasted longer than expected. The financial crisis is a good example of this situation for many organisations.

Organisations in Auckland should also be encouraged to recognise their place as part of a network of organisations. No organisation can operate in isolation; each will need suppliers, customers, consumers, service users etc. This includes not only investigating their interdependencies but also increasing and improving their level of collaborative planning. In particular each industry sector needs to be aware of the role it could play in helping communities and the economy to recover in local, regional and national emergencies. This is not only limited to those organisations traditionally seen as contributing to the response such as emergency services, transport and governance, but includes all organisations as employers and providers of goods and services which is what will really enable communities to recover.

7.7.1 Leveraging Strengths in Auckland

The Auckland organisations taking part in this research scored particularly well in the internal and external situation monitoring and reporting, and devolved and responsive decision making indicators. It is important that organisations not only focus on addressing their weaknesses but also leverage off of their strengths in order to maintain and increase their resilience.

As the economic and population centre of New Zealand, organisations in Auckland are well placed to be proactive about managing emergencies and crises. However organisations' experience of crises in the last 5 years indicates that the majority of organisations have little recent experience of anything other than financial turmoil, and power cuts. While this bodes well for organisations' ability to avoid crises where possible, it does mean that organisations in this area do not have much experience of what a large scale disaster or crisis, such as a natural disaster, would mean for them.

Internal and External Situation Monitoring and Reporting

The ability of organisations in Auckland to monitor their internal and external environment for signals of opportunities and potential threats is critical given this lack of experience. Although a volcanic eruption or earthquake, for example, may be difficult to miss, there are a host of secondary consequences for organisations from any crisis. One example is how an organisation could significantly grow their market share if they were positioned correctly to provide their product or service quicker and more effectively than anyone else following a disaster. A resilient organisation would also be able to see opportunities to transform their organisation to better suit a new environment.

To make the most of this strength, Auckland organisations need to make sure that they monitor the internal and external environment and that their reporting and information sharing practises are continuously reviewed. It is also critical that organisations recognise that 'near misses', (where an organisation either succeeds or gets by, but only just) is not confirmation of their abilities or of success, but is a signal for them to review their practices. Organisations should always aim to learn lessons, not only from crises, but near misses as well (Weick & Sutcliffe, 2007).

Devolved and Responsive Decision Making

Devolved and responsive decision making, how flexible organisations' decision making structures and processes are, is critical for adaptive capacity. This often involves a culture where autonomy and authority to make decisions, including allocation of resources, adjusts depending on the situation. This is important for situations where top management may be unavailable or where middle managers may need to purchase extra equipment or authorise overtime to enable continuity of operations and minimise disruption.

Many organisations may have these arrangements in place on an informal basis however it is essential that everyone in the organisation understands these procedures, what triggers them and exactly what they can and cannot do. This scaling of authority and processes also extends to other duties such as communicating with the media, opening or closing sites, locations or facilities, and how and when to communicate sensitive information.

For some organisations, for example those operating in hazardous environments, some processes such as health and safety checks may be changed during periods of stress or crises in order to prevent accidents. This too needs to be addressed in advance of a crisis so that proper training and information can be provided. Far from only relying on predetermined arrangements, discussion of these problems will not only enable creativity and innovation during the response but will also highlight existing problems and contradictions.

7.7.2 Addressing Weaknesses in Auckland

Planning Strategies

The Auckland organisations taking part in this study scored poorly on the planning strategies indicator. This is in part due to the silo mentality discussed earlier, where not every member of the organisation is aware of the organisation's emergency arrangements. However this in itself is not necessarily an indication of poor resilience. It is not always necessary for every member of the organisation to know the emergency arrangements in depth, however it should be recommended that every member of staff is

introduced to the arrangements and involved in arrangements which directly link with either their role or something on which their role directly relies or reports to. It should be emphasised that this is applicable to all organisations regardless of their industry sector or size.

Despite the different approaches to resilience previously discussed, it is important for organisations to engage in formal planning. The production of an emergency plan does not necessarily increase an organisations' resilience however the lessons learned from the planning process should feed into the culture of the organisation. Formal planning also increases the organisations awareness of the risks in its business environment, including interdependencies. Collaborative planning, planning done in conjunction with other organisations, can also be very useful in enabling organisations to increase their resilience.

Capability and Capacity of External Resources

Auckland organisations scored poorly on capability and capacity of external resources. This indicator measures how well organisations can access resources from outside of their organisation during a crisis. This could include existing contracts for rented vehicles, plant and equipment as well as temporary or contract staff.

To address this, organisations should complete an analysis of existing contracts to identify dependencies e.g. suppliers, temporary contract staff, rented vehicles and plant etc. They can then use memorandums of understanding (MOUs) to make arrangement to ensure continuity of supply. Multi-agency exercises would help organisations to familiarise themselves with the needs of their sector. They should also identify maximum tolerable periods of disruption given current resources.

7.8 Conclusions about the Resilience of Organisations in the Auckland Region

The purpose of this section is to answer research question 3:

What conclusions can be drawn from the data about the resilience of organisations in the Auckland Region?

All of the organisations that took part in this research received a results report. Reports included a summary of their results, discussion of their strongest and weakest resilience indicators, and a comparison between their scores and the average scores for their industry sector and Auckland as a whole. For these organisations this represents a real opportunity to assess their resilience so that they can identify how resilient they are and then map a path to becoming more resilience which is efficient and effective for them.

As discussed in Section 6.1 the sample for this research is relatively small. This means that conclusions on the resilience of the organisations that took part in this research cannot be generalised to Auckland as a whole. However, together with the reasons for non-response, they do provide an indication of trends likely to be evident across Auckland which can be investigated further.

While a random sample of organisations was necessary for this study and will be necessary for confirmatory studies, future research using the tool need not necessarily be constrained by this. All organisations participating in this research provided positive feedback on the tool and the results provided. This indicates that the main challenge is convincing organisations that their resilience is worth investigating. Once they have the results they are then empowered to take action, however longitudinal study is required to assess how organisations are using the results, if at all.

Chapter 8 – The Resilience Benchmarking Methodology

This chapter presents the benchmarking methodology which has been developed through this thesis to guide the application and use of the resilience measurement tool. Part of the purpose of this research was to develop a resilience benchmarking methodology; this answers research question 4 – what is a suitable benchmarking methodology for organisational resilience?

8.1 The Development of the Resilience Benchmarking Methodology

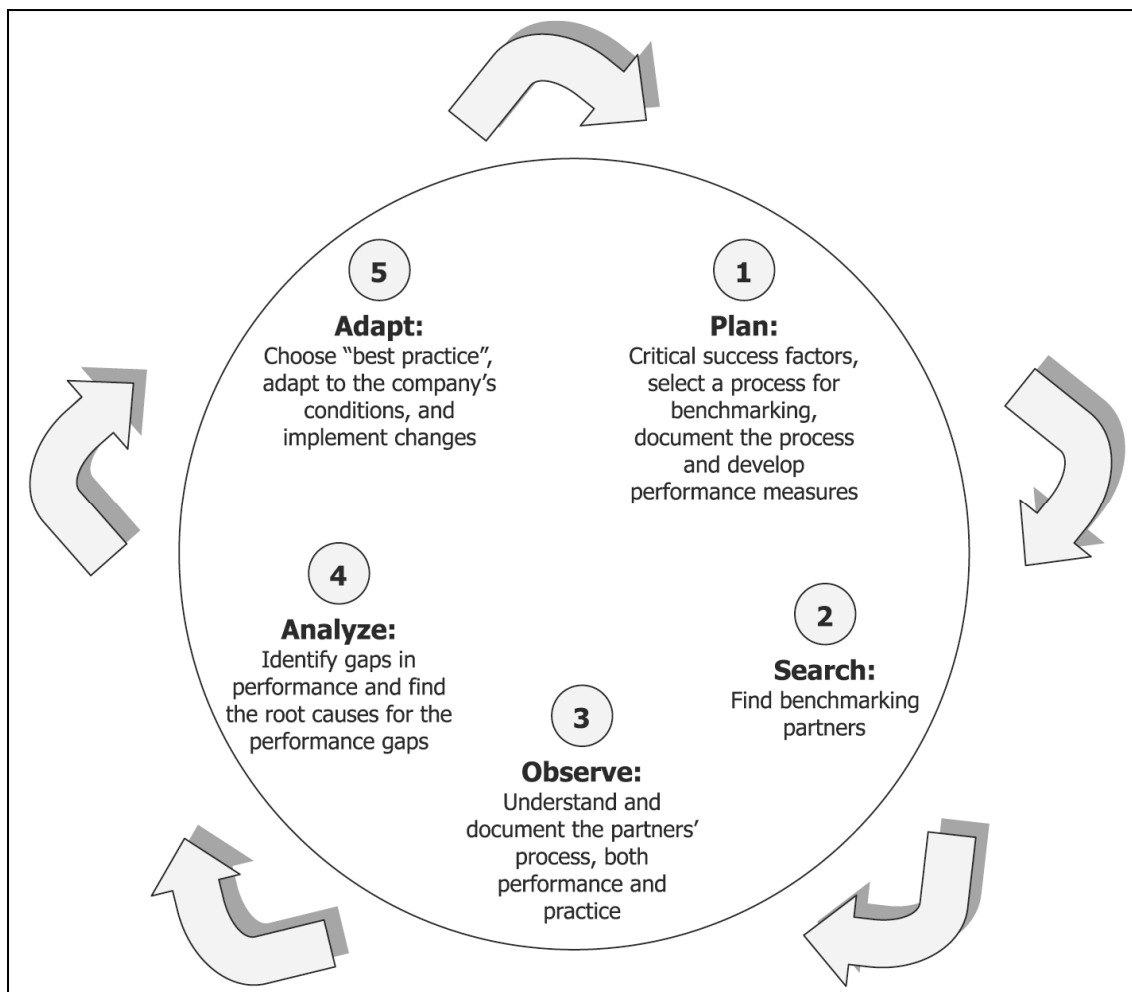
As a first step in developing the resilience benchmarking methodology, possible criteria for the methodology were examined and a set of five criteria were developed. As the benchmarking methodology is designed to guide the use of the resilience measurement tool, it was determined that the benchmarking methodology should:

- Encompass the common steps or stages found in existing benchmarking models
- Be complimentary to business continuity and emergency management models
- Provide organisations with information on their resilience strengths and weaknesses which can feed directly into a business case for resilience
- Demonstrate a change in trends and scores if used over time
- Be able to contribute towards assessing an organisation's resilience maturity

8.1.1 Common Elements of Benchmarking Models

The development of the resilience benchmarking methodology started with a review of current benchmarking models used in organisations; this is shown in Section 2.5.4. Anderson and Pettersen's (1996) benchmarking wheel is presented again here as Figure 8.38 and was found to encompass the stages most common to all benchmarking models (Bhutta & Huq, 1999).

Figure 8.38: The Benchmarking Wheel



(Anderson & Pettersen, 1996, p. 14)

8.1.2 Business Continuity and Emergency Management Models

It is critical that any resilience benchmarking methodology developed through this research compliments existing models of business continuity and emergency management used in organisations. If the methodology conflicts with accepted models, organisations will not easily be able to use it and it will place extra pressure on limited resources. The British Standards Institute defines business continuity management as a,

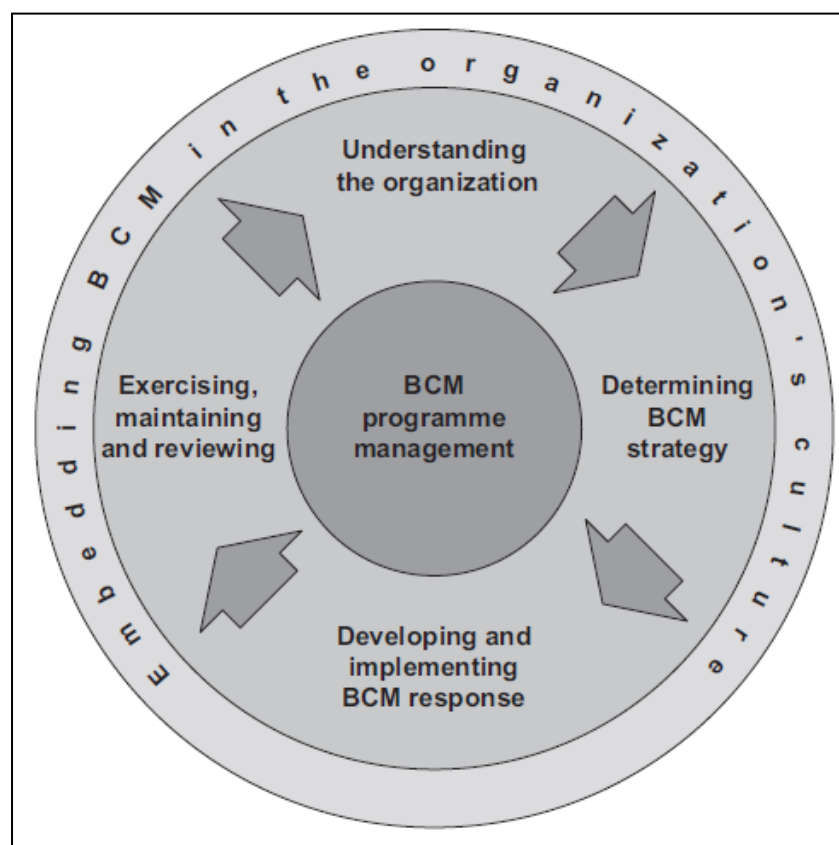
"...holistic management process that identifies potential threats to an organization and the impacts to business operations that those threats, if realized, might cause, and which provides a framework for building organizational resilience with the capability for an effective response that

safeguards the interests of its key stakeholders, reputation, brand and value-creating activities”.

(BSI, 2006, p. 1)

They go on to present the Business Continuity Lifecycle as the process through which organisations should establish and maintain BCM; this is shown as Figure 8.39. The BCM lifecycle includes 6 elements; management of the BCM programme, understanding the organisation, determining BCM strategy, developing and implementing the response, exercising, maintaining and reviewing, and embedding BCM into the organisation’s culture.

Figure 8.39: The Business Continuity Management Lifecycle



(BSI, 2006, p. 9)

Each of the elements of this model makes a contribution to an organisation’s resilience. BCM programme management is the leadership, management and governance which establishes and maintains the BCM programme. This contributes to the organisation’s

resilience by prioritising resilience as a goal, establishing leadership commitment to resilience, and ensuring continuing evaluation of resilience management activities. Understanding the organisation involves developing the BCM programme within the context of the organisation, its core business functions and its operating environment. This element also takes into account an understanding of the organisation's social and cultural characteristics. This enables the organisation to prioritise products, services and resources and to identify the organisation's minimum operating requirements. This feeds directly into the development of BCM strategies to ensure continuity of operations. The development and implementation of a BCM response involves taking actions, as directed by the strategies, and addressing organisational strengths and weakness; this includes developing response and recovery plans.

All of these stages are also reflected in emergency management and disaster models such as the Disaster Cycle (planning/preparedness, mitigation, response, and recovery) and the 4R's used in New Zealand (reduction, readiness, response and recovery). Each of these models broadly encompasses the plan, do, check, act process (Bhutta & Huq, 1999, p. 257). In the context of developing a resilience benchmarking methodology, each of the elements should be considered.

8.1.3 Information for the Business Case for Resilience

To invest in resilience, organisations need to be able to demonstrate a business case for resilience and also for specific resilience investments that is stronger than the case made for other initiatives such as new staff or new equipment. To achieve this it is necessary to investigate the information required to make a good business case and to make sure that the resilience benchmarking methodology can provide as much of this information as possible.

Epstein and Westbrook (2001) discuss the links between customer satisfaction and profit. Through their discussion they present a case study of the Canadian Imperial Bank of Commerce (CBIC) who developed the Action-Profit Linkage (APL) model to help articulate and measure the causal relationships between actions and profit which could inform a business case. This model is based on the belief that profit is driven by

customer behaviour, and links the drivers of customer loyalty to measurable customer loyalty variables. As an example,

“The model helped CIBC managers identify key relationships...they found a 1-point increase in any of the loyalty-behaviour elements increases profits by \$0.60 per month per customer. They also found that a 5% increase in employee commitment yields a 2% increase in customer loyalty, which increases profitability by \$72 million annually”.

(Epstein & Westbrook, 2001, p. 42)

The link between actions and profit is echoed by Collins and Porras (2000) who provide examples of visionary companies who have focused on customer service or organisational culture to increase profitability.

The literature on making a business case specifically for resilience is sparse; however more attention has been paid to making a business case for sustainability. Schaltegger and Wagner (2006) argue that it is possible to create a business case for sustainability. Spirig (2006) argues that competitive advantage can be achieved by communicating *social performance*, this means that if organisations do not communicate their progress towards becoming more sustainable or resilient, they will not achieve any competitive advantage as a result.

Epstein and Roy (2003) examine 20 corporate sustainability reports to investigate whether companies have the information they need to make a business case for sustainability. They go on to discuss a framework to help guide managers in making this business case which provides ideas useful for resilience. Epstein and Roy emphasise the importance of being able to measure the drivers of sustainability performance and argue, *“...managers must quantify how one variable drives another until the link to ultimate corporate financial performance is clear”* (Epstein & Roy, 2003, p. 83). This not only emphasises the importance of measurement, but also of developing a causal model of sustainability that explains the relationships between the drivers and the critical paths within that model to creating greater sustainability. This is also an important consideration for a business case for resilience; a causal model of resilience

would increase understanding of the critical path between resilience investments and resilience performance.

Positioning the drivers of sustainability as inputs to their framework, Epstein and Roy (2003) describe the outputs and make a distinction between intermediate results e.g. improved sustainability, and financial outcomes. Alongside intermediate results and financial outcomes, they also argue that stakeholder reactions should be evaluated as an outcome of investment. Having identified the inputs (the drivers of sustainability) and the outputs (intermediate results, financial outcomes and stakeholder reactions), Epstein and Roy (2003) argue that a feedback process, equivalent to organisational learning and sensemaking, is also a fundamental aspect of their framework. This reflects many models of crisis management which also include the notion of feedback which helps to build situation awareness (Smith, 1990).

In the context of developing a business case for resilience the principles of measuring drivers, evaluating intermediate results, measuring financial outcomes, and evaluating stakeholder reactions, outlined above are useful and are incorporated into the resilience benchmarking methodology. The drivers of resilience and the intermediate results (improvements in resilience) can both be measured using the resilience measurement tool developed through this thesis.

In addition to a general business case for resilience, it is also important for managers to be able to demonstrate a business case for proposed resilience investments. The business case for resilience must be better than the business case for new equipment or new staff. Gambles (2009, p. 1) defines a business case as,

“...a recommendation to decision makers to take a particular course of action for the organisation, supported by an analysis of its benefits, costs and risks compared to the realistic alternatives, with an explanation of how it can best be implemented”.

Gambles (2009) goes on to identify two broad purposes of a business case – decision making and mobilising support. Within each of these he also identifies sub-categories:

- Decision making
 - Enable decision making
 - Meet compliance requirements
 - Secure funding
- Mobilising support
 - Provide a baseline or success criteria for measuring the project
 - Mobilise support
 - Provide a platform for managing the project

Gambles (2009) goes on to present a process for developing business cases to enable decision making and mobilise support which consists of 12 interrelated and overlapping steps.

The IT Toolkit, a website for IT managers and professionals, provides many articles based on practitioner experience, on how to structure a business case. In general they suggest a much simpler process consisting of four key steps; identify the business problem, identify alternative solutions, recommend the preferred solution, and describe the implementation approach (Toolbox for IT, 2006). Step 1, identify the business problem is often neglected when discussing resilience. Although many organisations will agree that they ‘should’ invest in their resilience, they often label it as a luxury (Mitroff, et al., 1989) and have not identified a specific need for resilience investment and so the business case lacks commitment and cost/benefit information. In the context of resilience, business problems could include:

- Unknown level of organisational resilience creating vulnerability and masking potential threats, opportunities, strengths and weaknesses
- Low level of organisational resilience signalling the organisation’s vulnerability to crises
- Known gaps in organisational resilience signalling the organisation’s vulnerability to crises
- A high level of organisational resilience that is not being utilised as a business opportunity

Step 2, identify alternative solutions, involves identifying all possible solutions to the business problems and seeking information on the appropriateness and feasibility of each solution. Step 3, recommend preferred solution, involves presenting the case for the recommended investment to decision makers. This involves actually writing the business case and includes all of the information gathered about the preferred option during Step 2 as well as:

- An overview of the strategy or solution
- A statement of assumptions
- A statement of the feasibility
- Cost benefit information – this can be qualitative and quantitative but should draw on financial data where possible (e.g. costs of previous or likely crises, costs of business disruption, resources required to implement the strategy or solution)
- Identify critical success factors
- Timescale or possible schedule
- Level of commitment required
- Ownership and responsibility

Step 4, describe the implementation approach, involves describing four elements; how the project will be initiated, planned and managed, executed, and evaluated. Initiation involves listing the steps required in initiating the project such as raising awareness and forming a project team. Planning and management involves describing who will manage the project and the budget. Execution involves outlining the actual process or methodology that will be used to deliver increased resilience and financial performance. Evaluation involves describing how the success of the investment will be measured e.g. by re-assessing the organisation's resilience and financial performance after the project and comparing the results. From this discussion the information required to make a business case for resilience can be identified; this is shown in Table 8.52.

Table 8.52: Information Required to Make a Business Case for Resilience Investment

Information	Description
STEP 1 – Identify the Business Problem	
Assessment of organisation’s current level of resilience	These measurements can be used to inform the starting point for resilience investments or strategies for improving organisational resilience. This can be achieved using the resilience measurement tool developed through this research.
Assessment of organisation’s resilience strengths and weaknesses	
Feedback from stakeholders on current level of resilience	The organisation needs to communicate with its internal and external stakeholders to identify whether its level of resilience is appropriate and meets stakeholder’s expectations.
STEP 2 – Identify Alternative Solutions	
An understanding of the causal relationships between indicators of resilience and financial performance	When proposing investments in resilience managers must be able to make a direct link between the problems identified, proposed strategies, and changes in the organisation’s resilience and financial or key performance indicators as a result.
Cost/benefit analysis	To compete against other projects for funding and resources managers need to be able to provide accurate evidence-based assessment of the costs and benefits of proposed resilience investment.
STEP 3 – Recommend Preferred Solution	
Overview of solution	An overview of the preferred solution.
Statement of assumptions	A statement of assumptions built into the process and the solution that is being recommended.
Measurement of financial outcomes	A measure of the organisation’s profitability, return on investment and cash flow (or alternative key performance indicators for not-for-profit organisations).
Cost/benefit analysis	An evidence-based assessment of the costs and benefits of the preferred solution.
STEP 4 – Describe the Implementation Approach	
A measure of an organisation’s resilience after the investment	These measurements can be used to evaluate whether the investment has resulted in increased resilience.
A measure of an organisation’s resilience strengths and weaknesses after the investment	
Measurement of financial and organisational performance outcomes	A measure an organisation’s profitability, return on investment and cash flow (or alternative key performance indicators for not-for-profit organisations) after the investment can be compared with the previous results to determine whether it has improved.
Feedback from stakeholders on level of resilience after the investment	The organisation needs to communicate with its internal and external stakeholders to identify whether its level of resilience, after the investment, is appropriate and meets stakeholder’s expectations.

8.1.4 Changes in Resilience and Resilience Maturity

In order to create a business case for resilience is it important to understand how the organisation's resilience changes over time. This will enable organisations to demonstrate improvements in resilience from one investment cycle to the next. One example of a very simple way for an organisation to track their resilience over time is shown in Appendix F1. This resilience tracker is a chart on which organisations can mark their scores for each iteration of the tool and then review their progress.

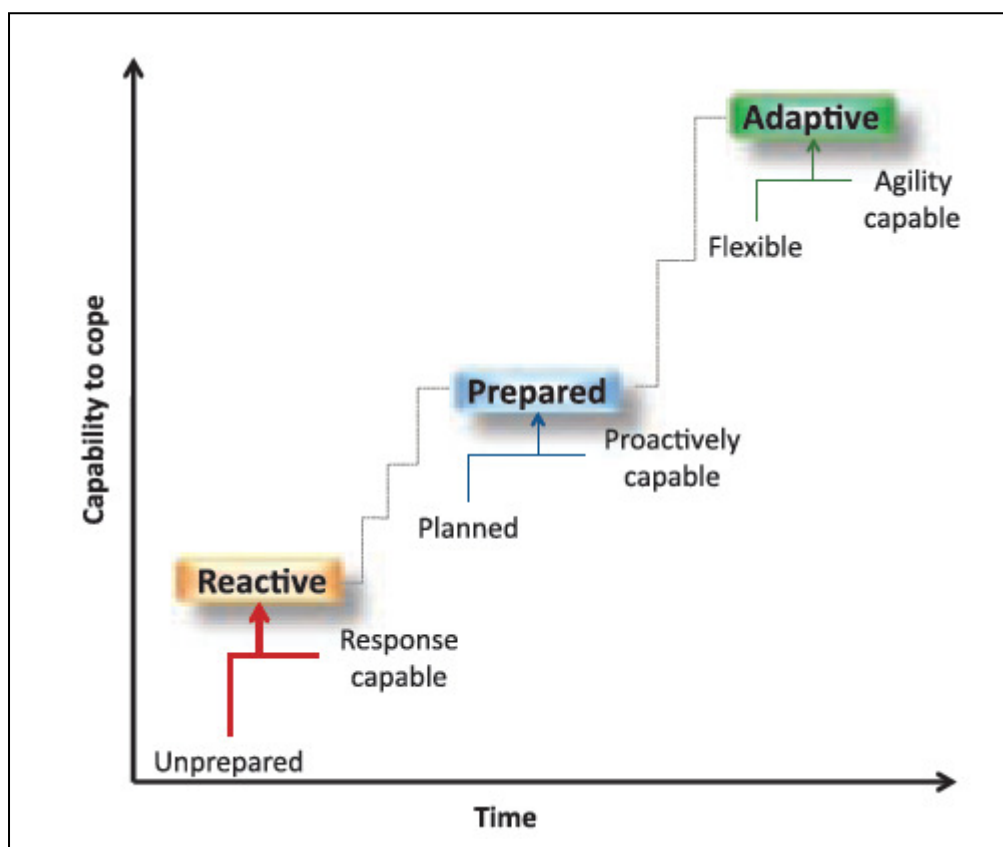
Duffy (2001) discusses maturity as a key consideration in organisation management in a continuously evolving environment. She goes on to emphasise the need for information and understanding and argues,

“...it is essential for organisation's leaders to understand where they are coming from, where they are going and what challenges they can expect in moving from one stage to another, as maturity evolves”.

(Duffy, 2001, p. 20)

Gibson and Tarrant (2010) discuss resilience as an outcome which can be observed along a continuum from vulnerable to resilient that demonstrates an organisation's resilience maturity. They go on to present a model of the progression of resilience maturity which is shown as Figure 8.40. In this model, organisations progress through three broad levels of resilience; reactive, prepared and adaptive. This reflects the two dimensions of organisational resilience identified in this research (planning and adaptive capacity). This model appears to present the three stages as linear so that a prepared organisation is less resilient than an adaptive organisation. However it is more likely that the stages are cumulative – a resilient organisation will have reactive, prepared and adaptive capabilities. This research would support a cumulative progression because it suggests that organisations must be both planned and adaptive. However as discussed in Chapter 7, some of the organisations that took part in the Auckland study were highly adaptive and did not focus on planning. This would suggest that organisations can start at any stage on Figure 8.40 but that to be resilient they must achieve capabilities from all three stages. A possible resilience maturity model is provided in Appendix F2.

Figure 8.40: The Progression of Resilience Maturity



(Gibson & Tarrant, 2010, p. 7)

Caralli et al. (2010) discuss Carnegie Mellon University's Computer Emergency Response Team (CERT) who have developed a resilience management model which focuses on operational IT resilience and incorporates six levels of resilience maturity; incomplete, preferred, managed, defined, quantitatively managed, and optimised.

Virtual Corporation, a software and consultancy organisation, have developed the Business Continuity Maturity Model; this is shown in Appendix F3. Tammineedi (2010) argues that this model can be used to help benchmark progress in business continuity in line with the British business continuity standard BS25999, and that it can provide organisations with competitive advantage. In this model, there are six levels of business continuity maturity ranging from self-governed to synergistic which are used to rate eight core competencies. These competencies include:

- Leadership;
- employee awareness;

- business continuity program structure;
- program pervasiveness;
- metrics;
- resource commitment;
- external coordination; and
- business continuity program content.

A particularly useful part of this model is the use of the athlete analogy where each level of maturity is related to a level of athletic performance. In this analogy the least resilient organisations are *able to crawl* and the most resilient organisations are *Olympic runners* (Virtual Corporation, 2005).

Duffy (2001, p. 20) discusses how maturity models are applied and argues that “*Immaturity in one area can affect success in another*”. Gibson and Tarrant (2010, p. 7) expand on this in the context of resilience and argue,

“Such a spectrum of resilience can be observed amongst different organisations facing the same event; within a single organisation experiencing different types of events, or over different periods of time; or internally amongst different functions within an organisation”.

This is also important in the application of the resilience measurement tool developed through this thesis. The tool can be used to compare resilience between departments, functions, organisations, industry sectors or geographic areas, and can compare resilience scores, benchmarks or levels of maturity.

8.2 A Methodology for Benchmarking Organisational Resilience

The purpose of this section is to answer research question 4:

What is a suitable benchmarking methodology for organisational resilience?

Figure 8.41 shows the resilience benchmarking methodology developed through this thesis. The methodology consists of the resilience drivers (inputs), the benchmarking

process, the intermediate and financial outcomes, and stakeholder reactions (outputs), and resilience maturity.

The **resilience drivers** are shown as the inputs to the benchmarking model. During this stage organisations identify the business problem or unmet need. In this methodology, the business problem identified plays a critical role because it provides the context for the benchmarking exercise. Examples of business problems relating to organisational resilience are discussed in section 8.1.3. These business problems provide the impetus behind investments in resilience and provide a basis for the benefit side of a cost/benefit analysis. For example, an organisation that took part in the Auckland study had recently been restructured and merged with another organisation. As a result two separate cultures, organisational identities and levels of resilience had also been restructured and merged. The business problem in this case is an unknown and potentially uneven resilience across the new organisational structure. In this example a measurement and understanding of the organisation's resilience strengths and weaknesses, and the distribution of these across organisational departments and hierarchies, would be the benefit achieved and this would be evaluated against the cost of using the measurement tool.

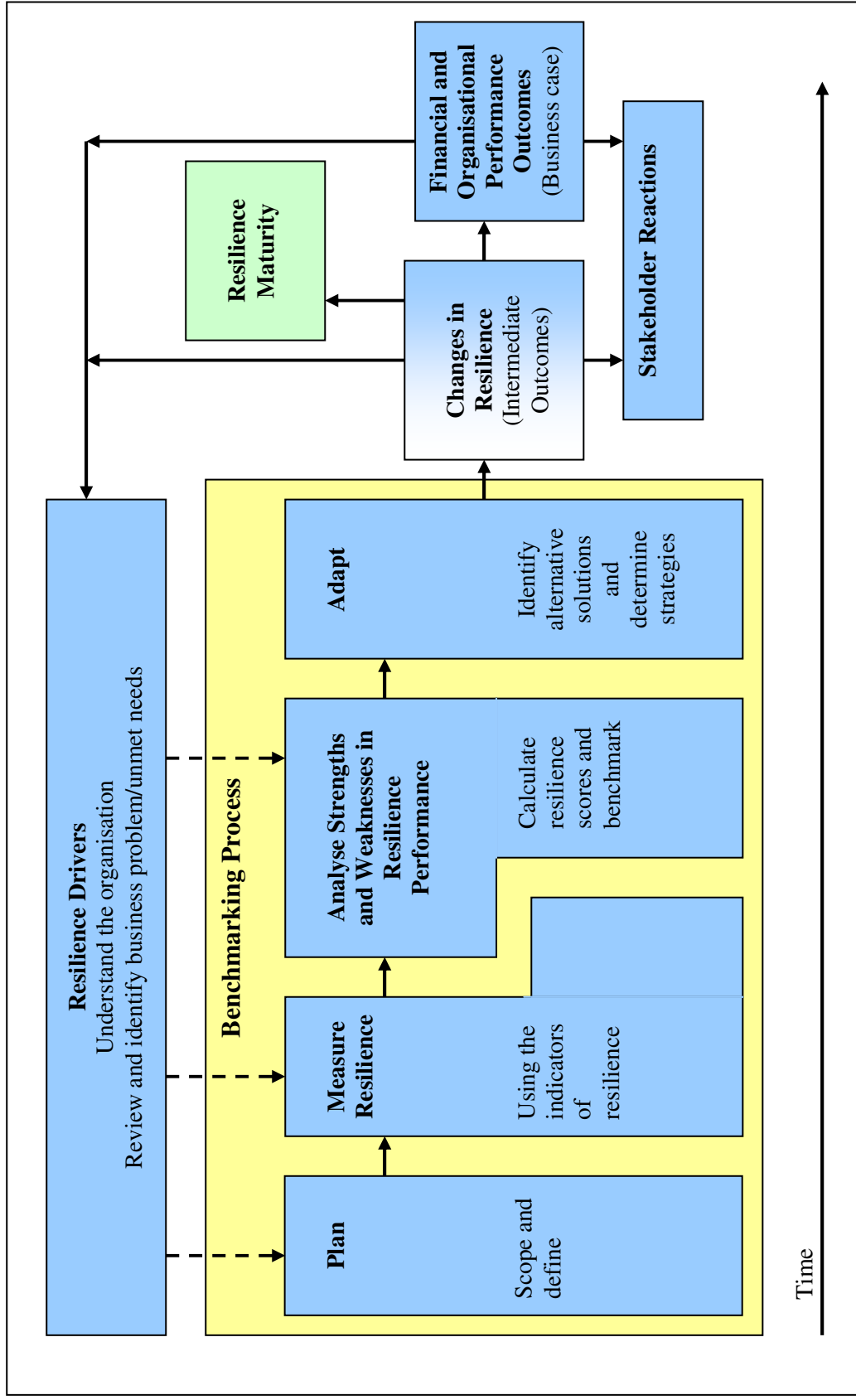
The benchmarking process itself consists of 4 stages; plan, measure, analyse and adapt. During the **planning stage** organisations use the business problem they have identified to define the scope of their benchmarking exercise. This includes identifying specific questions that they would like to answer, such how many of their staff are aware of the organisation's emergency plan. The planning stage also addresses the level and scale of comparison included in the benchmarking. For example, organisations can compare themselves against other organisations in their industry or geographic area, other organisations under their parent company, or between departments or functions within the organisation.

The **measure stage** involves the use of the resilience measurement tool developed through this thesis to collect data about the organisation's resilience which answers the questions identified and addresses the business problem. During this stage staff are asked to answer questions about the organisation's resilience. This provides data on each of the indicators of organisational resilience which is then analysed.

The **analyse stage** involves the calculation of resilience scores, strengths and weaknesses and the calculation of the comparative resilience benchmark. This is a percentage which tells an organisation which percentile their resilience score falls within. An organisation with a resilience benchmark of 70% will be in the 70th percentile which means that 69% of organisations achieved a lower resilience score and 30% of organisations scored a higher resilience score. This type of benchmark is only meaningful when organisations are measured as a block e.g. in an annual survey of resilience across an industry sector or geographic area. For organisations measuring their resilience more frequently or outside of block measurements, the resilience scores and scores for each of the indicators are more valuable. However once a base line of data has been established through successive confirmatory studies (testing the tool across cultures and a wider population of organisations), organisations could benchmark their resilience more robustly against the baseline data.

The **adapt stage** involves the identification of possible solutions and the development of resilience strategies which are aligned to the organisation's business objectives. Resilience strategies will usually represent a balance between addressing the strengths and weaknesses identified stakeholders' reactions to the results, and available resources. The organisation then creates work programmes, assigns responsibilities and resources, and takes actions to improve their resilience.

Figure 8.41: Resilience Benchmarking Methodology



The outputs of the tool are changes in resilience (intermediate outcomes), financial and organisational performance outcomes, and stakeholder reactions. **Changes in resilience** over time provide important information for the business case for resilience and for evaluating the success of investments in resilience; this is discussed in Section 8.1.4. Changes in resilience and **financial and organisational performance outcomes** then feed back into the drivers of resilience and future iterations of the benchmarking process. The links between improved resilience and financial and organisational performance are discussed in Section 6.8. Once an organisation has measured and benchmarked their resilience it is important to gauge **stakeholder reactions** to the results. In particular any surprises (good or bad) should be discussed. An example would be where an organisation achieves a very low score for planning indicators despite continuous investment over the last five years in planning. In this case the results for the planning indicators and an analysis of the difference in perception between management and staff could help the organisation to improve their planning more effectively and efficiently and to learn lessons about what does and does not work in their organisation.

Resilience maturity is included in the model as a result of changes in resilience over time. Further research is required to define robust levels of maturity; however in this initial version five levels of resilience maturity are defined. In addition an example of a resilience maturity model has been developed and can be seen in Appendix F2.

Chapter 9 – Conclusion

This chapter summarises the research findings, identifies the limitations of the research, and discusses direction for future research in this area. The research findings are presented in relation to the aims, objectives and research questions of this thesis.

9.1 Research Findings

The aim of this research was to:

1. Quantitatively test existing organisational resilience theory derived from qualitative case study research against a wider population of organisations in New Zealand.
2. To develop a survey tool to measure and benchmark organisations' resilience.

The objectives of this research were to:

1. To review McManus's (2007) definition and indicators of organisational resilience, and propose a model of organisational resilience.
2. To develop metrics and a resilience measurement tool to measure and benchmark organisations' resilience.
3. To use the resilience measurement tool to test both McManus's (2007) definition and indicators, and the proposed model of organisational resilience.
4. To use the resilience measurement tool to gain a picture of the resilience of organisations in Auckland, New Zealand.

The research questions for this research included:

1. What social or behavioural factors influence and determine organisations' resilience?
2. What metrics can be developed to measure the indicators of organisational resilience?

3. What conclusions can be drawn from the data about organisational resilience in the Auckland region?
4. What is a suitable benchmarking methodology for organisational resilience?

This thesis reviewed McManus's (2007) definition and indicators of organisational resilience and developed additional indicators and metrics as part of a survey tool to measure and benchmark organisational resilience. The survey tool was quantitatively tested using a random sample of 249 individuals from 68 organisations in Auckland, New Zealand. Data from this study was then used to test both McManus's (2007) definition and indicators, and the proposed model of organisational resilience; this analysis generated the new model of organisational resilience. The results were discussed in relation to the resilience of participating organisations, industry sectors and Auckland as a whole.

9.1.1 A New Model of Organisational Resilience

The new model of organisational resilience developed through this thesis is shown again as Figure 9.42. In the model, resilience is comprised of two dimensions; adaptive capacity and planning, which are measured by a suite of thirteen indicators. Figure 9.42 also shows the definition of each indicator and each of the indicators which are measured using the questions presented in Section 6.3.

This model represents a simplification or restructuring of the concept of organisational resilience. McManus's Relative Overall Resilience (ROR) model which was used as the starting point for this research consisted of three dimensions; situation awareness, management of keystone vulnerabilities and adaptive capacity, and fifteen indicators. Other models reviewed in the literature review also had complex structures. Despite the structure of the new model it still incorporates all of the dimensions of the earlier models, just within a simpler structure. The new model of organisational resilience is inclusive and supports literature reviewed by McManus (2007) as well as this thesis.

Figure 9.42: A New Model of Organisational Resilience

	Indicator	Definition
Adaptive Capacity	Minimisation of Silo Mentality	Minimisation of divisive social, cultural and behavioural barriers, which are most often manifested as communication barriers creating disjointed, disconnected and detrimental ways of working.
	Capability & Capacity of Internal Resources	The management and mobilisation of the organisation's resources to ensure its ability to operate during business-as-usual, as well as being able to provide the extra capacity required during a crisis.
	Staff Engagement & Involvement	The engagement and involvement of staff who understand the link between their own work, the organisation's resilience, and its long term success. Staff are empowered and use their skills to solve problems.
	Information & Knowledge	Critical information is stored in a number of formats and locations and staff have access to expert opinions when needed. Roles are shared and staff are trained so that someone will always be able to fill key roles.
	Leadership, Management & Governance Structures	Strong crisis leadership to provide good management and decision making during times of crisis, as well as continuous evaluation of strategies and work programs against organisational goals.
	Innovation & Creativity	Staff are encouraged and rewarded for using their knowledge in novel ways to solve new and existing problems, and for utilising innovative and creative approaches to developing solutions.
	Devolved & Responsive Decision Making	Staff have the appropriate authority to make decisions related to their work and authority is clearly delegated to enable a crisis response. Highly skilled staff are involved, or are able to make, decisions where their specific knowledge adds significant value, or where their involvement will aid implementation.
	Internal & External Situation Monitoring & Reporting	Staff are encouraged to be vigilant about the organisation, its performance and potential problems. Staff are rewarded for sharing good and bad news about the organisation including early warning signals and these are quickly reported to organisational leaders.
Planning	Planning Strategies	The development and evaluation of plans and strategies to manage vulnerabilities in relation to the business environment and its stakeholders.
	Participation in Exercises	The participation of staff in simulations or scenarios designed to practise response arrangements and validate plans.
	Proactive Posture	A strategic and behavioural readiness to respond to early warning signals of change in the organisation's internal and external environment before they escalate into crisis.
	Capability & Capacity of External Resources	An understanding of the relationships and resources the organisation might need to access from other organisations during a crisis, and planning and management to ensure this access.
	Recovery Priorities	An organisation wide awareness of what the organisation's priorities would be following a crisis, clearly defined at the organisation level, as well as an understanding of the organisation's minimum operating requirements.

Table 9.53 shows how many items, or questions, were retained within each of the dimensions through the analysis. It demonstrates that McManus's (2007) proposed dimensions and the additional dimensions proposed through this thesis were incorporated into the new model.

Table 9.53: Number of Items Retained in the New Model

Model Dimensions	New Model Dimensions	
	Adaptive Capacity Items	Planning Items
Resilience Ethos	1	2
Situation Awareness	8	6
Management of Keystone Vulnerabilities	5	12
Adaptive Capacity	19	0
Subtotal	33	20
Total	53	

The new model of organisational resilience will be useful to organisations because it presents a complex concept in the simplest possible structure. Organisations can use the model to discuss the components of resilience and to think about where their strengths and weaknesses might be, as well as what their current strategies actually address and what they don't.

9.1.2 Organisational Resilience in Auckland

As part of the test of the resilience measurement tool developed through this thesis, 68 organisations in the Auckland Region of New Zealand used the tool between March and November 2009. The results of this study provide a snapshot of the resilience of the organisations that took part and an indication of trends which may be observed across Auckland.

The strengths and weaknesses of the organisations that took part were discussed in Section 7.2. Particular strengths of organisations in the Auckland Region include situation monitoring and reporting and devolved and responsive decision making. This means that organisations are able to monitor their business environment and understand what changes in that environment mean for the organisation now and in the future. The majority of organisations drew their resilience strengths from the ability of their staff to

be responsive and adaptive to change. This includes expert decision making based on a balance between skills, experience and authority. Particular weaknesses of organisations in the Auckland Region include planning strategies and external resources. Of the organisations that took part in the study, only 24 (35%) have emergency or crisis management plans, and of those organisations only 12 (50%) said that their plans were sufficient to be useful in a crisis. The majority of organisations had not identified resources that they might need to access from outside of their organisations during a crisis. This creates vulnerability in crises affecting physical infrastructure or resources because while many organisations assume that they will be able to access what they need (e.g. generators at short notice) the availability of these resources is not guaranteed and has not been investigated.

9.1.3 The Business Case for Organisational Resilience

For organisations to invest in resilience they must be able to make a business case for resilience investment based on evidence which demonstrates the value added by resilience. The business case for resilience must be as good as, or better than, the case for new equipment or a new member of staff. It must be able to compete against other cases for investment put before the executive or board.

The resilience measurement tool developed through this thesis included a series of financial and management questions designed to investigate the link between resilience and organisational performance; this is presented in Section 6.8. This analysis identified significant relationships between organisations' resilience scores and their cash flow, profit to sales ratio and return on investment. This is a significant contribution of this thesis and while causality cannot yet be determined it provides evidence for the relationship between organisational resilience and organisational performance which can be used to form and test future hypotheses.

9.2 Research Limitations and Future Research

This section discusses the limitations of the research presented in this thesis and how each of them could be addressed through future research. The limitations identified include:

- Sample size
- Different levels of participation within each organisation
- Discontinuities between perceptions of senior managers and staff
- Weaknesses in the planning strategies indicator
- Lack of consideration of physical and infrastructural measures
- Lack of confirmation of the structure of the new model and the indicators
- Lack of knowledge about the relationships between the indicators and possible causality within the model
- Lack of information validation of the tool and whether organisations achieving a high score would be more resilient in a crisis
- Measures of organisational performance
- The business case for resilience

9.2.1 Sample Size

The 68 organisations that took part in this research represent a small sample size. However, they provide a larger sample than many disaster and crisis management studies. The sample size achieved had several impacts on this thesis and what could be achieved.

Firstly although the sample of 249 individuals was suitable for factor analysis and a new model of organisational resilience was developed, the sample was not large enough to complete a robust multiple regression at organisation level. This means that while the research identified the indicators of organisational resilience and their structure under the two dimensions, it was not able to investigate the relationships between the indicators within the dimensions. The relationships between the indicators of organisational resilience are important because it is likely that some indicators have

more impact on organisational resilience than others. Knowledge of these relationships and which indicators have the most impact on resilience will enable researchers to introduce weightings into the calculation of resilience scores and will make the resilience measurement and benchmarking tool more accurate. This information could also help organisations to identify the most efficient ways to improve their resilience.

The techniques that were used to encourage organisations to take part in the research were discussed in Section 6.1. This discussion included giving organisations notice of the research before they were approached to take part. In this thesis, an invitation letter was sent ahead of the invitation email to introduce the research, however as discussed in Section 4.3, this had very little effect. In future research it is suggested that much more time is spent building up a profile of the research topic and raising awareness among the sample population. While this may not be practical for Ph.D. research it is possible that more promotion of the research agenda, in advance of the research, would encourage more organisations to take part. A further option for achieving a higher response rate, especially in future administration of the resilience measurement tool to a random sample, would be to invite senior managers to an event at which the business case for the research agenda was presented and they were able to take the survey. Staff copies of the resilient measurement tool could then be emailed or posted to organisations once senior management buy-in was achieved.

9.2.2 Stratified Samples

In this thesis the researcher asked that as many staff as possible from each organisation take part in the research. For some organisations this resulted in high internal response rate, however for others only one member of staff took part. This represents a potential problem with the representativeness of the sample. This is because in those organisations where only one member of staff has taken part, the results of their organisation are based on a single opinion.

As discussed in Section 4.1.1, there is no clear direction for specifying a number or percentage of staff that should take part and this should be investigated further before the tool can be used robustly with low levels of internal representation.

9.2.3 Differences in Perception of Organisational Resilience between Senior Managers and Staff

When using the resilience measurement tool individual participants were asked to specify their hierarchical level within the organisation; senior manager, middle manager, team leader or supervisor, or staff. During the Auckland study the researcher observed differences in the answers between senior managers and staff. While this provides an interesting question for future research it also presents a possible problem.

As discussed above, internal representation is important so that the organisation's results accurately reflect the whole organisation as opposed to the opinions and experience of only one member of staff. If individual participants have different perceptions and experiences of their organisation's resilience which are related to their hierarchical position within the organisation, then perhaps the sample of participants from each organisation also needs to be stratified to make sure that all hierarchical levels are represented equally.

Hofstede (1990) took this approach and used a stratified sample within organisations to achieve representation across the different hierarchical levels. He surveyed approximately 60 individuals from each of his sample organisations and stratified these so that roughly 20 individuals were managers, 20 were professionals and 20 were non-professionals. It is recommended that the benefits of stratifying a sample in this way should be examined and tested in relation to the resilience measurement tool.

9.2.4 Strengthening the Planning Strategies Indicator

The planning strategies indicator developed through this thesis is designed to measure whether an organisation develops and evaluates plans and strategies to manage vulnerabilities in relation to its business environment and stakeholders. The items or questions used to measure the planning strategies indicator are discussed in Section 6.3.9 and are presented again below in Table 9.54. Together, the items achieve a Cronbach's alpha of 0.677 which is just below the minimum of 0.7 suggested by Hinkin (1998) for a reliable indicator.

Table 9.54: Planning Strategies Items

Item Number	Item Loading	Item Wording
KV _{1.1}	.592	Given our level of importance to our stakeholders I believe that the way we plan for the unexpected is appropriate
KV _{1.3}	.572	Our organisation currently has people who perform the following roles (tick all that apply) – scored 0-4, 1 point for each of risk management, crisis management, emergency management, business continuity
KV _{1.4.1}	.490	Does your organisation have a formal written crisis/emergency or business continuity plan?
KV _{6.1}	.534	People in our organisation understand how quickly we could be affected by unexpected and potentially negative events

This was the only indicator retained within the new model of organisational resilience which did not achieve reliability above the recommended minimum alpha level. This means that, in its current form, the tool may not accurately capture organisations' planning strategies which are most likely critical to the planning dimension of organisational resilience. To address this, additional items should be developed and tested; suggestions for this are shown in Table 9.55.

Table 9.55: Suggested Items to Strengthen the Planning Strategies Indicator

Item
I have been involved in planning for crises or emergencies that might affect our organisation
We have formally assessed the impact of a crisis on our ability to operate
Risk management is an integral part of how we manage our work
I know where to find a copy of our organisation's crisis or emergency management plan
I know who has responsibility in our organisation for updating our plan

It is also possible that the issue of planning strategies is captured through other indicators. An example of this could be how the last item suggested in Table 9.55 could be pulled into the staff engagement and involvement indicator in a factor analysis.

9.2.5 Physical Infrastructure and Resources

During the pilot study discussed in Section 5.2, and in various presentations of the research outcomes, the lack of items relating to physical resources and infrastructure has

been identified as a possible weakness of the model and the tool. This is relevant for two reasons:

1. All organisations rely on infrastructure
2. Business Continuity Management practises should be incorporated into the measurement tool

All organisations rely on infrastructure such as electricity, water, roading etc. However organisations' understanding and awareness of impact that the unavailability of infrastructure would have on their organisation is not specifically assessed in this tool. This means that an organisation achieving a high resilience score may not have addressed how they would continue to operate without basic infrastructure such as telecommunications.

Business continuity management (BCM), one of the organisational disciplines that contribute to organisations' resilience, largely focuses on managing disruption to critical business processes, systems and resources. However the resilience measurement tool developed in this thesis does not echo this operational approach. One item relating to maximum tolerable periods of disruption, a BCM concept which addresses how much disruption an organisation can absorb, was included in the survey. However this item did not load on either of the two factors of organisational resilience during the analysis. While it was retained in the survey for information purposes it does not form part of the new model of organisational resilience. This may mean that a significant determinant or contribution to organisations' resilience, whether they have identified key business areas and planned for their continuity, is not accounted for (from an operational perspective) in the resilience measurement tool.

One way to address this would be to include a scenario based question in the resilience measurement tool to provide a context and then ask about their organisation's awareness of infrastructure and resource issues. Paton (2007) uses a volcanic scenario to contextualise questions about preparedness in his study of community resilience in Auckland. The same technique could be used with organisational participants and would provide them with a common point of reference enabling a better comparison between

the results. This is particularly relevant to the availability to physical resources and infrastructure. Table 9.56 provides examples of possible items that could be used.

Table 9.56: Possible Resources and Infrastructure Items

Item
Have you planned for how your organisation would cope if you lost access to the telephone and email services for a) 1 hour, b) 1 day, c) 3 days, d) more than 3 days
Would your organisation be able to implement its emergency, crisis or business continuity plan if your main building or location did not have electricity for 1 day, c) 3 days, d) more than 3 days

9.2.6 Confirmatory Study

Hinkin (1995, p. 980) reviews scale development processes and argues that,

“The use of an independent sample to provide an application of the measure in a substantive context will enhance the generalizability of the new measures”.

Here Hinkin is arguing that once a measure has been developed it should be re-tested using a separate sample in order to confirm the measurement tool and demonstrate construct validity. Hinkin (1995) also argues that while Cronbach’s alpha coefficients are regularly used as indicators of reliability (as in this study), for constructs such as resilience that will change over time, a confirmatory study should also be completed. A confirmatory study was outside of the scope of this Ph.D. research however this is an important next step for the development of the resilience measurement tool. The purpose of this confirmatory study should be to re-test the structure of the model of resilience identified in this research as well as to strengthen the planning strategies indicator.

A confirmatory study could also be used to test adjusted versions of the 19 items or questions that were dropped from the model developed through this thesis during the factor analysis discussed in Chapter 6. Possible options for each of the 19 items are provided in Appendix G1.

9.2.7 Relationships between Indicators

Full investigation of the causal relationships between the indicators of organisational resilience, was outside of the scope of this Ph.D. thesis. However, an understanding of the relationships between the indicators is important. The calculation of resilience scores in this thesis treated all of the indicators as though they contributed equally to organisations' resilience in an additive model. In reality, this is unlikely and it may skew the measurement tool. An understanding of the causal relationships between the indicators will enable the weighting of indicators, and will help to develop a more robust measurement tool as it moves to a multiplicative model.

In future research, structural equation modelling (SEM) should be used to investigate and model the relationships between the dimensions and indicators of organisational resilience. SEM is also capable of investigating causality between the indicators and dimensions, and the discussion below can be used as a starting point.

In the planning dimension, it is likely that recovery priorities (P₄), proactive posture (P₅) and participation in exercises (P₂) have more influence than the other planning indicators – possibly because they determine the other indicators. As a result, the recovery priorities, proactive posture and participation in exercises indicators could be weighted during the calculation of resilience results; this is shown in the example below.

$$\text{Planning} = ((4 \times P_4) + (3 \times P_5) + (2 \times P_2) + P_2 + P_3 + P_4)$$

In the adaptive capacity dimension, it is likely that leadership (A₁) and innovation and creativity (A₇) have more influence than other adaptive capacity indicators. These too could be weighted during the calculation of resilience results; this is shown in the example below.

$$\text{Adaptive Capacity} = ((3 \times A_1) + (2 \times A_7) + A_2 + A_3 + A_4 + A_5 + A_6 + A_8)$$

When considering overall resilience, the literature suggests that a balance between planning (P) and adaptive capacity (AC) must be achieved; however this need not necessarily be an equal balance. An example of this is shown below.

$$\text{Resilience} = P + (2 \times AC)$$

9.2.8 Longitudinal and Case Study Research

Part of the rationale for this research is that organisations need information on their resilience strengths and weaknesses and how these change over time so that they can evaluate resilience strategies and investments. However this study has not investigated the use of the resilience measurement tool over time.

This could be achieved through a case study of a small sample of organisations from the Auckland sample to follow up on how their resilience has changed and whether they found the results of the study useful. A case study could also significantly contribute to the business case for resilience by investigating the relationship between investments made in resilience and changes in organisational resilience over the investment period. This would enable the investigation of the extent to which investments in resilience have improved resilience scores within a given time period.

Longitudinal research using the resilience measurement tool would also help to evaluate whether the tool produces accurate measurements of organisations' resilience. This would require organisations to use the measurement tool on a regular basis and after significant crises that affect the organisation. The assumption here is that the tool will be able to track organisations' resilience over time and that an organisation who achieves consistently high resilience scores will be resilient.

9.2.9 Measures of Organisational Performance

The analysis of measures of organisational performance in this thesis identified significant relationships between organisations' resilience scores and their cash flow, profit to sales ratio and return on investment for for-profit organisations. However the

number of not-for-profit organisations in the sample was not large enough to provide a robust investigation of performance measures for not-for-profit organisations. This is a limitation of the tool because it does not yet measure organisational performance (including measures for not-for-profit organisations) accurately enough.

Future studies should aim to develop this part of the resilience measurement tool and especially to test possible key performance indicators on a wider sample of organisations.

9.3.10 The Business Case for Resilience

This thesis represents the first step towards a business case for organisational resilience. However the research does not yet demonstrate a causal relationship between resilience and organisational performance. This is a limitation of this research because without a business case which demonstrates that investments in resilience add as much, if not more value, than other investments, organisations will not be encouraged to allocate resources to the resilience.

Once the tool has been confirmed and refined through confirmatory study with a larger sample of organisations and measures of organisational performance (in relation to resilience) have been refined, the business case for resilience will be stronger.

9.3 Thesis Summary

The purpose of this thesis was to develop a methodology and tool to measure and benchmark organisational resilience. To achieve this, organisational resilience theory derived from qualitative case study research has been empirically tested against a random sample of Auckland organisations. Three significant contributions this research include the new model of organisational resilience, the organisational resilience measurement tool, and the resilience benchmarking methodology.

The new model of organisational resilience presented in Section 6.3 and discussed again in Section 9.1.1, suggests that resilience is comprised of two dimensions; adaptive

capacity and planning. In turn these dimensions are measured using thirteen indicators of organisational resilience. The new model reflects a simpler structure than the literature on measuring organisational resilience would suggest, however it supports the central theme of anticipation vs. resilience, which runs throughout the disaster and crisis management literature.

The organisational resilience measurement tool operationalises the new model of organisational resilience developed through this thesis and enables organisations to actually use the model. The tool consists of 14 demographic and background questions, 53 resilience measurement questions, and 15 organisational performance questions. The adaptive capacity and planning dimensions, and the overall measurement tool, achieve acceptable alpha scores indicating that the resilience measurement tool is reliable and has good internal consistency.

The resilience benchmarking methodology presented in Chapter 8 was developed to guide organisations in using the tool as part of a continuous cycle of resilience management or improvement. The methodology is the result of the literature review and the researcher's experience of the administration and use of the tool. It provides organisations with a process which they can use to make sure that the resilience measurement tool produces useful results for their organisation. This is important not only for the continued use of the tool but also to provide information for the business case for organisational resilience.

Through the development of the resilience measurement tool and the benchmarking methodology this thesis has satisfied the four research objectives identified in Sections 1.3 and 9.1 and has also answered the four research questions presented in Sections 2.6 and 9.1. It has reviewed literature, identified indicators, developed metrics, tested the tool and presented a *picture* of the resilience of Auckland organisations, and has also presented a resilience benchmarking methodology.

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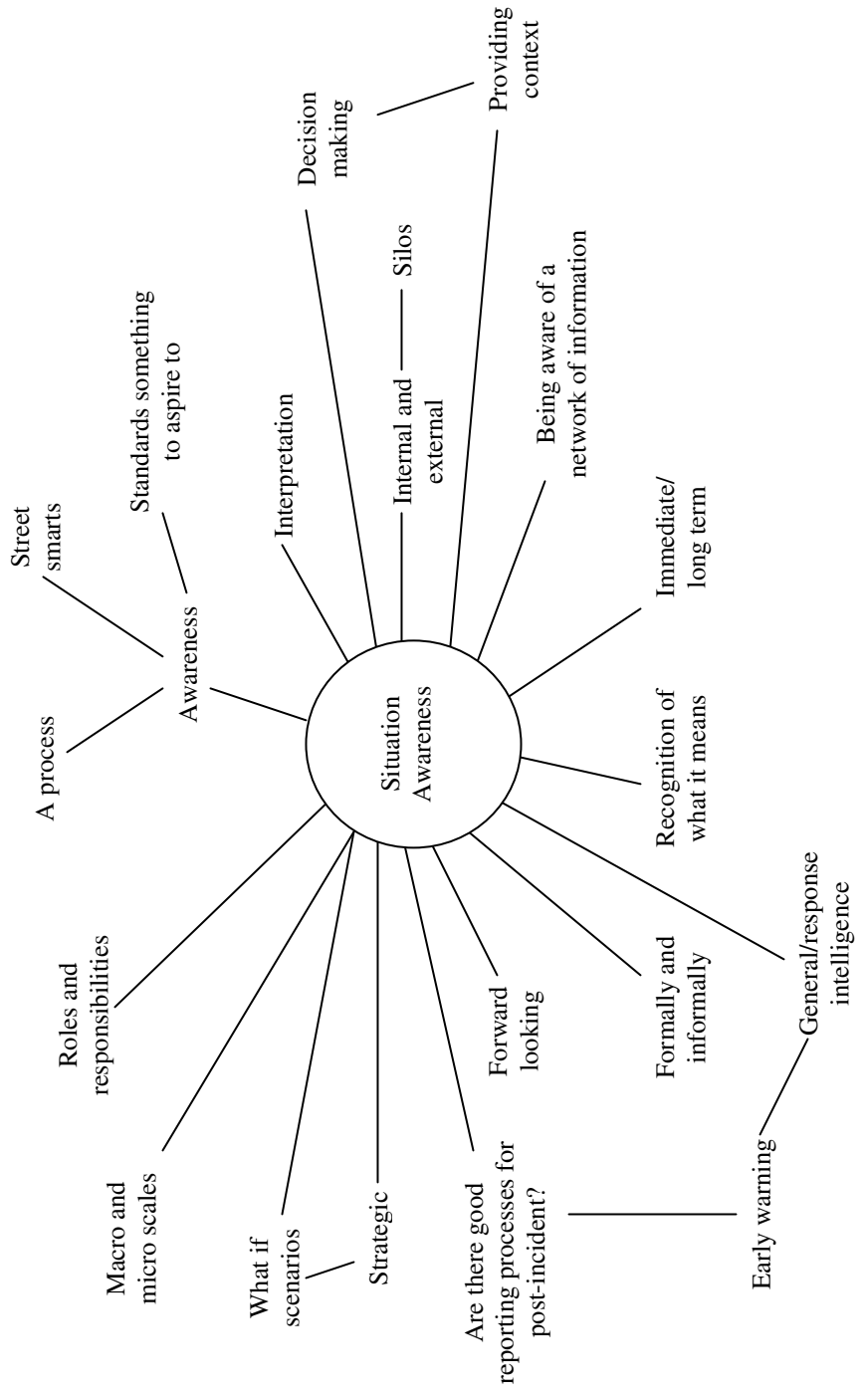
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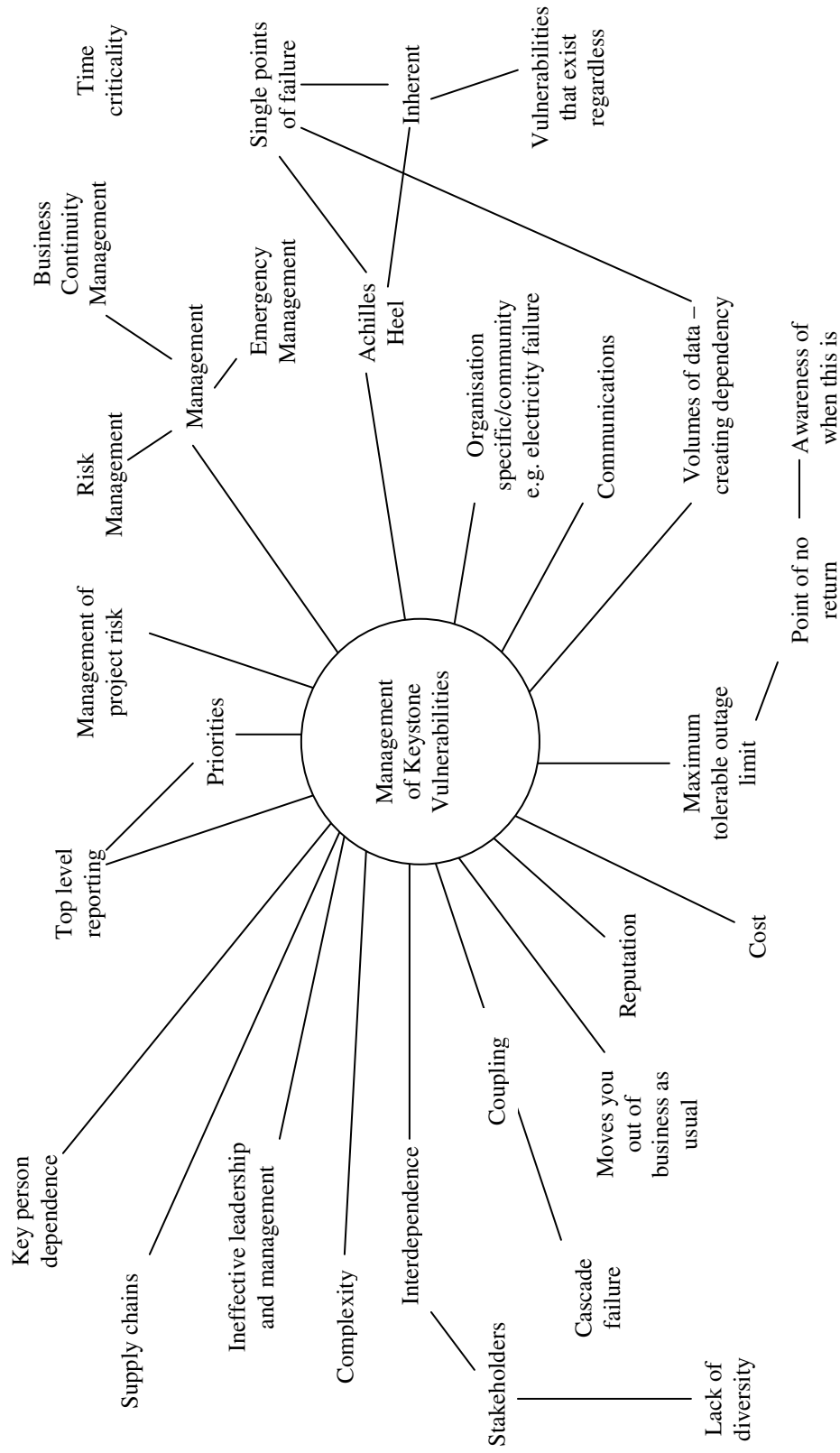
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Appendix A

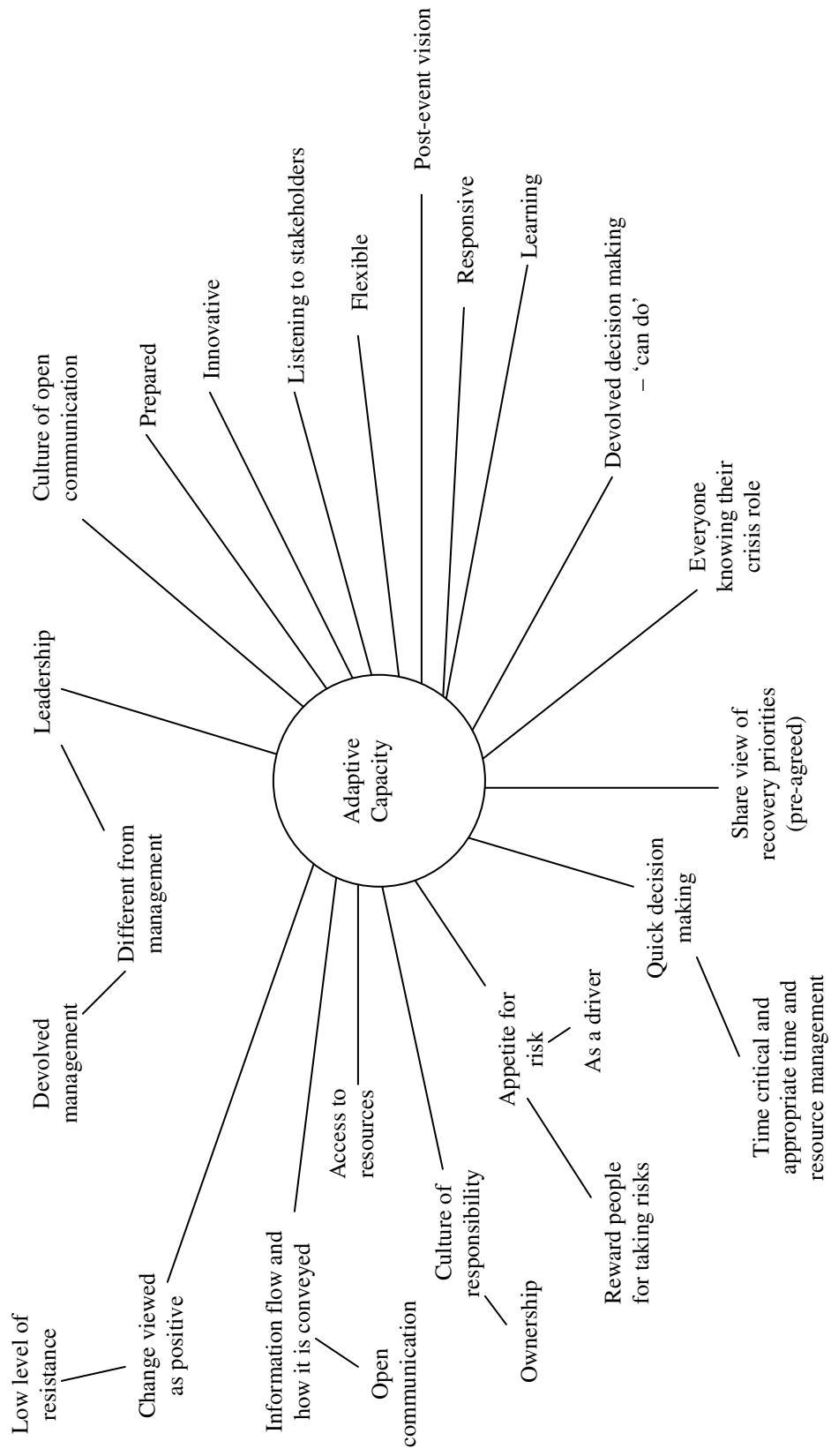
Appendix A.1: Indicators Workshop - Situation Awareness Mind Map



Appendix A2: Indicators Workshop - Management of Keystone Vulnerabilities Mind Map



Appendix A3: Indicators Workshop - Adaptive Capacity Mind Map



Appendix A4: Indicators Workshop - Situation Awareness Indicator Clusters and Overarching Terms

1. Roles & Responsibilities

- Relevant position descriptions include roles and responsibilities for incident management and reporting.
- Understanding roles and responsibilities.
- Induction process for employees includes risk awareness and incident management.
- Clear crisis management process with senior management trained and aware of responsibilities.
- Clear knowledge of roles and responsibilities, self, others, the organisation within its sector.
- Performance indicators.
- Resources for facilitation of risk management to distributed owners of risk management.
- Good staff induction processes.
- Induction processes to emphasise informal and formal networks and roles in adverse events.

2. Understanding of Hazards and Consequences

- Knowledge of third party providers' impacts (contractual arrangements include proof of continuity of service).
- Build crisis contexts into contractual arrangements.
- Doing crisis planning with other organisations.
- Involvement of stakeholders in risk management/business continuity management programmes.
- Incident reporting process.
- Analysis of past incidents and failure – learning organisations.
- Good systems for converting data to information to business intelligence.

3. Connectivity

- How networked staff are e.g. breadth of board of directors, ability of staff to be members of external communities.
- Membership of sector groups.
- Investment in building external networks with other organisations.
- Working with other organisations and supporting awareness increasing activities.
- Cross department/group working, lack of internal silos.
- All processes connected and shared.
- Knowledge management and knowledge sharing.
- Inadequate sharing/exporting of information as an indicator of poor resilience.
- Effective informal communication networks, internal and external.

4. Strategic Vision & Planning for Surprises

- Scenario analysis, identification of hazards and threats.
- Regular reviews of risks in a strategic planning context and scenario analysis.
- Multi-business unit scenario exercises to identify cross business consequences.
- Regular and robust strategic planning.
- Scheduled session (or mechanism) for considering the 'what ifs'.
- Time and resources set aside for 'what if' thinking.
- Strong risk management/business continuity management framework, policies, priorities and strategies.
- Conforming to standards and involvement in creating standards.
- How to behave, cyclical 4360 program, well imbedded, including all within business continuity management.
- Processes in place to monitor emerging risks, internal and external.
- Effective application of appropriate standards.

Appendix A5: Indicators Workshop - Management of Keystone Vulnerabilities Indicator Clusters

1. Collaborative Resilience Planning

- Collaboration with organisation facing common keystone vulnerabilities.
- High stakeholder involvement.
- Good relationships with community.
- Incentives and mandates for individuals to manage vulnerability.
- Drivers that push the organisation to manage keystone vulnerabilities.
- Ability to apply financial impact to vulnerability and 'point of no return figure'.
- Strategic long term planning incorporates managing out keystone vulnerabilities e.g. building replacement.
- Involvement with other organisations in exercises to test plans.
- Participation in exercises.
- Continuity plans developed and tested for all key systems and processes.
- Actual testing conducted for business continuity plans, disaster recovery plans, validation and reporting.
- Contingency plans to manage failure.

2. Commitment to Vulnerability Reduction & Robust Enabling Strategies

- Risk management is reviewed by CEO/board.
- Level of top down commitment to vulnerability management.
- Management buy-in to risk management/business continuity management process.
- Extend input into identifying and managing keystone vulnerabilities.
- Being prepared to respond to any/all of the keystone vulnerabilities.
- Clear view on how to respond to a keystone vulnerability incident/event (or process to develop a response).
- Persons allocated/designated responsible for management of keystone vulnerabilities (overall and for each keystone vulnerability).
- Opportunity cost.
- Flexibility and options built into any new processes.
- Supply chain management with a focus on continuity during non-bad events.
- Value placed on diversity, quality and flexibility (not just lowest price).
- Adequacy of education/awareness of consequences/impacts of vulnerabilities.
- Open discussion and analysis of assumptions.
- Openness and accountability.
- Staff training to notice, report and review problems/situational or environmental changes.
- Adequacy of practises for stability and managed change e.g. new projects, different projects.

3. Effective Vulnerability Monitoring & Analysis

- Analysis of points of no return.
- Recognition of MTOL.
- Risk management programme which views organisation as part of a network.
- Focus in contracts and communications on vulnerability introduced by supply organisation.
- Analysis of cascade failure scenarios 'what if'.
- Risk management process in place/business continuity management/emergency management.
- There is a regular programme to rescue vulnerabilities.
- How frequently do you review your risk register?
- Risk treatments are reviewed regularly for effectiveness.
- Good situation awareness.
- Comprehensiveness of risk/vulnerability assessment.
- Continuous/cyclical evaluation.
- Effective reporting structures.

Appendix A6: Indicators Workshop - Adaptive Capacity Indicator Clusters

1. Devolved and Responsive Decision Making and Management

- Devolved management.
- Devolved and rapid decision making.
- Low level of resistance to change.
- Willing to embrace change in a responsible way.
- Decisions for change are made with full acknowledgement and management of risks.
- Open input from all into decision making.
- Crisis management process allows quick decisions.
- Roles and responsibilities, everyone knowing how decisions will be made in a crisis.
- Ability to switch from day-to-day to crisis procedures to speed things up (emergency powers).
- Access to contingency resources and expertise.
- Timely access to resources even if unusual.

2. Practiced Response Mechanisms and Recovery Priorities

- Reliable work-arounds for operation etc.
- Regular exercises to practise response arrangements.
- Having a broad recovery strategy for various scales of crisis/keystone vulnerability.
- Practical response and recovery leadership experts (valid confidence).
- Poor preparedness and 'winging it' in a response as an indicator of poor resilience.
- Continuous evaluation of situation awareness.
- Regular review and continuous improvement of business as usual processes.
- Pre-defined strategies for high impact scenarios.
- Pre-agreed priorities and focus in context of situation.
- Broad plans for crisis well communicated.

3. Innovation and Creativity

- Rewards for positive risk taking.
- Reward risk taking.
- Innovation encouraged at all levels of the organisation.
- Thinking outside of the box when it comes to thinking about crises and responses.
- New ideas generated and presented to management.
- Adaptive and flexible to capitalise on new opportunities.
- Responsive to change and innovation.
- Responsive to environmental changes e.g. customer needs.
- Good understanding of the speed/rate of change and recovery.

4. Effective Crisis Leadership and Ownership

- Everyone knows their crisis role.
- Clear knowledge of roles and responsibilities for self and others.
- Knowing who to call and can get things.
- The right people with the right skills utilised.
- Known access to internal and connected information.
- Can-do attitude where issues management is viewed positively by staff.
- Staff at all levels knowing what is important, what is their role, willing to act in a devolved mode.
- Staff prepared to go above and beyond the call of duty.
- Acceptance, no blame and no such things as stupid questions/ideas.
- All staff take responsibility for problems (low-blame rate).

Appendix A7: Definitions of the Proposed Dimensions and Indicators of Organisational Resilience

Resilience Ethos

A culture of resilience that is embedded within the organisation across all hierarchical levels and disciplines, where the organisation is a system managing its presence as part of a network, and where resilience issues are key considerations for all decisions that are made.

Indicator	Definition
Commitment to Resilience	A belief in the fallibility of existing knowledge as well as the ability to learn from errors as opposed to focusing purely on how to avoid them. It is evident through an organisation's culture, training and how it makes sense of emerging crises and emergencies.
Network Perspective	A culture that acknowledges organisational interdependencies and realises the importance of actively seeking to manage those interdependencies to better prevent or respond to crises and emergencies. It is a culture where the drivers of organisational resilience, and the motivators to engage with resilience, are present.

Situation Awareness

An organisations understanding of its business landscape, its awareness of what is happening around it, and what that information means for the organisation now and in the future.

Indicator	Definition
Roles & Responsibilities	Roles and responsibilities are clearly defined and people are aware of how these would change in a crisis or emergency, the impact of this change, and what support functions it would require.
Understanding & Analysis of Hazards & Consequences	An anticipatory all hazards awareness of any events or situations which may create short or long term uncertainty or reduced operability, and an understanding of the consequences of that uncertainty to the organisation, its resources and its partners.
Connectivity Awareness	An awareness of the organisation's internal and external interdependencies and links, and an understanding of the potential scale and impact that crises or emergencies could have on those relationships and the organisation's ability to operate.
Insurance Awareness	An awareness of insurance held by the organisation and an accurate understanding of the coverage that those insurance policies provide in a crisis or emergency situation.
Recovery Priorities	An organisation wide awareness of what the organisation's priorities would be following a crisis or emergency, clearly defined at the organisation level, as well as an understanding of the organisation's minimum operating requirements.
Internal & External Situation Monitoring & Reporting	The creation, management and monitoring of human and mechanical sensors that continuously identify and characterise the organisation's internal and external environment, and the proactive reporting of this situation awareness throughout the organisation to identify weak signals of crisis or emergency.
Informed Decision Making	The extent to which the organisation looks to its internal and external environment for information relevant to its organisational activities and uses that information to inform decisions at all levels of the organisation to prevent or better respond to crises or emergencies.

Management of Keystone Vulnerabilities

The identification, proactive management, and treatment of vulnerabilities that if realised, would threaten the organisation's ability to survive.

Indicator	Definition
Planning Strategies	The identification and evaluation of organisational planning strategies designed to identify, assess and manage vulnerabilities in relation to the business environment and its stakeholders.
Participation in Exercises	The participation of organisational members in simulations or scenarios designed to enable the organisation to rehearse plans and arrangements that would be instituted during a response to an emergency or crisis.
Capability & Capacity of Internal Resources	The management and mobilisation of the organisation's physical, human, and process resources to ensure its ability to effectively address the organisation's operating environment as it changes before during and after a crisis or emergency.
Capability & Capacity of External Resources	Systems and protocols designed to manage and mobilise external resources as part of an interdependent network to ensure that the organisation has the ability to respond to crises and emergencies.
Organisational Connectivity	The management of the organisation's network interdependencies and the continuous development of inter-organisational relationships to enable the organisation to operate successfully and to prevent or respond to crises and emergencies.
Robust Processes for Identifying & Analysing Vulnerabilities	Processes embedded in the operation of the organisation that identify and analyse the emerging and inherent vulnerabilities in its environment and enable it to effectively manage vulnerabilities to further the networks' resilience.
Staff Engagement & Involvement	The engagement and involvement of organisational staff so that they are responsible, accountable and occupied with developing the organisations resilience through their work because they understand the links between the organisation's resilience and its long term success.

Adaptive Capacity

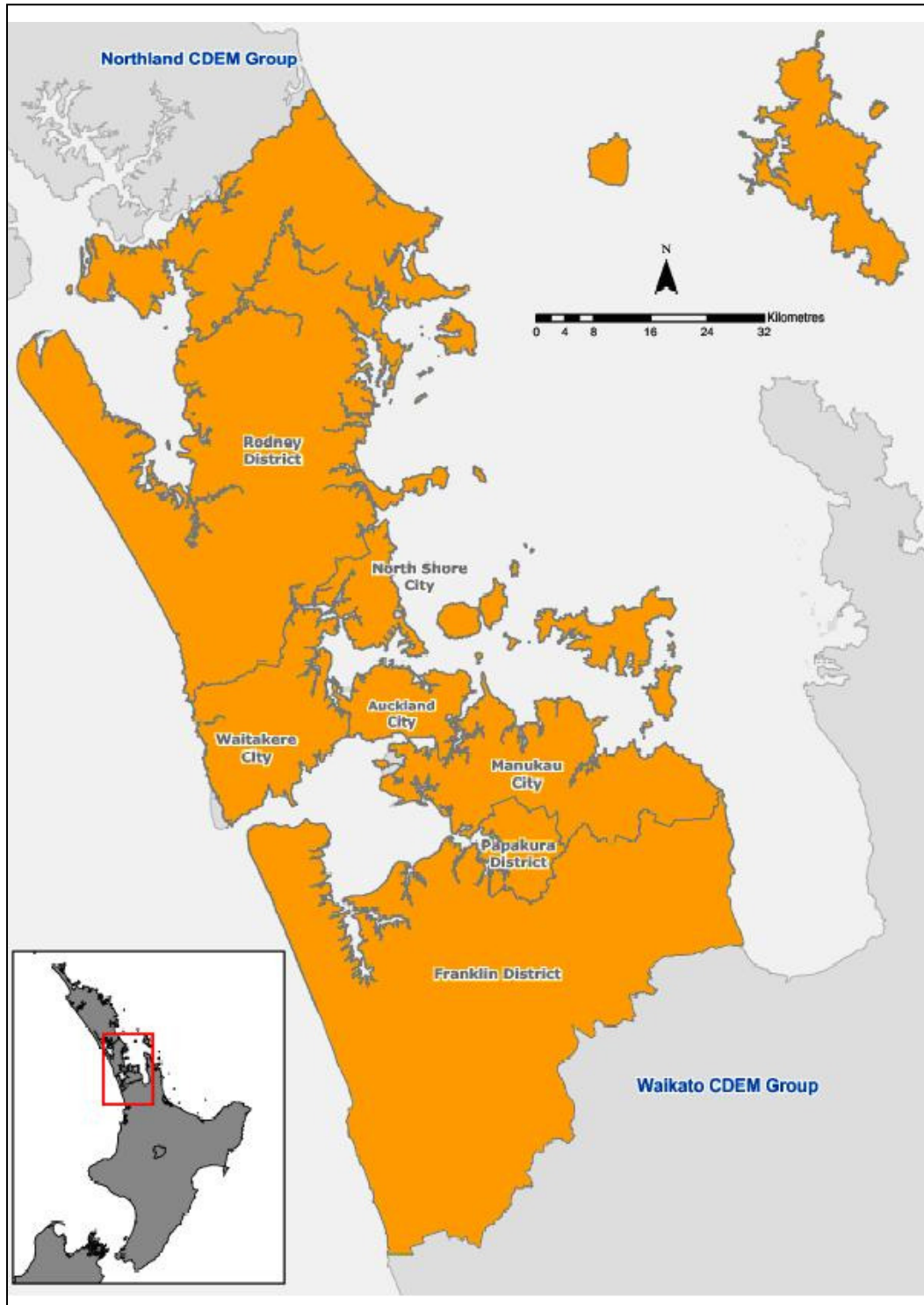
The organisations ability to constantly and continuously evolve to match or exceed the needs of its operating environment before those needs become critical.

Indicator	Definition
Silo Mentality	Cultural and behavioural barriers which can be divisive within and between organisations which are most often manifested as communication barriers creating disjointed, disconnected and detrimental ways of working.
Communications & Relationships	The proactive fostering of respectful relationships with stakeholders to create effective communications pathways which enable the organisation to operate successfully during business-as-usual and crisis or emergency situations.
Strategic Vision & Outcome Expectancy	A clearly defined vision which is understood across and between organisations and empowers stakeholders to view the organisation's future positively.
Information & Knowledge	The management and sharing of information and knowledge across and between organisations to ensure that those making decisions in crises or emergencies have as much useful information as possible.

Leadership, Management & Governance Structures	Inspirational organisational leadership which successfully balances the needs of internal and external stakeholders and business priorities, and which would be able to provide good management and decision making during times of crisis.
Innovation & Creativity	An organisational system where innovation and creativity are consistently encouraged and rewarded, and where the generation and evaluation of new ideas is recognised as key to the organisation's performance during crises or emergencies.
Devolved & Responsive Decision Making	An organisational structure, formal or informal, which evolves during the response to an emergency or crisis, where people have the authority to make decisions directly linked to their work and where, when higher authority is required, this can be obtained quickly and without excessive bureaucracy.

Appendix B

Appendix B1: Map of the Auckland Region



(Auckland Civil Defence Emergency Management Group, 2008)

Appendix B2: Senior Manager Introduction Letter

Benchmark Resilience

An exciting new research project 'Benchmarking the Resilience of Organisations' is being launched at the University of Canterbury and there are opportunities for 1000 organisations in Auckland to participate.

The project is being conducted as Ph.D. research at the University of Canterbury by Amy Stephenson. It is being funded by the Foundation for Science Research and Technology and the Auckland Civil Defence and Emergency Management Group. The Benchmark Resilience Project will provide a snapshot of the resilience of the Auckland Region; it will also add value and provide empowering information to organisations to address their resilience.

Resilience can be an asset to your organisation and to its stakeholders. New Zealand's environment makes it vulnerable to natural hazards like earthquakes and floods. Organisations, both big and small, are also susceptible to power cuts, data corruption, loss of key staff or reputation, property damage and public health issues like pandemic influenza. And it's not just the big problems that can cause trouble for organisations; many experience small disruptions on a daily basis. **But how would your organisation cope if you experienced the level of disruption that you normally see in one month, in the space of one day?**

A resilient organisation is one that not only survives, but is also able to thrive in an environment of change and uncertainty

Despite the many business benefits of becoming more resilient, organisations often struggle to prioritise resilience and to link resilience to crisis or disaster, with the ability to operate effectively and efficiently during business as usual. Measuring and benchmarking organisational resilience is about two things, firstly asking 'as an organisation how resilient are we and what do we need to work on?', and secondly remembering that what gets measured gets done!

The benchmarking tool is a web-based survey which organisations can use to measure and compare their resilience. Participation in this research means that it is free to use and it can provide some interesting and useful results. Despite being in its early stages the tool can still offer many real benefits to organisations that participate, these include:

- Raising awareness of resilience issues in your organisation
- Providing a starting point for developing the business case for resilience for your organisation
- The Benchmark Resilience Results Report which will:
- Provide a numerical and visual snapshot of how resilient your organisation is

- Tell you how your organisation's resilience compares with other organisations in Auckland
- Tell you how your organisation's resilience compares with other organisations in your sector (where available)
- Summarise your organisation's resilience based on independent indicators, including which areas of resilience your organisation is good at and which it could improve
- Discuss your organisation's strongest and weakest areas of resilience, and ways in which these could be improved.

If you would like to participate in the project to measure and benchmark your organisation's resilience and would like more information, please contact the research team by emailing me using the email below. Also, please feel free to ask any questions you may have about the research and its purpose.

Regards,

Amy Stephenson - Ph.D. Candidate
amy.stehenson@pg.canterbury.ac.nz
University of Canterbury, Department of
Civil & Natural Resources Engineering
Resilient Organisations Research Programme

Note: This letter was only used for the Auckland study discussed in Chapters 7, 8 and 9, not the pilot study.

Appendix B3: Follow-up Phone Call Script

This telephone protocol is to be used by researchers when following-up with organisations who did not respond to the 1st letter for the full Auckland benchmarking study and who have not volunteered to take part on the ResOrgs website.

For each call, please record the data and outcome on the call (a sheet will be provided for this).

Introduction

- Hello, my name is.....
- Would it be possible to speak to...(organization contact, or someone else who could address the issue)
- We recently sent you a letter inviting your organisation to take part in the Benchmark Resilience research project.
- Did you receive the letter?

About the Project

- The project involves 1000 Auckland organisations using the web-based tool, which is free to use, to measure and benchmark their resilience.
- The current global financial crisis is just one example of when an organisation needs to be resilient to survive.
- Organisations are also susceptible to:
 - Power cuts
 - Data corruption
 - Loss of key staff or reputation
 - Property damage
 - Natural hazard events like volcanic eruptions and weather bombs
- The project is being conducted through the University of Canterbury in conjunction with the Auckland Civil Defence Emergency Management Group.
- Would you like to take part in the project?

Benefits of Participation

- Not only is the project important from a research point of view but it also offers significant benefits to organisations that take part.
- Participating organisations are able to use the benchmarking tool free of charge!
- Each organisation will receive a full results report which includes:
 - A summary of your organisation's overall resilience
 - A detailed analysis of your organisation's resilience strengths and weaknesses
 - A comparative resilience benchmark which allows you to compare your resilience against other organisations in the Auckland region
 - Individual action plans for what your organisation could do to improve its resilience
 - Some organisations will also be able to compare their resilience against other organisations in their industry within Auckland!

Anonymity and Confidentiality

- If your organisation agrees to take part, your results and data are 100% confidential and will not be shared, we do the comparison by aggregating the data so no single individual or organisation can be identified in any way.
- The benchmarking tool and the research as a whole has been reviewed and approved by the University of Canterbury Human Ethics Committee.

Reasons Organisations Might Give for Not Taking Part

- Haven't had time to do it:
 - The survey only takes 20-25 minutes to do on average; some people have done in as little as 8 minutes.
- Staff don't want to do it:
 - Emphasize that it doesn't take long, it is anonymous and confidential.
 - They would be helping their organisation to become more resilient, increased resilience will prepare them for crisis and make the organisation more likely to survive a crisis or emergency.
 - The tool does not measure or evaluate the resilience of individual staff members in any way.
- Staff don't have access to a computer:
 - We can send out paper copies, ask staff to return the survey into a box over the course of one week and then bulk post it back to us (*we don't want to do this for every organisation but if it's a small business then this is ok*).
- We're only a small business:
 - Being a small business means that you are that much more sensitive to changes in your organisation's environment or conditions.
 - The survey has been specifically designed to be applicable to small businesses.
- We have our own business performance tools:
 - This benchmarking tool is unique in that it is actually designed specifically to measure and compare resilience.
 - It is free to use and will provide you with useful additional information which you could use to evaluate and compare with your existing tools.
 - Business performance is different from resilience.
- We already use benchmarking tools:
 - As you go through the survey you will recognize many of the themes as things that you have worked with and used before. This tool is wide ranging and while it cannot provide a full measure it does include things like Return on Investment, culture, staff satisfaction, profit, sales, decision making and leadership.
 - It draws them together and relates them to resilience specific indicators.
- We have recently been through a lot of restructuring or change so I don't think it would be very useful:
 - That is perfect, now is the best time for you to use the tool. One of the main purposes of the tool is to allow organisations to answer the question of how resilient are we now? After restructuring or a lot of change everything is new and most organisations are quite unsure of how their new structure will work during business-as-usual, let alone during a crisis.
 - One of the most useful things you can do now is to measure your resilience which includes elements of your culture, financial position, your staff skills, knowledge and satisfaction. Then you can use that information to move forward and work out strategies to manage your new structure and increase your resilience at the same time – it's a more holistic way of managing.
- I don't really know about this resilience stuff:
 - You don't need to; the tool is specifically designed so that it does not measure how much you know about resilience.

- It asks questions about your organisation and then, using indicators and the way the questions are phrased, relates them to your organisation's overall resilience.
- However through taking part and using the tool, you and your staff will automatically become more aware of resilience issues and learn about how you could become more resilient.
- Your results report will also include specific action plans which are tailored to your organisation and can help your organisation to improve its resilience.

How Does the Tool Work?

- We need as many members of staff from as many different roles and levels of your organisation as possible to take part, the more data we have, the more accurate your results will be.
- Each individual clicks on a link within an email and fills out the online survey (anonymously).
- The results are aggregated (averaged out) and that average is then your organisation's submission for the tool.
- The results are analysed, and then your results report is written.

What to Do Next

- If you would like to take part in the project we just need a few details:
 - Full name (*if not original contact*)
 - Job title (*if not original contact*)
 - Email address
 - Telephone number (*if not original contact or we don't have a direct line*)

Process

- We will send you two emails:
 - 1st Email – Contains a link to the survey which is only to be filled out by one senior manager at your organisation. This version of the survey contains all of the resilience measurement and benchmarking questions as well as an extra section of financial and management questions. You can choose to either fill this survey out yourself (possibly asking your Chief Financial Officer to be on hand to help if necessary), or you can ask someone else (who would have the necessary financial and management information) to do it on your behalf.
 - 2nd Email – Contains a link to the survey which we will ask you to forward through an all staff email (to staff at your Auckland location only). Please also add a sentence at the beginning of this email to let your staff know that you support the project and how important it is to take part.
- We will also send you this information again so that you have it to refer to.
- The web-based tool will remain open until the end of April.

Appendix B4: Benchmark Resilience Information Booklet

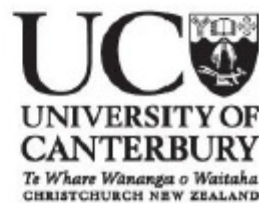


Benchmark Resilience Auckland



How would your organisation cope with the level of disruption that you normally experience in one month in the space of one day?

Your organisation is 1 of 1000 being invited to measure and benchmark its resilience!





What is resilience?

A resilient organisation is one that not only survives, but is also able to thrive in an environment of change and uncertainty

Resilience can be an asset to your organisation and to its stakeholders. New Zealand's environment makes it vulnerable to natural hazards like earthquakes and floods.



Organisations, both big and small, are also susceptible to power cuts, data corruption, loss of key staff or reputation, property damage and public health issues like pandemic influenza. And it's not just the big problems that can cause trouble for organisations; many experience small disruptions on a daily basis.



What products and services does your organisation rely on?

Power, fuel, product components, business services...

Who provides those products and services?

How confident are you that this supply would be able to continue during a crisis or disaster?



FAQ's

Will our results be confidential and anonymous?

Yes, all results are confidential and anonymous. No individual or organisation will be identifiable in any way and no organisation will receive results other than their own and the average scores for the Auckland region.

We do not have time, we are having to put all of our efforts into getting through the financial crisis!

Resilient organisations constantly challenge their accepted assumptions and ways of working. If your organisation is going through significant change, either because you have chosen to or because your environment is changing, now is a good time to measure your resilience - the results will help you address those business-as-usual concerns at the same time as assessing your resilience to future crises.

We are only a small business, should we still do it?

Yes, resilience is important for all organisations and some areas of resilience may even be easier for you to achieve.

We already use some performance measurement tools, why should we bother?

Measuring resilience is different, it is more comprehensive and cultural than other measurements you may use. However you will recognise many aspects that relate to other things you measure. Measuring your organisation's resilience will provide you with a check on your other measurements, it's free, and we do all of the data analysis and presentation for you!



What are the benefits of taking part?

Why should we take part in the project?

As well as helping to measure the resilience of the Auckland region your organisation will receive a tailored results report which includes:

- A description of your organisation's resilience
- A numerical and visual snapshot of your organisation's resilience strengths and weaknesses
- A comparison between the resilience of your organisation and others in the Auckland region
- A resilience benchmark
- An action plan outlining how you can draw on your strengths and improve your weaknesses

Participation will also help to raise awareness of resilience issues in your organisation and will provide a check for any ongoing business continuity, resilience or risk management programs.

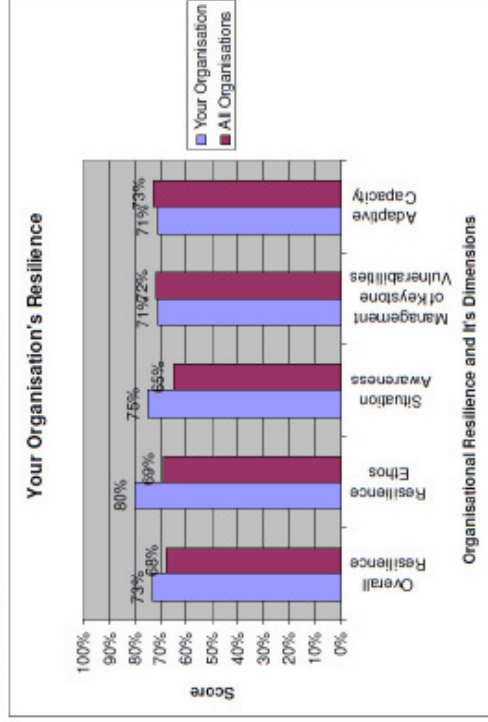
Use of the tool is free for participating organisations!

Who is conducting the project?

The project is being conducted as Ph.D. research at the University of Canterbury by Amy Stephenson. It is being funded by the Foundation for Research Science and Technology and the Auckland Region Civil Defence Emergency Management Group.

What will my results look like?

Your results report will include a number of graphs and diagrams; an example is shown below. This graph shows an organisations score, firstly for overall resilience, and then for each of the four dimensions that comprise organisational resilience. The discussion below the graph also gives the organisations resilience benchmark.



Your organisation's resilience benchmark allows you to compare your resilience with other organisations in the Auckland region. **Your organisation's overall resilience benchmark is 73%**. This means that, in Auckland, 72% of organisations scored lower than your organisation, and 27% of organisations scored higher than your organisation.

Why is it important?

Despite the many business benefits of becoming more resilient, organisations often struggle to prioritise resilience and to link resilience to crisis or disaster, with the ability to operate effectively and efficiently during business as usual. The lists below show that business-as-usual and crisis concerns are often not that different.

Business-as-usual Concerns

- Profit
- Efficiency
- Stakeholders
- Communication
- Brand and marketing
- Providing a product or service
- Innovation
- Knowledge
- Security

Crisis and Disaster Concerns

- Financial survival
- Streamlining processes to enable quick decision making
- Looking after 'our' people
- Communicating effectively with stakeholders and the media to manage reputation
- Maintaining product or service provision while responding to crisis
- Finding creative and innovative solutions to new problems
- Stopping the crisis from escalating further

Measuring and benchmarking organisational resilience is about two things, firstly asking 'as an organisation how resilient are we and what do we need to work on?', and secondly remembering that what gets measured gets done!

This is what can be achieved using the Benchmark Resilience tool. It uses the perception and experiences of staff across your organisation to identify your resilience strengths and weaknesses.

What do we have to do?

What is actually involved in taking part?

We collect the data used to measure your organisation's resilience through a web-based survey. You receive the links in an email, forward them to your staff, fill out the survey, and then wait for your results to be sent to you.

Is it possible for two of our Auckland branches or offices to be compared?

Yes, we would be happy to provide you with a comparison of overall resilience and resilience strengths and weaknesses between branches or offices of your organisation in the Auckland region. To do this, both branches or offices must give written consent and must take part in the project. Please email amy.stephenson@pg.canterbury.ac.nz to discuss this process.

To take part in the research, or if you have any questions, please email amy.stephenson@pg.canterbury.ac.nz

A full example results report is available from www.resorgs.org.nz/benchmark

The Resilient Organisations team wish to thank the Auckland Region Civil Defence Emergency Management Group for their support in this project.



RESILIENT ORGANISATIONS

www.resorgs.org.nz

Resilient Organisations © 2009

Appendix B5: Survey Link Email

Hi,

Further to our conversation about the Benchmark Resilience research project, please find attached a letter and an example of the results report that participating organisations will receive. Have a read and let me know if you have any questions; if you would like to take part, please see the email below.

Hi,

Further to your conversation with my colleague Charlotte about the Benchmark Resilience research project, please see attached the original letter that was sent to your organisation, a PDF copy of the survey questions so that you can see what's involved, and an example of the results report that participating organisations will receive. If you decide to take part in the research please see the information below. The research is not only important for me as part of my Ph.D. but is also important for organisations and communities in Auckland.

Thank you for participating in the Benchmark Resilience research project. We look forward to providing you with information on the resilience of your organisation. At the end of this study your organisation will receive a fully confidential report that will provide a numerical and visual snapshot of your organisation's resilience, tell you how your organisation's resilience compares with others in the Auckland region, identify and discuss your organisation's resilience strengths and weaknesses and ways in which you can address them.

It is important that as many staff as possible from your organisation's Auckland location take part in the research. The more data we have, the more accurate the results we can provide. Participation is anonymous and confidential and no individual staff member or organisation will be identifiable in any way.

You will shortly receive a second email containing instructions and a link to the web-based Benchmark Resilience tool; this should be forwarded to all staff at your organisation's Auckland location.

The link below will take you to a version of the survey that is only to be filled out by one senior manager. This survey contains all of the resilience measurement questions that your staff will answer, as well as an extra section containing financial and management questions. You can use the below link on this email fill out the survey yourself, or you can pass it to another senior manager (such as your Chief Financial Officer) to fill out on your behalf. If you have any questions about the tool or the research please email me at amy.stephenson@pg.canterbury.ac.nz.

Link

As a side note please feel free to add a sentence at the beginning of the all staff email to encourage your staff to take part.

Regards,

Appendix C

Appendix C1: The Organisational Resilience Measurement Tool that was Used for the Pilot Study

Ethics Statement

Please read the following before completing the questionnaire.

You are invited to participate in the research project 'Benchmarking the Resilience of Organisations' by completing the following questionnaire. The aim of the project is to measure organisations resilience and benchmark it against other organisations in Auckland and against best practice. This questionnaire forms the pilot study for the research and will take 30-40 minutes to complete.

The project is being carried out as a requirement for a Ph.D. by Amy Stephenson who can be contacted at 02102638187, under the supervision of Dr. Erica Seville (Research Fellow in the Department of Civil & Natural Resources Engineering at the University of Canterbury), who can be contacted at 021456706. They will be pleased to discuss any questions you may have about participation in the project.

The questionnaire is not anonymous, but it is confidential. You will be asked to give your name at the start of the survey; this is so that you can withdraw your participation, including withdrawal of any information you have provided, for up to two weeks after you have completed the survey. Once you have completed the survey Amy will ring you within 1 week to discuss your experience of the survey. Your details and answers are confidential and will not be shared with anyone.

This information is available for you to download and keep for reference in the PDF document on the Resilient Organisations website.

I have read and understood the description of the above-named project. I understand that I may withdraw from the project, including withdrawal of any information I have provided for up to two weeks after I have completed the survey.

I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

On this basis I agree to participate as a subject in the project, and I consent to the use of my answers with the understanding that my data will be confidential.

Instructions

Thank you for agreeing to take part in the Benchmark Resilience Project.

The survey requires no special skills, and there are, no right or wrong answers. You may not be able to answer all of the questions, if you can't answer a question chose the 'Don't Know' option. Many of the questions refer to 'your organisation', when answering these questions please think about your organisation at your location as a whole and not just your department or business unit. The questions use your perception and your experience of your organisation to measure and benchmark its resilience. Questions do not reflect on, or judge, your own performance or resilience in any way.

Once you have started the survey you cannot save your progress or leave the survey without losing your answers. Please make sure that you have 20-30 minutes to complete the survey.

You will see a progress bar at the top of your screen. This shows you how far through the survey you are, and indicates how much of the survey is left.

Once you are happy with your answers on a page, click the next at the bottom of the page to move on.

If you have any questions at any time, or upon completion wish to retrieve your data from the project please don't hesitate to call Amy on 02102638187 or Erica on 021456706.

Demographic and Background Information Questions

Demographic	Item
Sex	Tick List Format: Are you male or female? – Male, Female
Age	Tick List Format: How old are you? - <20, 21-30, 31-40, 41-50, 51-60, 61+
Organisation Name	Open Format: What is the name of your organisations?
Hierarchical Level	Tick List Format: Which of these levels best describes your position within your organisation? – Senior manager, Middle manager, Team leader/supervisor, Staff
Job Title	Open Format: What is your job title?
Time in Industry	Tick List Format: How long have you worked in your industry? (please tick one) – Less than 1 year, 1-3 years, 4-10 years, 11-20 years, 21+ years
Time in Job	Tick List Format: How long have you worked at your organisation? (please tick one) – Less than 1 year, 1-3 years, 4-10 years, 11-20 years, 21+ years
Industry Sector	Tick List Format: Which industry sector is your organisation in? – Accommodation, Administrative and support services, Agriculture forestry and fishing, Arts sports and recreation services, Construction, Education and training, Electricity gas water and waste services, Financial and insurance services, Government public administration and safety, Healthcare and social assistance, Information media and telecommunications, Manufacturing, Mining, Professional scientific and technical services, Rental hiring and real estate services, Retail trade, Transport postal and warehousing, Wholesale trade, Other (please specify)
Organisation Classification	Tick List Format: Which classification best describes your organisation? - Individual proprietorship, Partnership, Registered limited liability company (non Co-op), Cooperative companies, Joint ventures and consortia, Branches of companies incorporated overseas, Government owner trading entity, Central government, Local authority trading enterprise (LATE), Incorporated and unincorporated societies and associations, Charitable trusts, Trusts/estates, Consulates and foreign embassies, Other (please specify)
Locations	Open Format: How many locations or sites does your organisation have?
Number of Staff	Tick List Format: How many full time people work for your organisation? (please tick one) – 1-5, 6-10, 11-50, 51-250, 251-500, 501-2000, 2001+
Crisis Experience	Tick List Format: Has your organisation experienced a crisis or emergency in the last 5 years? (please tick one) – Yes, No, Don't know
Crisis Memory	Open Format: In what year did the crisis occur? On the scale shown please rate, how severe your organisation's most recent crisis was for your organisation - We dealt with it as part of business-as-usual, It challenged us but was not overly disruptive, It definitely challenged us and was moderately disruptive, It definitely challenged us and was very disruptive, It could have shut us down permanently, Don't know Open Format: Please briefly describe what the crisis was, how long it lasted for and what the impact was on your organisation

Resilience Measurement Questions - Resilience Ethos

Indicator	Item
Commitment to Resilience	RE1.1 Our organisation is focused on being able to respond to the unexpected
	RE1.2 In our organisation, there is an appropriate balance between short and long term priorities
	RE1.3 Our organisation is concerned with building people's ability to respond to unexpected challenges
Network Perspective	RE2.1 Our organisation actively participates in industry or sector groups
	RE2.2 Our organisation is able to collaborate with others in our industry to manage unexpected challenges
	RE2.3 Management see our organisation as having a leadership role in our industry

Resilience Measurement Questions - Situation Awareness

Indicator	Item
Roles & Responsibilities	SA1.1 Most people in our organisation have a clear picture of what their role would be in a crisis
	SA1.2 Our organisation is able to shift rapidly from business as usual mode to respond to crises
	SA1.3 If key people were unavailable, there are always others who could fill their role
Understanding & Analysis of Hazards & Consequences	SA2.1 During an average day, people interact often enough to know what's going on in our organisation
	SA2.2 Managers actively listen for problems in our organisation because it helps them to prepare a better response
	SA2.3.1 Tick List Format: Think of the highest risk facing your organisation; which of the categories provided does it fit into? (please tick one) - Natural hazard, Financial crisis, Major accident or fire, Pandemic, Loss of critical services e.g. electricity, Reputation damage, Fraud, Regulatory issues, Staffing issues, Failure of a key supplier or customer, Other
	SA2.3.2 Our organisation fully understands the impact that this risk would have on us
	SA3.1 Our organisation is aware of crises that could affect our industry
Connectivity Awareness	SA3.2 Our organisation has a good understanding of how quickly we would be affected if one of our larger customers or suppliers went out of business
	SA3.3 Our organisation is conscious of how a crisis in our organisation would impact other organisations
Insurance Awareness	SA4.1 If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation
	SA4.2 If our organisation sustained significant physical damage, we would have sufficient funds to re-start operations until our insurance claim was settled
Recovery Priorities	SA5.1 Our organisation has clearly defined priorities for what is important during and after a crisis
	SA5.2 I believe that our organisation's priorities for recovery from a crisis would be sufficient to provide direction for staff

Indicator	Item	
Internal & External Situation Monitoring & Reporting	SA5.3	Our organisation understands the minimum level of resources it needs to operate successfully
	SA6.1	Whenever our organisation suffers a close call we use it as a trigger for self evaluation rather than confirmation of our success
	SA6.2	Our organisation proactively monitors what is happening in its industry to have an early warning of emerging issues
	SA6.3	Our organisation is successful at learning lessons from past projects and making sure these lessons are carried through to future projects
Informed Decision Making	SA7.1	Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information
	SA7.2	In our organisation, it is generally easy to obtain expert assistance when something comes up that we don't know how to handle
	SA7.3	If something is not working well, I believe staff from any part of our organisation would feel able to raise the issue with senior management

Resilience Measurement Questions - Management of Keystone Vulnerabilities

Indicator	Item	
Planning Strategies	KV1.1	Given our level of importance to our stakeholders I believe that the way we plan for the unexpected is appropriate
	KV1.2	Tick List Format: Our organisation prepares for crisis through: (please tick one) - Planning, Insurance, A combination of planning and insurance, Don't know
	KV1.3	Tick List Format: Our organisation currently employs people in the following areas (tick all that apply) – Risk management, Crisis management, Emergency management, Business continuity management
	KV1.4.1	Tick List Format: Does your organisation have a formal written crisis/emergency or business continuity plan? – Yes, No, Don't know
	KV1.4.2	Tick List Format: Is your organisation's formal written crisis/emergency or business continuity plan of a sufficient standard to be useful in an emergency? – yes, no, don't know
	KV1.5	Tick List Format: Has your organisation done any formal planning for a specific hazard or risk? (please tick one) – Yes, No, Don't know
	KV1.5.1	Tick List Format: Which of the following hazards or risks has your organisation planned for? (tick all that apply) - Natural hazard, Financial crisis, Major accident or fire, Pandemic, Loss of critical services e.g. electricity, Reputation damage, Fraud, Regulatory issues, Staffing issues, Failure of a key supplier or customer, Other
	KV1.6.1	Tick List Format: Has your organisation done any planning for a possible flu pandemic? – Yes, No, Don't know
	KV1.6.2	Tick List Format: In response to the threat of flu pandemic, our organisation has: (please tick the option closest to the planning that your organisation has completed) - Discussed how a flu pandemic would be managed with key staff, Put formal

Indicator	Item	
Participation in Exercises	KV2.1	plans in place to manage a flu pandemic if it happened, Engaged in formal planning with other organisations to manage the impact of a flu pandemic on our sector Our organisation understands that having a plan for emergencies is not enough and that the plan must be practised and tested to be effective
	KV2.2	People are generally able to take time off from their day-to-day roles to be involved in practising how we respond in an emergency
	KV2.3	I believe our organisation invests sufficient resources in being ready to respond to an emergency of any kind
Capability & Capacity of Internal Resources	KV3.1	I believe that our organisation has sufficient internal resources to operate successfully during business-as-usual
	KV3.2	During business as usual resources are managed so that we are always able to absorb a small amount of unexpected change
	KV3.3	When a problem occurs in our organisation, internal resources become more easily available at short notice and there is less red tape to deal with
Capability & Capacity of External Resources	KV4.1	I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to
	KV4.2	Our organisation has agreements with other organisations to provide resources in an emergency
	KV4.3	Our organisation has thought about and planned for support that it could provide to the community during an emergency
Organisational Connectivity	KV5.1	People in our organisation actively manage areas of their work that rely on other organisations
	KV5.2	Our organisation keeps in contact with organisations that it might have to work with in a crisis
	KV5.3	Our organisation understands how it is connected to other organisations in the same industry or location, and actively manages those links
Robust Processes for Identifying & Analysing Vulnerabilities	KV6.1	People in our organisation understand how quickly we could be affected by unexpected and potentially negative events
	KV6.2	People in our organisation report significant mistakes even if others do not notice that a mistake is made
	KV6.3	People in our organisation are always rewarded if they spot potential trouble spots
Staff Engagement & Involvement	KV7.1	People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges
	KV7.2	Most people in our organisation feel responsible for the organisations effectiveness
	KV7.3	People in our organisation typically “own” a problem until it is resolved

Resilience Measurement Questions - Adaptive Capacity

Indicator	Item	
Silo Mentality	AC1.1	People are encouraged to move between different departments or try different roles within our organisation to gain experience
	AC1.2	There is an excellent sense of teamwork and camaraderie in our organisation
	AC1.3	In our organisation, it is important that there are no barriers which stop us from working well with each other and with other organisations
Communications & Relationships	AC2.1	Our organisation is regarded as an active participant in industry and sector groups
	AC2.2	People in our organisation work with whoever they need to work with to get the job done well, regardless of departmental or organisational boundaries
	AC2.3	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly
Strategic Vision & Outcome Expectancy	AC3.1	Our organisation has a vision or mission and it is formalised in a written statement
	AC3.2	When I read my organisations vision or mission statement I recognise it as reflecting the values that we aspire to
	AC3.3	In our organisation we regularly take time from our day-to-day work to re-evaluate what it is we are trying to achieve
Information & Knowledge	AC4.1	In our organisation, it is a priority that people have the information and knowledge they need to respond to unexpected problems that arise
	AC4.2	In our organisation, if something out of the ordinary happens, people know who has the expertise to respond
	AC4.3	In our organisation, we make a conscious effort to ensure that critical information (e.g. staff contact details) is available in a number of different formats and locations
Leadership, Management & Governance Structures	AC5.1	I am confident that management would provide good leadership if our organisation was struck by a real crisis
	AC5.2	I believe people would accept decisions made by management about how our organisation should manage a crisis, even if they were developed with little consultation
	AC5.3	Managers constantly monitor staff workloads and reduce them when they become excessive
	AC5.4	Top management think and act strategically to ensure that our organisation is always ahead of the curve
	AC5.5	Top management in our organisation are good examples of professionals that we can aspire to learn from
Innovation & Creativity	AC6.1	Our organisation actively encourages people to challenge and develop themselves through their work
	AC6.2	People in our organisation are known for their ability to use their knowledge in novel ways
	AC6.3	People in our organisation are rewarded for “thinking outside of the box”
Devolved & Responsive Decision Making	AC7.1	Should problems occur, someone with the authority to act is always accessible to people on the front lines
	AC7.2	When we need to, our organisation can make tough decisions quickly
	AC7.3	In this organisation, the people most qualified to make decisions make them regardless of seniority

Reflective Business Performance Questions

Indicator	Item
External Directors	Tick List Format: Does your organisation have external directors/trustees on its governing board? – Yes, No, Don't know
Staff Satisfaction	Tick List Format: Has your organisation used a staff satisfaction survey or assessment in the last 2 years? Open Format: Please describe your score from the most recent staff satisfaction survey that your organisation took part in
Staff Turnover	Tick List Format: What is your organisation's average annual staff turnover over the last 5 years? – 0-5%, 6-10%, 11-20%, 21-40%, 41%+
Senior Management Turnover	Tick List Format: What is your organisation's average annual senior management turnover over the last 5 years? – 0-5%, 6-10%, 11-20%, 21-40%, 41%+
Skip logic question – for-profit/not-for-profit organisations were separated from this point	Tick List Format: Which of the following best describes your organisation? – For-profit, Not-for-profit
For-profit Organisations Only	
Sales Growth Rate	Tick List Format: What is your organisation's average annual sales growth rate over the last 5 years? For each year, this is calculated as your organisation's annual increase in sales divided by the previous year's sales. – Less than 0%, 1-10%, 11-30%, 31-100%, 101%+, Don't know
Profit to Sales Ratio	Tick List Format: What is your organisation's average annual profit to sales ratio over the last 5 years? For each year, this is calculated as your organisation's net profit before tax divided by the total sales. – Less than 0%, 0-5%, 6-10%, 11-20%, 21%+, Don't know
Return on Investment	Tick List Format: What is your organisation's average annual return on investment (ROI) over the last 5 years? For each year, this is calculated as your organisation's profit after tax, divided by its assets minus its liabilities. – Less than 0, 0-5, 6-10, 11-20, 21+, Don't know
Not-for-profit Organisations Only	
Income Budget Increase	Tick List Format: By how much, on average, has your organisation's income budget increased each year, over the last 5 years? – Less than 0%, 1-10%, 11-30%, 31-100%, 101%+, Don't know
Operating Surplus	Tick List Format: What is your organisation's average operating surplus as a percentage of its total income over the last 5 years? – 0-5%, 6-10%, 11-20%, 21-40%, 41%+, Don't know

Note: Only one senior manager from each organisation was asked to complete the reflective questions.

Open Question

Information & Comments	Item
	We invite you to propose a question you feel should have been asked in this survey but was not--and then answer it

Thank You

Thank you for taking the time to fill out this survey, your participation is very important and your organisation will be able to learn from its results.

The information you have provided will enable us to link our measurement of your organisations resilience to its actual financial and market performance. We look forward to sharing the results with you. If you have any questions about the research or the survey please contact either Amy Stephenson (Ph.D. student) on 02102638187 or Dr. Erica Seville, (Research Fellow in the Department of Civil & Natural Resources Engineering at the University of Canterbury) on 021456706.

Also, please encourage as many of your colleagues to take this survey as possible – the more results we have, the better the information we can provide to your organisation!

Appendix C2: A Screenshot of a Likert Question Used in the Pilot Study

Resilient Organisations

AUCKLAND REGION EMERGENCY MANAGEMENT
Rāpiti Whakahaere Mate Ohonata

UC UNIVERSITY OF CANTERBURY
Te Whare Hīranga o Wānanga CLAYTON RIVER NEW ZEALAND

Benchmark Resilience

To what extent do you agree or disagree with the following statements?

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Don't Know
Our organisation is focused on being able to respond to the unexpected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In our organisation, there is an appropriate balance between short and long term priorities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organisation is concerned with building people's ability to respond to unexpected challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Progress bar: 26%

Note: This is a screenshot of the questions used to measure the commitment to resilience indicator during the pilot study for the resilience measurement tool.

Appendix C3: Semi-structured Interview Questions

Accessing the Survey

- Were the instructions on how to access the survey clear and easy to follow?
- Were there any technical (IT) problems when accessing the survey?

Survey Introduction and Ethics

- Is the survey introduction easy to understand?
- Were you comfortable with the purpose of the research and how this was written?
- Was it easy to understand what would happen to your data?

Survey Questions

- Was the language used in the survey questions easy to understand?
- Was there any confusing terminology or references?
- Were there any questions which did not seem to belong or which seemed a bit out of place?
- Do you feel the questions were relevant to your organisation's resilience?
- Were there any questions which you did not feel you should answer or which made you uncomfortable?
- Are there any questions that you feel should have been included but were not?

Format and Layout

- Did you dislike any of the colours or their placement on the survey?
- How easy was it to read a question and understand what kind of answer was required?
- Did you find the progress bar which was displayed on each screen helpful?
- Was there anything about the format or layout of the survey which made it difficult to use?

Appendix C4: Example of Other Types of Questions used within the Survey

Benchmark Resilience

16%

What is your full name? (first name then surname)

Are you male or female?

Male

Female

How old are you?

<20

21-30

31-40

41-50

51-60

61+

What is the name of your organisation?

Which of these levels best describes your position within your organisation?

Note: This screenshot shows radio buttons, dropdown lists and open question.

Appendix C5: The Organisational Resilience Measurement Tool that was used for the Auckland Study

Ethics Statement

Benchmarking the Resilience of Organisations

Please read the following before completing the questionnaire.

You are invited to participate in the research project 'Benchmarking the Resilience of Organisations' by completing the following questionnaire. The aim of the project is to measure organisations resilience and benchmark it against other organisations in Auckland and against best practice. This questionnaire will take 20-30 minutes to complete.

The project is being carried out as a requirement for a Ph.D. by Amy Stephenson who can be contacted at 0210436901, under the supervision of Dr. Erica Seville (Research Fellow in the Department of Civil & Natural Resources Engineering at the University of Canterbury), who can be contacted at 021456706. They will be pleased to discuss any questions you may have about participation in the project.

The questionnaire is anonymous and confidential, individuals are not identifiable and your data will not be shared with any third parties. You may withdraw your participation, including withdrawal of any information you have provided, for up to two weeks after you have completed the questionnaire.

This information is available for you to download and keep for reference in the PDF document on the Resilient Organisations website which you will automatically be taken to at the end of the questionnaire.

I have read and understood the description of the above-named project. I understand that I may withdraw from the project, including withdrawal of any information I have provided for up to two weeks after I have completed the questionnaire. I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

On this basis I agree to participate as a subject in the project, and I consent to the use of my answers with the understanding that my data will be confidential.

Instructions

Thank you for agreeing to take part in the Benchmark Resilience Project.

The questionnaire requires no special skills, and there are, no right or wrong answers. You may not be able to answer all of the questions, if you can't answer a question chose the 'Don't Know' option. Many of the questions refer to 'your organisation'. When answering these questions please think about your organisation at your Auckland location and not just your department or business unit. The questions use your perception and your experience of your organisation to measure and benchmark its resilience. Questions do not reflect on, or judge, your own performance or resilience in any way.

Once you have started the questionnaire you cannot save your progress or leave without losing your answers. However if you need to leave for a short time you can minimise the questionnaire to the bottom of your screen and then maximise it and continue the questionnaire when you're ready. Please make sure that you have 20-30 minutes to complete the questionnaire.

You will see a progress bar at the top of your screen. This shows you how far through the questionnaire you are, and indicates how much is left.

Once you are happy with your answers on a page, click next at the bottom of the page to move on.

If you have any questions, or upon completion wish to retrieve your data from the project please don't hesitate to call Amy on 0210436901 or Erica on 021456706.

Demographic and Background Information Questions

Demographic	Item
Sex	Tick List Format: Are you male or female? – Male, Female
Age	Tick List Format: How old are you? - <20, 21-30, 31-40, 41-50, 51-60, 61+
Organisation Name	Open Format: What is the name of your organisations?
Department	Drop Down List: Which of the following best describes the department or business unit you work in? – Accounting & Payroll, Administration, Catering, Customer Services, Design & Print Services, Emergency Planning/Management, Engineering, Facilities & Maintenance, Finance & Insurance, Health & Safety, Human Resources, ICT, Logistics, Marketing, Manufacturing, Media & Public Relations, Procurement, Risk Management, Sales, Transport, Waste Management, Welfare, Other
Hierarchical Level	Tick List Format: Which of these levels best describes your position within your organisation? – Senior manager, Middle manager, Team leader/supervisor, Staff
Job Title	Open Format: What is your job title?
Time in Industry	Tick List Format: How long have you worked in your industry? (please tick one) – Less than 1 year, 1-3 years, 4-10 years, 11-20 years, 21+ years
Time in Job	Tick List Format: How long have you worked at your organisation? (please tick one) – Less than 1 year, 1-3 years, 4-10 years, 11-20 years, 21+ years
Organisation Classification/Type (Senior Managers Only)	Tick List Format: Which classification best describes your organisation? - Individual proprietorship, Partnership, Registered limited liability company (non Co-op), Cooperative companies, Joint ventures and consortia, Branches of companies incorporated overseas, Government owner trading entity, Central government, Local authority trading enterprise (LATE), Incorporated and unincorporated societies and associations, Charitable trusts, Trusts/estates, Consulates and foreign embassies, Other (please specify)
Crisis Experience	Tick List Format: Has your organisation experienced a crisis or emergency in the last 5 years? (please tick one) – Yes, No, Don't know
Crisis Memory	Open Format: In what year did the crisis occur? On the scale shown please rate, how severe your organisation's most recent crisis was for your organisation - We dealt with it as part of business-as-usual, It challenged us but was not overly disruptive, It definitely challenged us and was moderately disruptive, It definitely challenged us and was very disruptive, It could have shut us down permanently, Don't know
	Open Format: Please briefly describe what the crisis was, how long it lasted for and what the impact was on your organisation

Resilience Measurement Questions - Resilience Ethos

Indicator	Item
Commitment to Resilience	RE1.1 Our organisation is focused on being able to respond to the unexpected
	RE1.2 In our organisation, there is an appropriate balance between short and long term priorities
	RE1.3 Our organisation has a culture where it is important to make sure that we learn from our mistakes and problems
Network Perspective	RE2.1 Our organisation actively participates in industry or sector groups
	RE2.2 Our organisation is able to collaborate with others in our industry to manage unexpected challenges
	RE2.3 Management see our organisation as having a leadership role in our industry

Resilience Measurement Questions - Situation Awareness

Indicator	Item
Roles & Responsibilities	SA1.1 Most people in our organisation have a clear picture of what their role would be in a crisis
	SA1.2 Our organisation is able to shift rapidly from business as usual mode to respond to crises
	SA1.3 If key people were unavailable, there are always others who could fill their role
	SA2.1 During an average day, people interact often enough to know what's going on in our organisation
Understanding & Analysis of Hazards & Consequences	SA2.2 Managers actively listen for problems in our organisation because it helps them to prepare a better response
	SA2.3.1 Tick List Format: Think of the highest risk facing your organisation; which of the categories provided does it fit into? (please tick one) - Natural hazard, Financial crisis, Major accident or fire, Pandemic, Loss of critical services e.g. electricity, Reputation damage, Fraud, Regulatory issues, Staffing issues, Failure of a key supplier or customer, Other
	SA2.3.2 Our organisation fully understands the impact that this risk would have on us
	SA2.4 What would be the maximum amount of time that your organisation could stop operating for and yet still be able to recover? (a range scored 1-6)
Connectivity Awareness	SA3.1 In our organisation we are aware of how dependent the success of one area is on the success of another
	SA3.2 Our organisation has a good understanding of how quickly we would be affected if one of our larger customers or suppliers went out of business
Insurance Awareness	SA3.3 Our organisation is conscious of how a crisis in our organisation would impact other organisations
	SA4.1 If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation
	SA4.2 If our organisation sustained significant physical damage, we would have sufficient funds to re-start operations until our insurance claim was settled

Indicator	Item
Recovery Priorities	SA5.1 Our organisation has clearly defined priorities for what is important during and after a crisis
	SA5.2 I believe that our organisation's priorities for recovery from a crisis would be sufficient to provide direction for staff
	SA5.3 Our organisation understands the minimum level of resources it needs to operate successfully
Internal & External Situation Monitoring & Reporting	SA6.1 Whenever our organisation suffers a close call we use it as a trigger for self evaluation rather than confirmation of our success
	SA6.2 Our organisation proactively monitors what is happening in its industry to have an early warning of emerging issues
	SA6.3 Our organisation is successful at learning lessons from past projects and making sure these lessons are carried through to future projects
Informed Decision Making	SA7.1 Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information
	SA7.2 In our organisation, it is generally easy to obtain expert assistance when something comes up that we don't know how to handle
	SA7.3 If something is not working well, I believe staff from any part of our organisation would feel able to raise the issue with senior management

Resilience Measurement Questions - Management of Keystone Vulnerabilities

Indicator	Item
Planning Strategies	KV1.1 Given our level of importance to our stakeholders I believe that the way we plan for the unexpected is appropriate
	KV1.2 Tick List Format: Our organisation prepares for crisis through: (please tick one) - Planning, Insurance, A combination of planning and insurance, Don't know
	KV1.3 Tick List Format: Our organisation currently employs people in the following areas (tick all that apply) – Risk management, Crisis management, Emergency management, Business continuity management
	KV1.4.1 Tick List Format: Does your organisation have a formal written crisis/emergency or business continuity plan? – Yes, No, Don't know
	KV1.4.2 Tick List Format: Is your organisation's formal written crisis/emergency or business continuity plan of a sufficient standard to be useful in an emergency? – yes, no, don't know
	KV1.5 Tick List Format: Has your organisation done any formal planning for a specific hazard or risk? (please tick one) – Yes, No, Don't know
KV1.5.1 Tick List Format: Which of the following hazards or risks has your organisation planned for? (tick all that apply) - Natural hazard, Financial crisis, Major accident or fire, Pandemic, Loss of critical services e.g. electricity, Reputation damage, Fraud, Regulatory issues, Staffing issues, Failure of a key supplier or customer, Other	
KV1.6.1 Tick List Format: Has your organisation done any planning for a possible flu pandemic? – Yes, No, Don't know	

Indicator	Item
	KV1.6.2
	KV2.1
Participation in Exercises	KV2.2
	KV2.3
Capability & Capacity of Internal Resources	KV3.1
	KV3.2
	KV3.3
Capability & Capacity of External Resources	KV4.1
	KV4.2
	KV4.3
Organisational Connectivity	KV5.1
	KV5.2
	KV5.3
Robust Processes for Identifying & Analysing Vulnerabilities	KV6.1
	KV6.2
	KV6.3
Staff Engagement & Involvement	KV7.1
	KV7.2
	KV7.3

Tick List Format: In response to the threat of flu pandemic, our organisation has: (please tick the option closest to the planning that your organisation has completed) - Discussed how a flu pandemic would be managed with key staff, Put formal plans in place to manage a flu pandemic if it happened, Engaged in formal planning with other organisations to manage the impact of a flu pandemic on our sector

Our organisation understands that having a plan for emergencies is not enough and that the plan must be practised and tested to be effective

People are generally able to take time off from their day-to-day roles to be involved in practising how we respond in an emergency

I believe our organisation invests sufficient resources in being ready to respond to an emergency of any kind

I believe that our organisation has sufficient internal resources to operate successfully during business-as-usual

During business as usual resources are managed so that we are always able to absorb a small amount of unexpected change

When a problem occurs in our organisation, internal resources become more easily available at short notice and there is less red tape to deal with

I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to

Our organisation has agreements with other organisations to provide resources in an emergency

Our organisation has thought about and planned for support that it could provide to the community during an emergency

People in our organisation actively manage areas of their work that rely on other organisations

Our organisation keeps in contact with organisations that it might have to work with in a crisis

Our organisation understands how it is connected to other organisations in the same industry or location, and actively manages those links

People in our organisation understand how quickly we could be affected by unexpected and potentially negative events

People in our organisation report significant mistakes even if others do not notice that a mistake is made

People in our organisation are always rewarded if they spot potential trouble spots

People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges

Most people in our organisation feel responsible for the organisations effectiveness

People in our organisation typically "own" a problem until it is resolved

Resilience Measurement Questions - Adaptive Capacity

Indicator	Item	
Silo Mentality	AC1.1	People are encouraged to move between different departments or try different roles within our organisation to gain experience
	AC1.2	There is an excellent sense of teamwork and camaraderie in our organisation
	AC1.3	In our organisation, it is important that there are no barriers which stop us from working well with each other and with other organisations
Communications & Relationships	AC2.1	Our organisation is regarded as an active participant in industry and sector groups
	AC2.2	People in our organisation work with whoever they need to work with to get the job done well, regardless of departmental or organisational boundaries
	AC2.3	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly
Strategic Vision & Outcome Expectancy	AC3.1	Our organisation has a vision or mission and it is formalised in a written statement
	AC3.2	When I read my organisations vision or mission statement I recognise it as reflecting the values that we aspire to
	AC3.3	In our organisation we regularly take time from our day-to-day work to re-evaluate what it is we are trying to achieve
Information & Knowledge	AC4.1	In our organisation, it is a priority that people have the information and knowledge they need to respond to unexpected problems that arise
	AC4.2	In our organisation, if something out of the ordinary happens, people know who has the expertise to respond
	AC4.3	In our organisation, we make a conscious effort to ensure that critical information (e.g. staff contact details) is available in a number of different formats and locations
Leadership, Management & Governance Structures	AC5.1	I am confident that management would provide good leadership if our organisation was struck by a real crisis
	AC5.2	I believe people would accept decisions made by management about how our organisation should manage a crisis, even if they were developed with little consultation
	AC5.3	Managers constantly monitor staff workloads and reduce them when they become excessive
	AC5.4	Top management think and act strategically to ensure that our organisation is always ahead of the curve
	AC5.5	Top management in our organisation are good examples of professionals that we can aspire to learn from
Innovation & Creativity	AC6.1	Our organisation actively encourages people to challenge and develop themselves through their work
	AC6.2	People in our organisation are known for their ability to use their knowledge in novel ways
	AC6.3	People in our organisation are rewarded for “thinking outside of the box”
Devolved & Responsive Decision Making	AC7.1	Should problems occur, someone with the authority to act is always accessible to people on the front lines
	AC7.2	When we need to, our organisation can make tough decisions quickly
	AC7.3	In this organisation, the people most qualified to make decisions make them regardless of seniority

Reflective Business Performance Questions

Indicator	Item
External Directors	Tick List Format: Does your organisation have external directors/trustees on its governing board? – Yes, No, Don't know
Number of Staff	Tick List Format: How many full time people work for your organisation? (please tick one) – 1-5, 6-10, 11-50, 51-250, 251-500, 501-2000, 2001+
Locations	Open Format: How many locations or sites does your organisation have?
Staff Turnover	Tick List Format: What is your organisation's average annual staff turnover over the last 5 years? – 0-5%, 6-10%, 11-20%, 21-40%, 41%+
Back-up IT	Tick List Format: Does your organisation have back-up IT facilities? – Yes, No, Don't Know
Relocation	If your building or work area was inaccessible due to physical damage or a hazard, where would you relocate to? (please tick one) – A temporary building or office that we would arrange when needed, A temporary building or office that we have already arranged, We have plans (that have already been tested) for our staff to work from home, We would arrange for our staff to work from home although we have not planned or practiced this, We would not relocate, Don't Know, Other (please specify)
Cash Flow	Tick List Format: How would you rate your organisation's cash flow? – Excellent, Good, Satisfactory, Poor, Very Poor, Don't know
Staff Satisfaction	Tick List Format: Has your organisation used a staff satisfaction survey or assessment in the last 2 years? – Yes, No Open Format: Please describe your score from the most recent staff satisfaction survey that your organisation took part in
Skip logic question – for-profit/not-for-profit organisations were separated from this point	Tick List Format: Which of the following best describes your organisation? – For-profit, Not-for-profit
For-profit Organisations Only	
Sales Growth Rate	Tick List Format: What is your organisation's average annual sales growth rate over the last 5 years? For each year, this is calculated as your organisation's annual increase in sales divided by the previous year's sales. – Less than 0%, 1-10%, 11-30%, 31-100%, 101%+, Don't know
Profit to Sales Ratio	Tick List Format: What is your organisation's average annual profit to sales ratio over the last 5 years? For each year, this is calculated as your organisation's net profit before tax divided by the total sales. – Less than 0%, 0-5%, 6-10%, 11-20%, 21%+, Don't know
Return on Investment	Tick List Format: What is your organisation's average annual return on investment (ROI) over the last 5 years? For each year, this is calculated as your organisation's profit after tax, divided by its assets minus its liabilities. – Less than 0, 0-5, 6-10, 11-20, 21+, Don't know

Debt	Tick List Format: What is your organisation's debt-to-equity ratio? (This is calculated by dividing your organisation's total debt by its stockholders' equity) – 0-0.4, 0.5-0.9, 1-1.4, 1.5-1.9, 2-2.4, 2.5-2.9, 3-3.4, Don't know (If don't know then subjective debt question is shown)
Subjective Debt	Tick List Format: How do you feel about your organisation's level of debt? – Very positive, Positive, Negative, Very negative
Not-for-profit Organisations Only	
Income Budget Increase	Tick List Format: By how much, on average, has your organisation's income budget increased each year, over the last 5 years? – Less than 0%, 1-10%, 11-30%, 31-100%, 101%+, Don't know
Operating Surplus	Tick List Format: What is your organisation's average operating surplus as a percentage of its total income over the last 5 years? – 0-5%, 6-10%, 11-20%, 21-40%, 41%+, Don't know

Note: Only one senior manager from each organisation was asked to complete the reflective questions.

Open Question

Item	
Information & Comments	We invite you to propose a question you feel should have been asked in this survey but was not--and then answer it

Thank You

Thank you for taking the time to fill out this questionnaire, your participation is very important and your organisation will be able to learn from its results.

As a reminder, you may withdraw your participation, including withdrawal of any information you have provided, for two weeks from the time you completed this questionnaire.

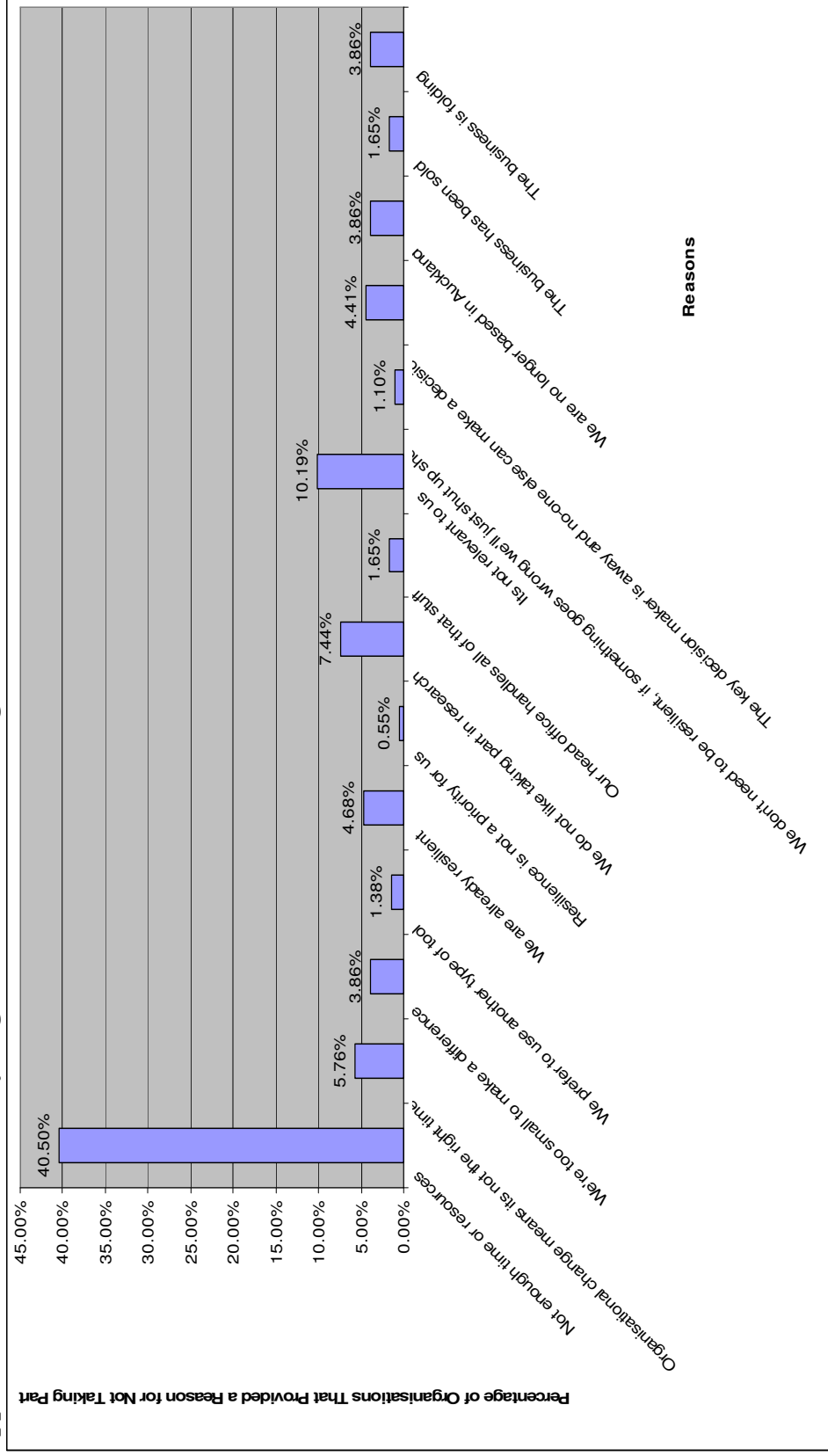
This questionnaire measures the resilience of your organisation. The individual results submitted by staff will be collated together to represent your organisation. Your organisation's results can then be compared against the results of others to see where your organisation is already strong and in what areas it could improve.

We look forward to sharing the results with you. If you have any questions about the research or the questionnaire please contact either Amy Stephenson (Ph.D. student) on 02102638187 or Dr. Erica Seville, (Research Fellow in the Department of Civil & Natural Resources Engineering at the University of Canterbury) on 021456706.

Also, please encourage as many of your colleagues to take this questionnaire as possible – the more results we have, the better the information we can provide to your organisation!

Appendix D

Appendix D1: Reasons Given by Organisations for Not Taking Part



Appendix D2: 3-Factor Rotated Factor Matrix for McManus's (2007) Model of Relative Overall Resilience

Item	Factor		
	1	2	3
SA2.2	.689		
AC2.2	.673		
AC1.2	.658		
AC1.3	.629		
AC5.5	.628		
AC5.4	.615		
AC5.1	.604		
AC5.2	.579		
AC4.2	.575		
AC5.3	.571		
KV3.2	.526		
SA3.1	.522		
AC4.1	.517		
SA2.1	.501		
SA1.3	.496		
AC3.3	.492		
AC4.3	.465		
KV3.1	.458		
AC1.1	.443		
KV3.3	.424		
SA1.1			
SA3.2			
KV5.1			
KV4.1			
SA2.3.1			
SA5.2		.688	
KV2.1		.664	
SA5.1		.656	
KV1.1		.592	
SA5.3		.586	
KV4.3		.580	
SA1.2		.573	
KV4.2		.519	
KV2.3		.517	
KV5.2		.505	
SA3.3		.500	
KV2.2		.481	
KV5.3		.464	
KV1.3		.436	.426
AC2.3			
SA4.2			
SA2.3.2			
KV1.2			
SA4.1			
AC2.1			
SA2.4			
AC3.2			.774
AC3.1			.735

KV1.4.1			.441
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Note: Items references are shown next to the relevant items in Appendix C1.

Appendix D3: Dropped Items from 3-Factor Rotated Factor Matrix for McManus's (2007) Model of Relative Overall Resilience

Dropped Items	Item Wording
SA _{1,1}	Most people in our organisation have a clear picture of what their role would be in a crisis
SA _{2,3,1}	Think of the overall highest risk facing your organisation; which of the categories provided does it fit into? (please tick one)
SA _{2,3,2}	Thinking of the risk that you identified in the question above, to what extent do you agree or disagree with the following statement? Our organisation fully understands the impact that this risk would have on us
SA _{2,4}	What would be the maximum amount of time that your organisation could stop operating for and yet still be able to recover? (a range scored 1-6)
SA _{3,2}	Our organisation has a good understanding of how quickly we would be affected if one of our larger customers or suppliers went out of business
SA _{4,1}	If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation
SA _{4,2}	If our organisation sustained significant physical damage, I believe we would have sufficient funds to re-start operations until our insurance claim was settled
KV _{1,2}	Our organisation prepares for crisis through: (please tick one) – planning (1), insurance (2), a combination of planning and insurance (3), our organisation does not prepare(4), don't know (5)
KV _{4,1}	I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to
KV _{5,1}	People in our organisation actively manage areas of their work that rely on other organisations
AC _{2,1}	Our organisation is regarded as an active participant in industry and sector groups
AC _{2,3}	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly

Appendix D4: 4-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Item	Factor			
	1	2	3	4
AC1.2	.677			
AC6.3	.643			
AC6.1	.627			
SA2.2	.621			
AC1.3	.620			
AC2.2	.617			
AC5.3	.609			
AC5.4	.601			
AC5.5	.573			
KV7.2	.562			
AC7.1	.562			
AC6.2	.547			
SA7.3	.547			
AC4.2	.545			
AC5.1	.535			
SA6.3	.518		.455	
AC5.2	.509			
KV7.3	.504			
AC3.3	.488			
AC4.1	.482			
AC7.3	.481			
AC7.2	.478			
RE1.3	.472			
AC1.1	.450			
SA2.1	.442			
AC4.3	.439			
KV3.2	.425			
SA1.3	.405			
KV6.3	.404			
KV7.1				
KV3.1				
SA7.2				
RE1.2				
SA7.1				
KV2.1		.639		
SA5.2		.584		
SA5.1		.547	.454	
KV4.2		.547		
KV4.3		.542		
SA1.2		.542		
SA5.3		.528		
KV1.1		.503		
KV5.2		.501		
KV2.3		.489		
KV2.2		.467		
KV6.1		.457		
KV5.3		.456		

SA6.1		.440		
KV3.3	.429	.431		
RE1.1		.406		
AC2.3				
SA4.2				
KV4.1				
SA4.1				
SA1.1				
KV6.2				
KV5.1				
SA2.4				
RE2.3			.549	
SA3.1	.402		.501	
SA3.3			.472	
SA2.3.2			.449	
RE2.2			.440	
RE2.1			.433	
SA6.2	.405		.429	
AC2.1			.403	
SA3.2				
SA2.3.1				
AC3.2				.754
AC3.1				.724
KV1.4.1				.462
KV1.3				.419
KV1.2				

Note: Items references are shown next to the relevant items in Appendix C1.

Appendix D5: Dropped Items from 4-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Dropped Items	Item Wording
RE _{1,2}	In our organisation, there is an appropriate balance between short and long term priorities
SA _{1,1}	Most people in our organisation have a clear picture of what their role would be in a crisis
SA _{2,3,1}	Think of the overall highest risk facing your organisation; which of the categories provided does it fit into? (please tick one)
SA _{2,4}	What would be the maximum amount of time that your organisation could stop operating for and yet still be able to recover? (a range scored 1-6)
SA _{3,2}	Our organisation has a good understanding of how quickly we would be affected if one of our larger customers or suppliers went out of business
SA _{4,1}	If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation
SA _{4,2}	If our organisation sustained significant physical damage, I believe we would have sufficient funds to re-start operations until our insurance claim was settled
SA _{7,1}	Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information
SA _{7,2}	In our organisation, it is generally easy to obtain expert assistance when something comes up that we don't know how to handle
KV _{1,2}	Our organisation prepares for crisis through: (please tick one) – planning (1), insurance (2), a combination of planning and insurance (3), our organisation does not prepare(4), don't know (5)
KV _{3,1}	I believe that our organisation has sufficient internal resources to operate successfully during business-as-usual
KV _{4,1}	I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to
KV _{5,1}	People in our organisation actively manage areas of their work that rely on other organisations
KV _{6,2}	People in our organisation report significant mistakes even if others do not notice that a mistake is made
KV _{7,1}	People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges
AC _{2,3}	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly

Appendix D6: 5-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Items	Factors				
	1	2	3	4	5
AC1.2	.682				
AC6.1	.649				
AC6.3	.638				
SA2.2	.634				
AC2.2	.626				
AC1.3	.613				
AC5.4	.605				
AC5.3	.588				
AC5.5	.583				
AC7.1	.558				
SA7.3	.556				
KV7.2	.545				
AC6.2	.545				
AC5.1	.544				
SA6.3	.539				
AC4.2	.534				
AC5.2	.519				
AC3.3	.500				
KV7.3	.486				
RE1.3	.484				
AC4.1	.479				
AC7.2	.471				
AC1.1	.460				
SA2.1	.454				
AC7.3	.453				
AC4.3	.436				
SA6.2	.417				
SA1.3	.412				
KV3.2	.411				
KV3.1					
KV6.3					
KV7.1					
SA7.2					
RE1.2					
SA7.1					
KV4.2		.579			
KV5.2		.532			
KV3.3		.524			
KV2.1		.520		.441	
KV5.3		.484			
KV4.3		.475			
KV1.1		.414			
KV4.1		.408			
SA4.1					
SA6.1					
SA4.2					
KV2.3					

AC2.3					
RE1.1					
KV5.1					
KV6.2					
SA2.4					
SA5.1			.602		
SA5.2			.593		
SA1.2			.574		
SA2.3.2			.552		
SA3.3			.537		
SA3.1	.435		.464		
SA5.3		.412	.451		
SA3.2			.440		
SA1.1			.431		
KV6.1			.405		
AC3.2				.768	
AC3.1				.749	
KV1.4.1				.479	
KV1.3				.437	
KV2.2					
KV1.2					
RE2.1					.638
AC2.1					.563
RE2.3					.489
RE2.2					.461
SA2.3.1					

Note: Items references are shown next to the relevant items in Appendix C1.

Appendix D7: Dropped Items from 5-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Dropped Items	Item Wording
RE _{1,1}	Our organisation is focused on being able to respond to the unexpected
RE _{1,2}	In our organisation, there is an appropriate balance between short and long term priorities
SA _{2,3,1}	Think of the overall highest risk facing your organisation; which of the categories provided does it fit into? (please tick one)
SA _{2,4}	What would be the maximum amount of time that your organisation could stop operating for and yet still be able to recover? (a range scored 1-6)
SA _{4,1}	If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation
SA _{4,2}	If our organisation sustained significant physical damage, I believe we would have sufficient funds to re-start operations until our insurance claim was settled
SA _{6,1}	Whenever our organisation suffers a close call we use it as a trigger for self evaluation rather than confirmation of our success
SA _{7,1}	Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information
SA _{7,2}	In our organisation, it is generally easy to obtain expert assistance when something comes up that we don't know how to handle
KV _{1,2}	Our organisation prepares for crisis through: (please tick one) – planning (1), insurance (2), a combination of planning and insurance (3), our organisation does not prepare(4), don't know (5)
KV _{2,2}	People are generally able to take time off from their day-to-day roles to be involved in practising how we respond in an emergency
KV _{2,3}	I believe our organisation invests sufficient resources in being ready to respond to an emergency of any kind
KV _{3,1}	I believe that our organisation has sufficient internal resources to operate successfully during business-as-usual
KV _{5,1}	People in our organisation actively manage areas of their work that rely on other organisations
KV _{6,2}	People in our organisation report significant mistakes even if others do not notice that a mistake is made
KV _{6,3}	People in our organisation are rewarded if they spot potential trouble spots
KV _{7,1}	People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges
AC _{2,3}	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly

Appendix D8: 2-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Items	Factors	
	1	2
SA2.2	.685	
AC1.2	.676	
AC6.1	.672	
AC6.3	.662	
AC2.2	.643	
AC5.4	.635	
SA6.3	.617	
AC1.3	.616	
AC5.5	.614	
AC7.1	.601	
AC5.1	.597	
AC5.3	.589	
AC4.2	.587	
AC5.2	.583	
SA7.3	.579	
AC6.2	.575	
AC4.1	.542	.421
AC7.2	.535	
RE1.3	.532	
KV7.2	.526	
AC7.3	.524	
SA3.1	.515	
SA6.2	.498	
SA1.3	.493	
SA2.1	.489	
AC4.3	.483	
AC3.3	.483	
KV3.2	.481	
KV7.3	.456	
AC1.1	.446	
KV3.1	.436	
SA7.2	.416	
KV3.3	.415	
KV6.3		
RE1.2		
SA1.1		
KV7.1		
KV5.1		
KV4.1		
SA3.2		
KV6.2		
SA2.3.1		
KV2.1		.711
SA5.1		.694
SA5.2		.676
KV4.3		.609
KV1.1		.592

KV1.3		.572
SA1.2		.558
KV2.3		.552
SA3.3		.549
SA5.3		.547
KV6.1		.534
KV2.2		.505
KV1.4.1		.490
KV4.2		.482
KV5.2		.478
RE1.1		.475
SA6.1		.462
KV5.3		.456
AC2.1		.438
RE2.2		.415
KV1.2		
SA7.1		
RE2.3		
AC3.1		
SA2.3.2		
AC3.2		
AC2.3		
RE2.1		
SA4.2		
SA2.4		
SA4.1		

Note: Items references are shown next to the relevant items in Appendix C1.

Appendix D9: Dropped Items from 2-Factor Rotated Factor Matrix for the Adjusted Model of Relative Overall Resilience

Dropped Items	Item Wording	Decision
RE1.2	In our organisation, there is an appropriate balance between short and long term priorities	Exclude – this is captured (without a timescale) in RE1.1 which focuses on the broader idea of whether organisations are focused on being able to respond
RE2.1	Our organisation actively participates in industry or sector groups	Exclude – this is fully captured in AC2.1
RE2.3	Management see our organisation as having a leadership role in our industry	Exclude – this is captured in AC5.4 which focuses on management ensuring that the organisation performs ‘ahead of the curve’
SA1.1	Most people in our organisation have a clear picture of what their role would be in a crisis	Exclude – this isn’t really captured anywhere else so it should be re-tested during the confirmatory study
SA2.3.1	Think of the overall highest risk facing your organisation; which of the categories provided does it fit into? (please tick one)	Exclude – it is possible that this loaded poorly because of the question type, the other two items from this indicator have been pulled into Factor 1 but they do not cover the consequences. This should be re-worded and re-tested during the confirmatory study
SA2.3.2	Thinking of the risk that you identified in the question above, to what extent do you agree or disagree with the following statement? Our organisation fully understands the impact that this risk would have on us	
SA2.4	What would be the maximum amount of time that your organisation could stop operating for and yet still be able to recover? (a range scored 1-6)	Keep for information, this is useful in measuring perceptions between hierarchical levels and it would be good to have average MTPODs for each industry
SA3.2	Our organisation has a good understanding of how quickly we would be affected if one of our larger customers or suppliers went out of business	Exclude – the other two items from this indicator have been pulled into the factors (1 each), however they do not capture the element of speed of impact, this should be re-worded and re-tested in the confirmatory study
SA4.1	If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation	Exclude – in this research all staff were asked these questions. These questions should be re-worded and then included in only the senior managers version as it is not necessary for everyone in the organisation to know about insurance
SA4.2	If our organisation sustained significant physical damage, I believe we would have sufficient funds to re-start operations until our insurance claim was settled	
SA7.1	Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information	Exclude – I think we were asking too many things here, investment, information and decisions. Two of the three questions are picked up in Factor 1 so suggest re-wording

			this and re-testing it in the confirmatory study
KV1.2	Our organisation prepares for crisis through: (please tick one) – planning (1), insurance (2), a combination of planning and insurance (3), our organisation does not prepare(4), don't know (5)		Exclude – this is captured in other questions and relies on knowledge of specific activities which not all staff would have
KV4.1	I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to		Exclude – the question focuses on too many things and the other two questions are picked up in Factor 2
KV5.1	People in our organisation actively manage areas of their work that rely on other organisations		Exclude - the organisation level questions both got pulled into Factor 2, but this individual one did not.. The answer to this question depends on what your role is, how much decision making/autonomy is involved and so is not suitable for all staff
KV6.2	People in our organisation report significant mistakes even if others do not notice that a mistake is made		Exclude – suggest that this is re-worded and re-tested in the confirmatory study. HRO theory indicates that this is an important aspect of high reliability
KV6.3	People in our organisation are rewarded if they spot potential trouble spots		Exclude – running the factor analysis with a lower extraction score of .3 includes this item in Factor 1 with a loading of .387. This item should be re-worded and re-tested in the confirmatory study
KV7.1	People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges		Exclude – this is captured by KV7.2 and KV7.3 which got pulled into Factor 1
AC2.3	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly		Exclude – the other two items have been pulled into the factors (1 each)
AC3.1	Our organisation has a vision or mission and it is formalised in a written statement		Exclude – the other item has been pulled into Factor 1 but does not cover organisational vision or mission specifically
AC3.2	When I read my organisation's vision or mission statement I recognise it as reflecting the values that we aspire to		

Note: Out of the 20 items that were dropped during the factor analysis, the researcher decided to maintain 1; this is shown as shaded. The other 19 items are included in Appendix D1 where rewording is suggested. This is discussed in Chapter 9.

Appendix D10: New Model Definitions of the Indicators of Organisational Resilience

Minimisation of Silos – Minimisation of divisive social, cultural and behavioural barriers, which are often manifested as communication barriers creating disjointed, disconnected and detrimental ways of working.

Internal Resources - The management and mobilisation of the organisation's resources to ensure its ability to operate during business as usual, as well as being able to provide the extra capacity required during a crisis.

Decision Making – Staff have the appropriate authority to make decisions related to their work and authority is clearly delegated to enable a crisis response. Highly skilled staff are involved in making decisions where their specific knowledge adds significant value, or where their involvement will aid implementation.

Innovation and Creativity – Staff are encouraged and rewarded for using their knowledge in novel ways to solve new and existing problems, and for utilising innovative and creative approaches to developing solutions.

Information and Knowledge – Critical information is stored in a number of formats and locations and staff have access to expert opinions when needed. Roles are shared and staff are trained so that someone will always be able to fill key roles.

Planning Strategies - The development and evaluation of plans and strategies to manage risks and vulnerabilities in relation to continuous changes in the organisation's environment and its stakeholders.

Participation in Exercises - The participation of staff in simulations or scenarios designed to practise response arrangements and validate plans.

External Resources – An understanding of the relationships and resources the organisation might need to access from other organisations during a crisis, and planning and management to ensure this access.

Recovery Priorities - An organisation wide awareness of what the organisation's priorities would be following a crisis, clearly defined at the organisation level, as well as an understanding of the organisation's minimum operating requirements.

Proactive Posture – A strategic and behavioural readiness to respond to early warning signals of change in the organisation's internal and external environment before they escalate into crisis.

Leadership - Strong crisis leadership to provide good management and decision making during times of crisis, as well as continuous evaluation of strategies and work programs against organisational goals.

Staff Involvement - The engagement and involvement of staff that understand the link between their own work, the organisation's resilience, and its long term success and are able to use their skills to solve problems.

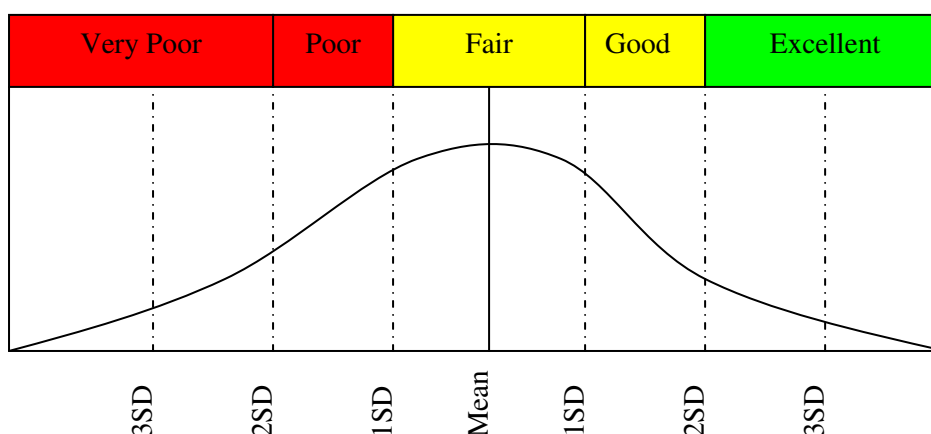
Situation Monitoring and Reporting – Staff are encouraged to be vigilant about the organisation, its performance and potential problems. The organisation has a culture which values learning from past problems and staff are able to report information that might help the organisation to improve.

Appendix E

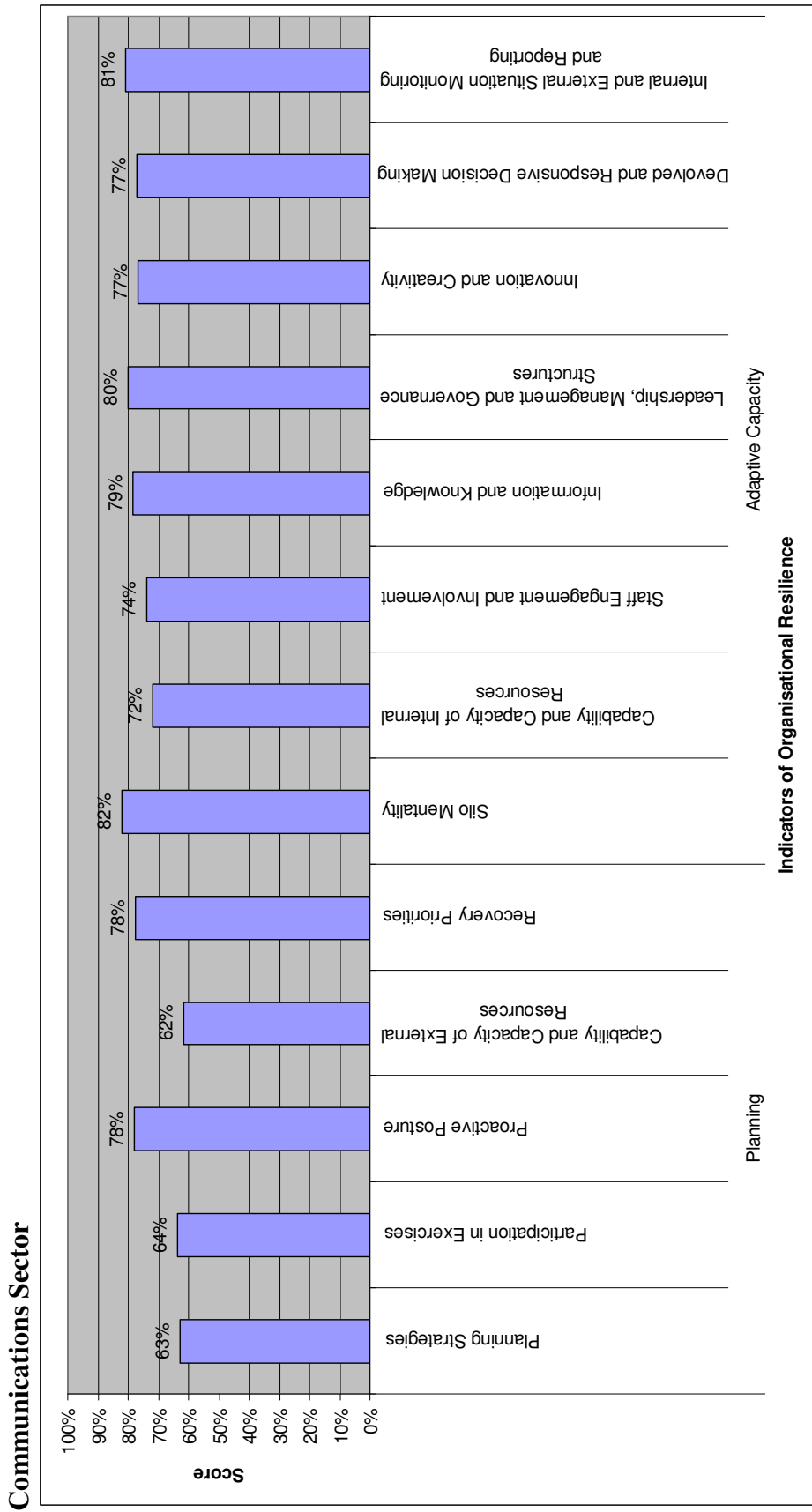
Appendix E1: Organisational Resilience Score Boundaries

Score	What Does It Mean?
81-100% Excellent	An organisation which scores 81-100% has an excellent level of resilience. Your organisation's culture is a key asset and you should focus on maintaining this as your organisation and its environment change over time.
73-80% Good	An organisation which scores 73-80% has a good level of resilience. It is likely that your organisation's culture is a significant asset and you should focus on building this as your organisation and its environment change over time. In particular you should focus on fostering relationships and awareness across organisational boundaries.
57-72% Fair	An organisation which scores between 57-72% has an overall fair level of resilience. It is likely that your organisation's particular strengths vary between departments or business units resulting in lower scores than you could achieve. You should focus on expanding your strengths across organisational boundaries including hierarchical levels and departments or business units. If your organisation scored poorly on planning indicators it is likely that your organisation has done some planning, but that awareness and understanding of this planning and how it can help your organisation, among your staff is limited. Focus on increasing staff awareness and involvement.
49-56% Poor	An organisation which scores 49-56% has a poor level of resilience. In particular you should focus on the Proactive Posture and Staff Engagement and Involvement indicators.
0-48% Very Poor	An organisation which scores 0-48% has a very poor level of resilience. In particular you should focus on the Proactive Posture indicator as well as those resilience indicators which represent your organisation's particular strengths.

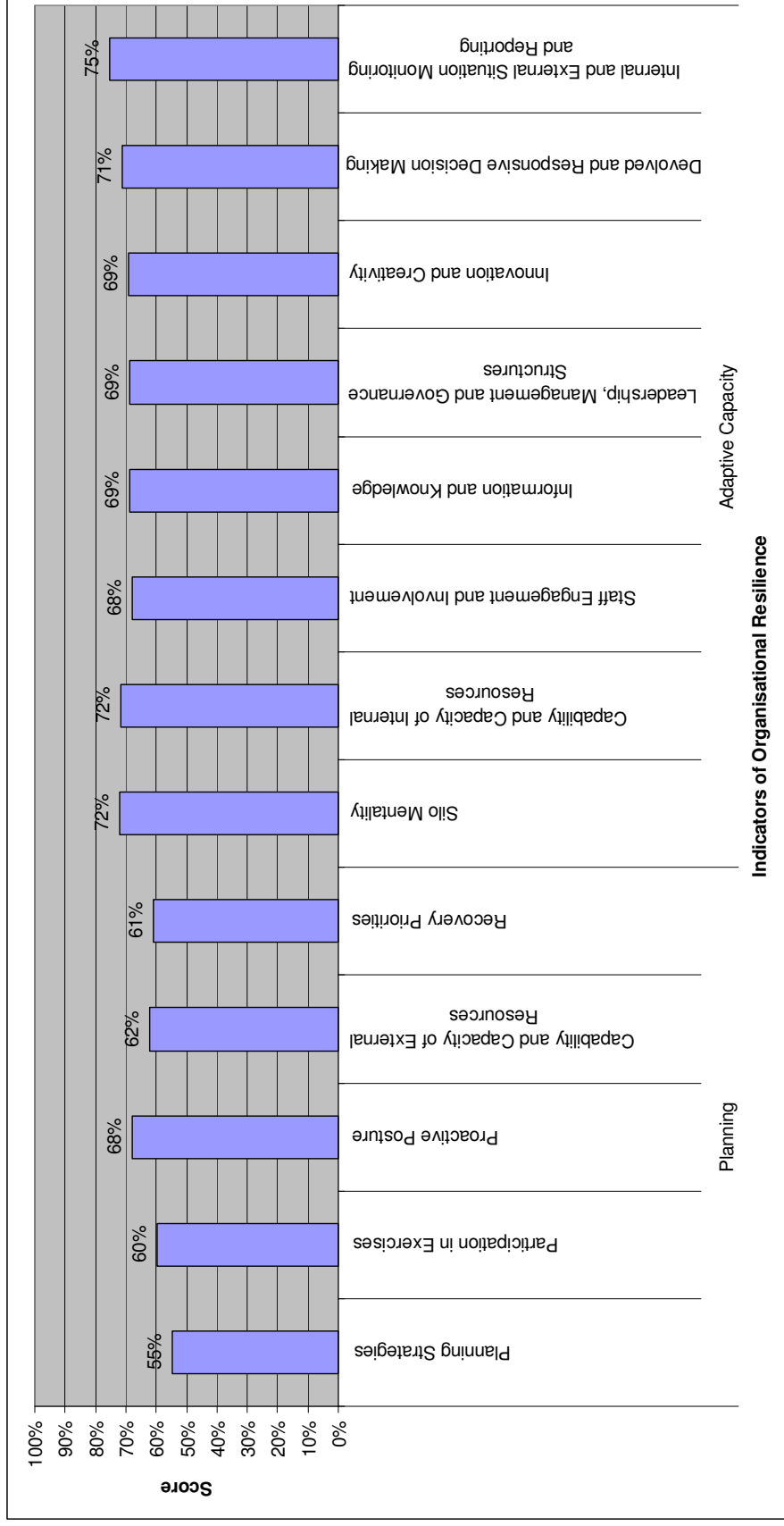
Note: The graph below shows a normal curve and demonstrates how the score boundaries were identified. This provides a relative benchmark that is only relevant to this study but provides useful information for participants.



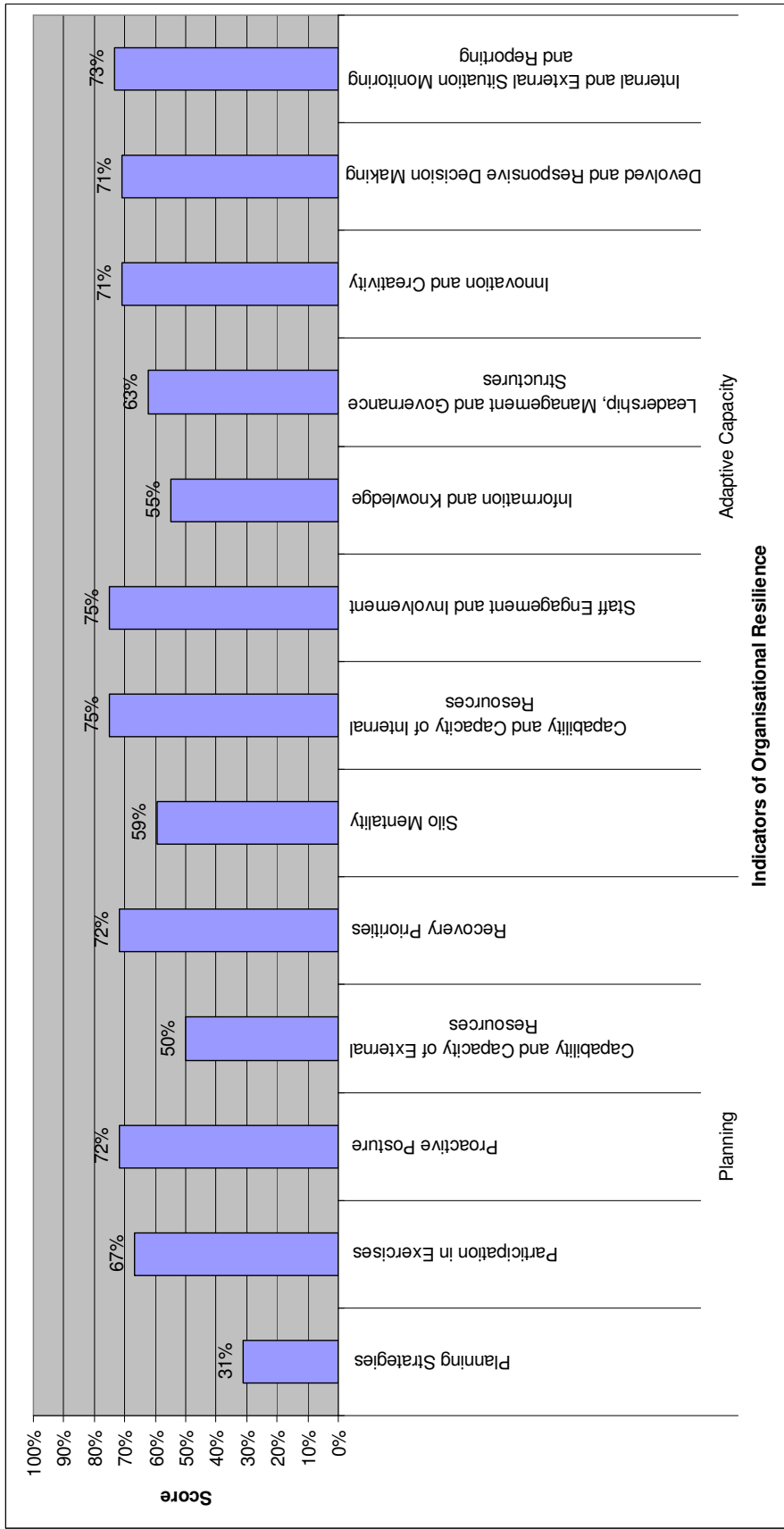
Appendix E2: Graphs showing Score for the Indicators of Organisational Resilience for each of the Industry Sectors



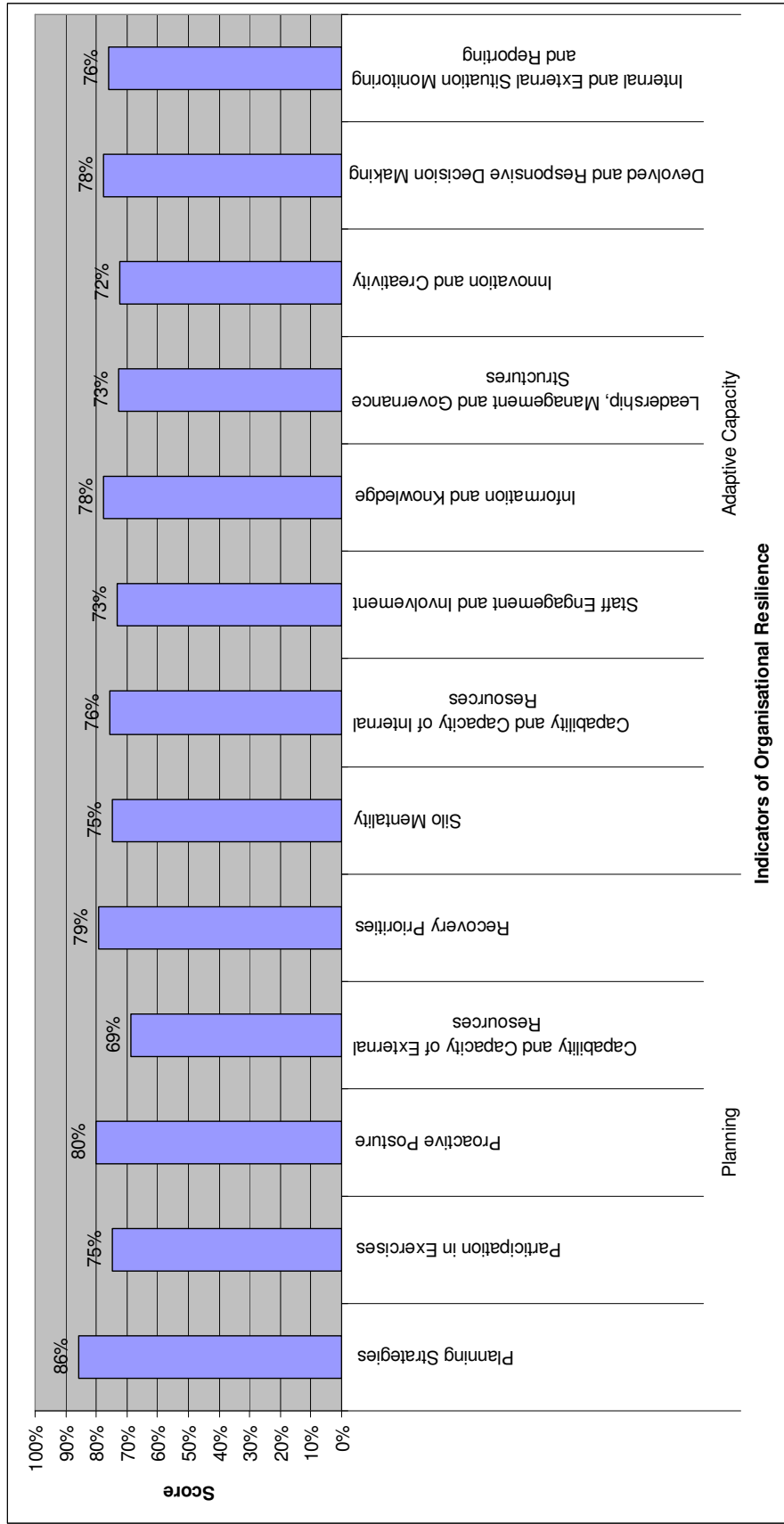
Education Sector



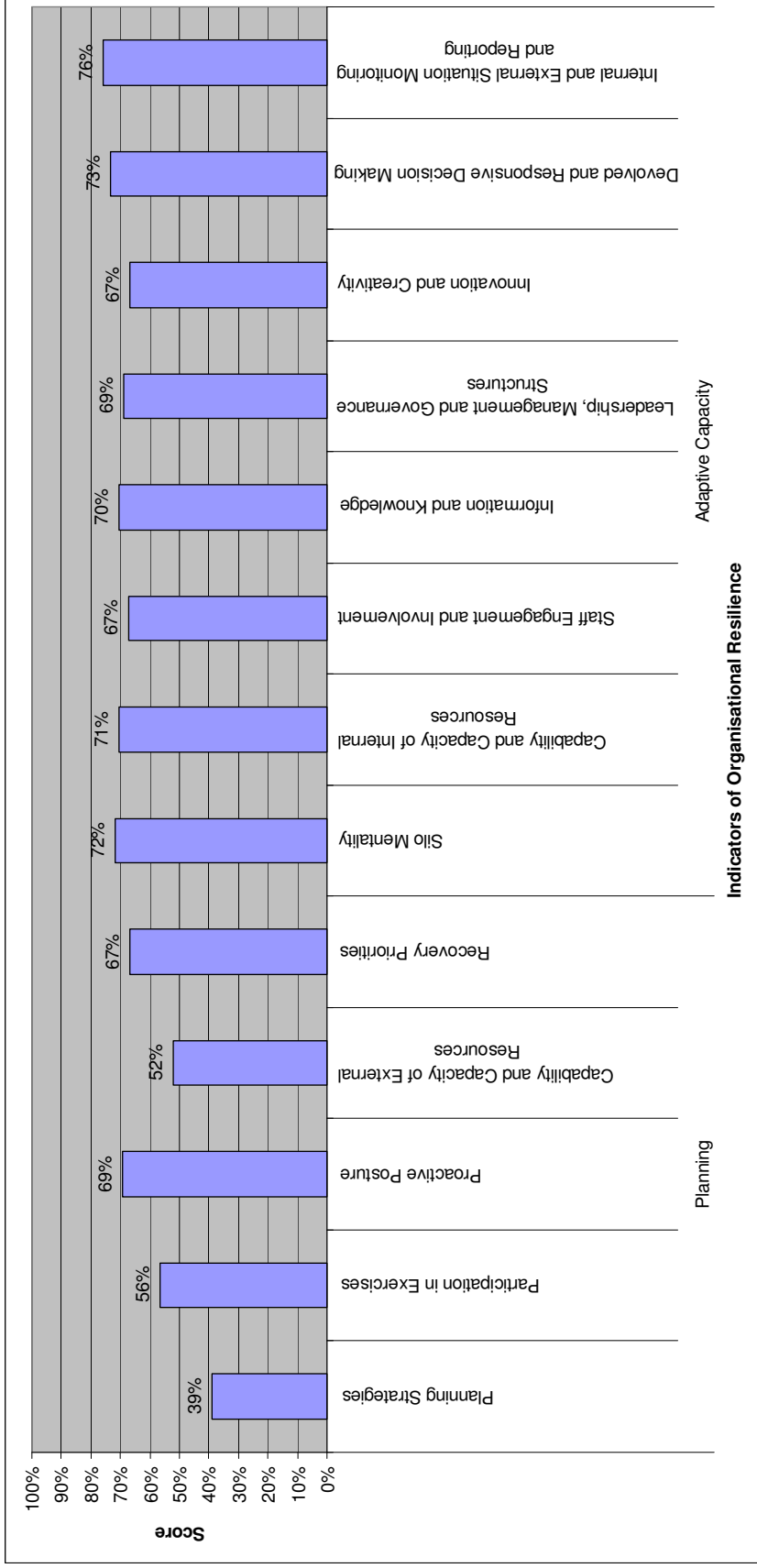
Finance and Insurance Sector



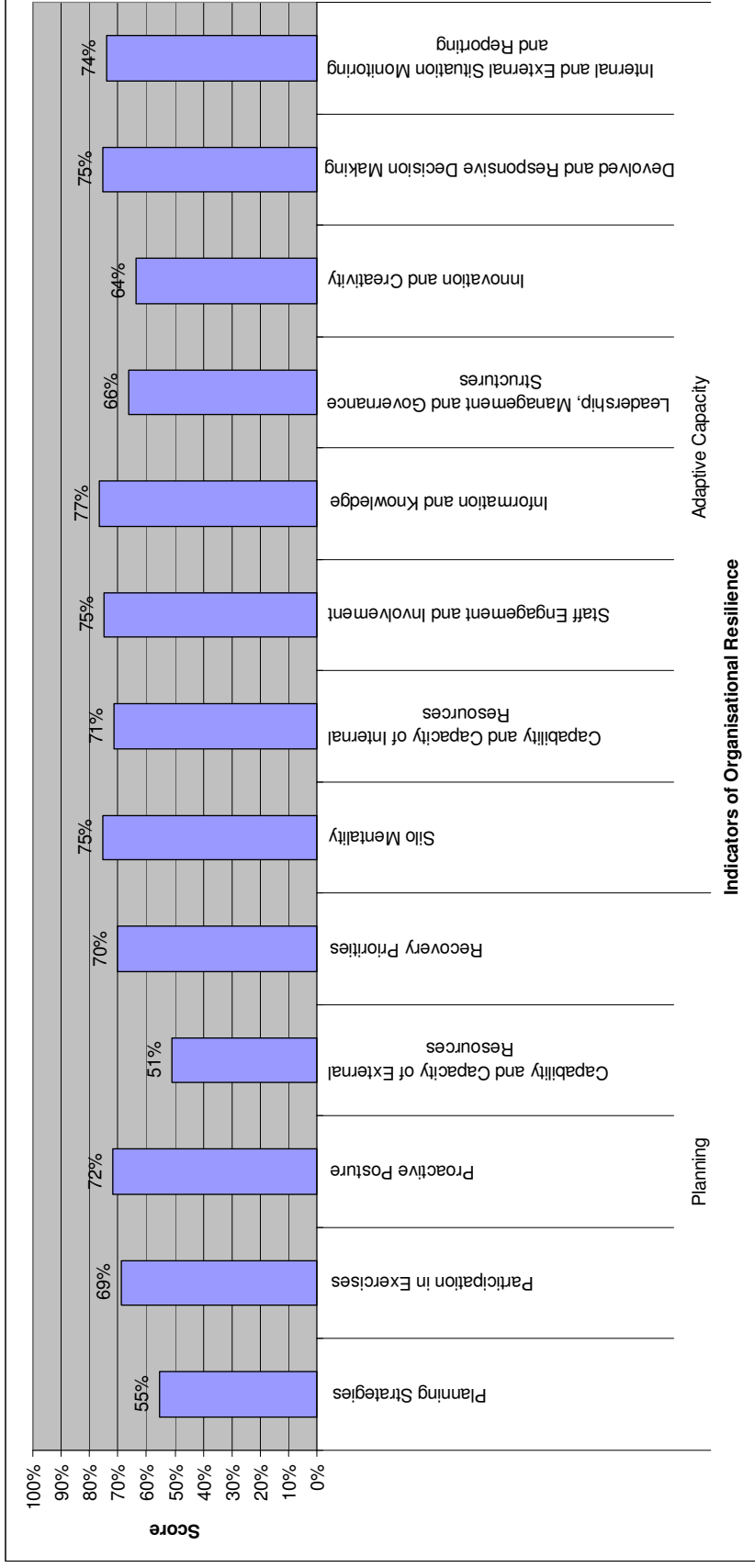
Health and Community Sector



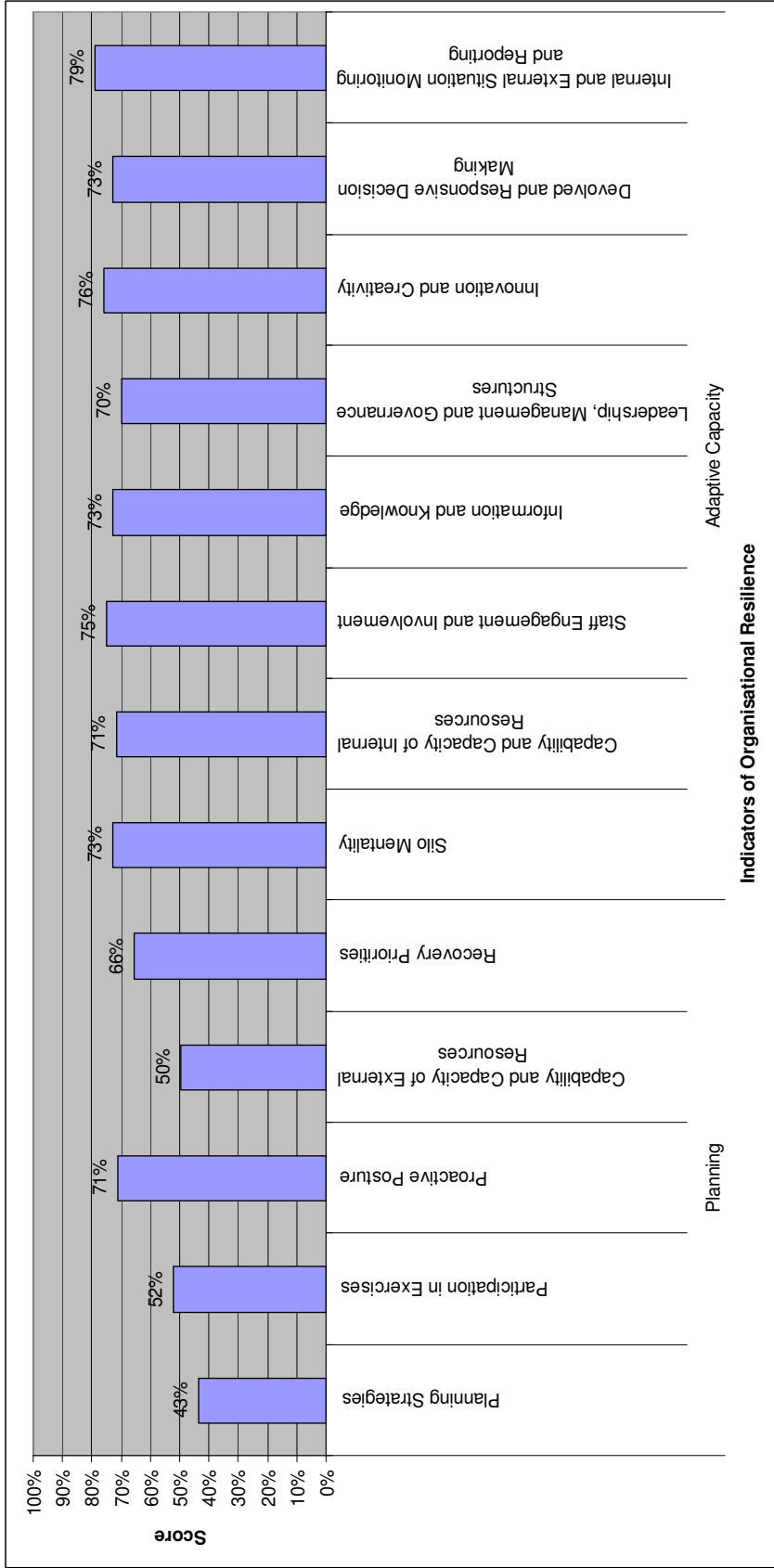
Manufacturing Sector



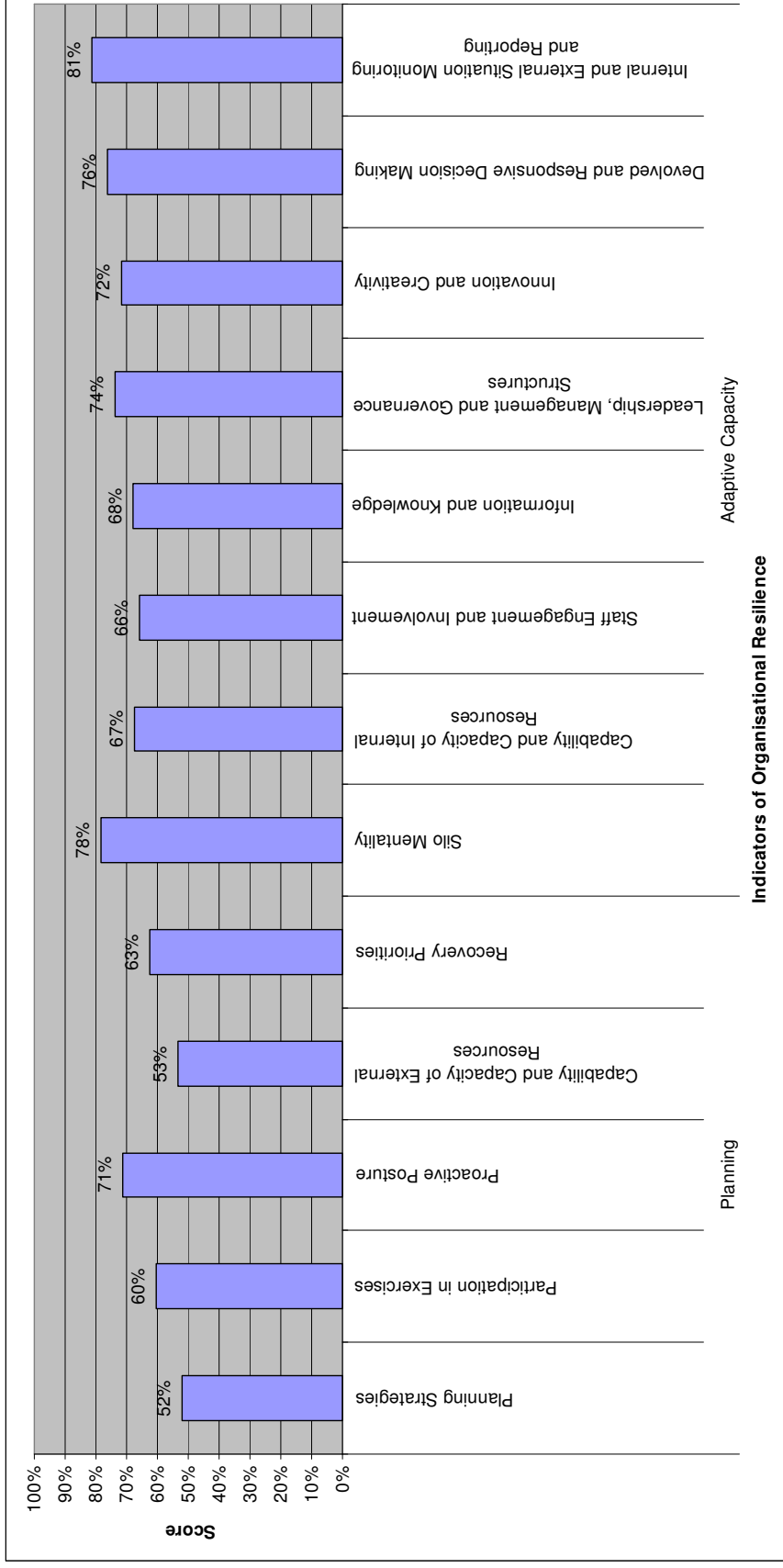
Personal and Other Services Sector



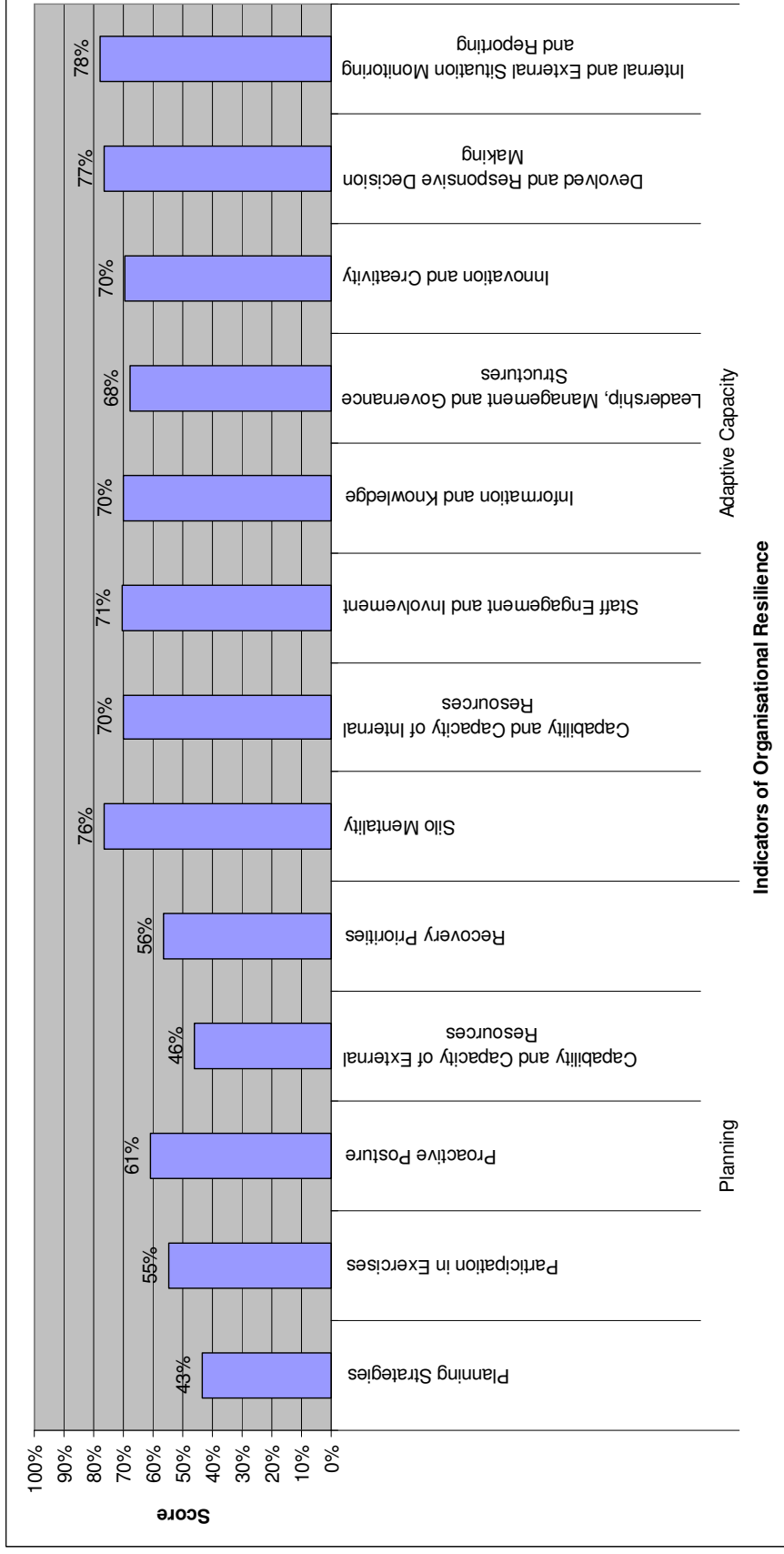
Property and Business Services Sector



Retail Trade Sector

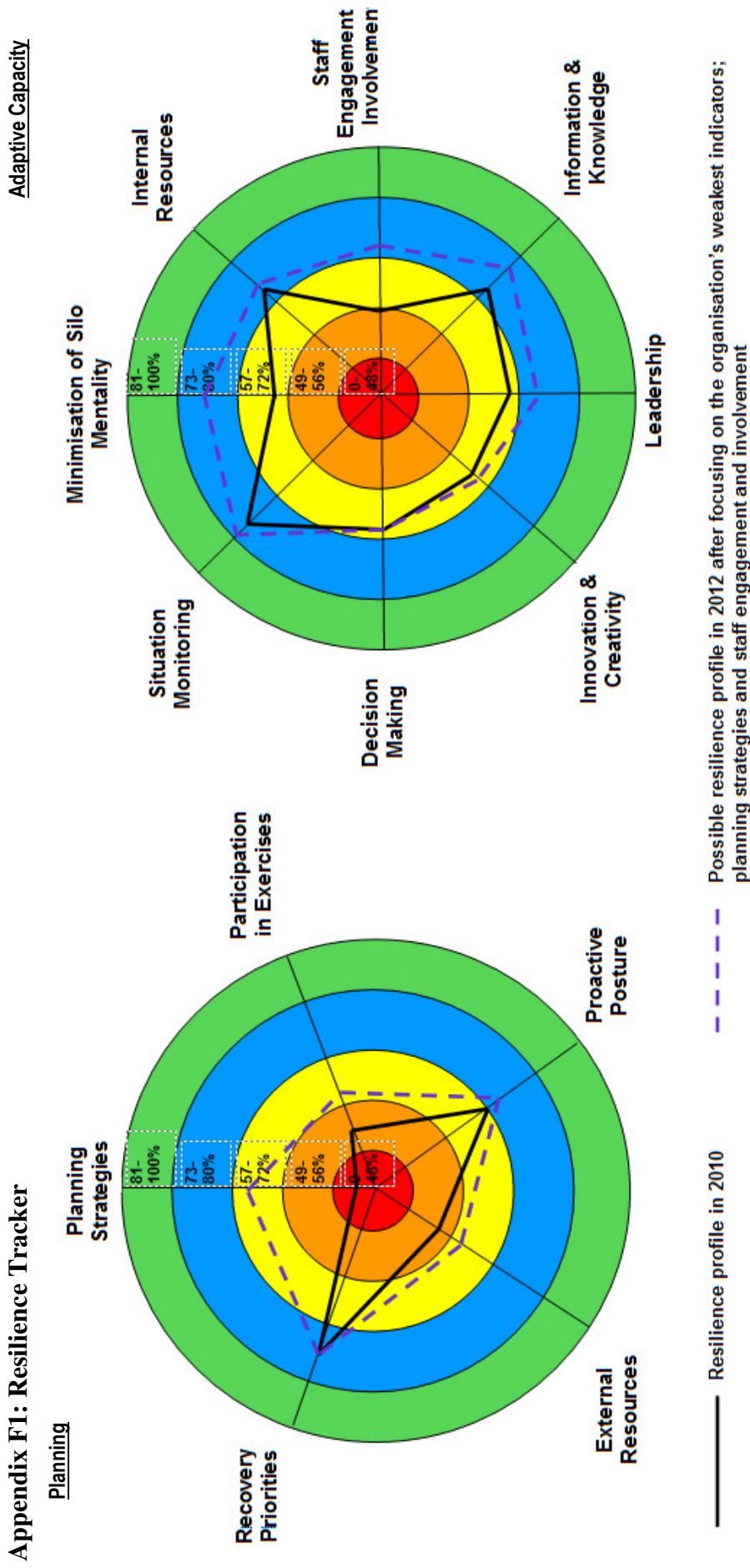


Wholesale Trade Sector



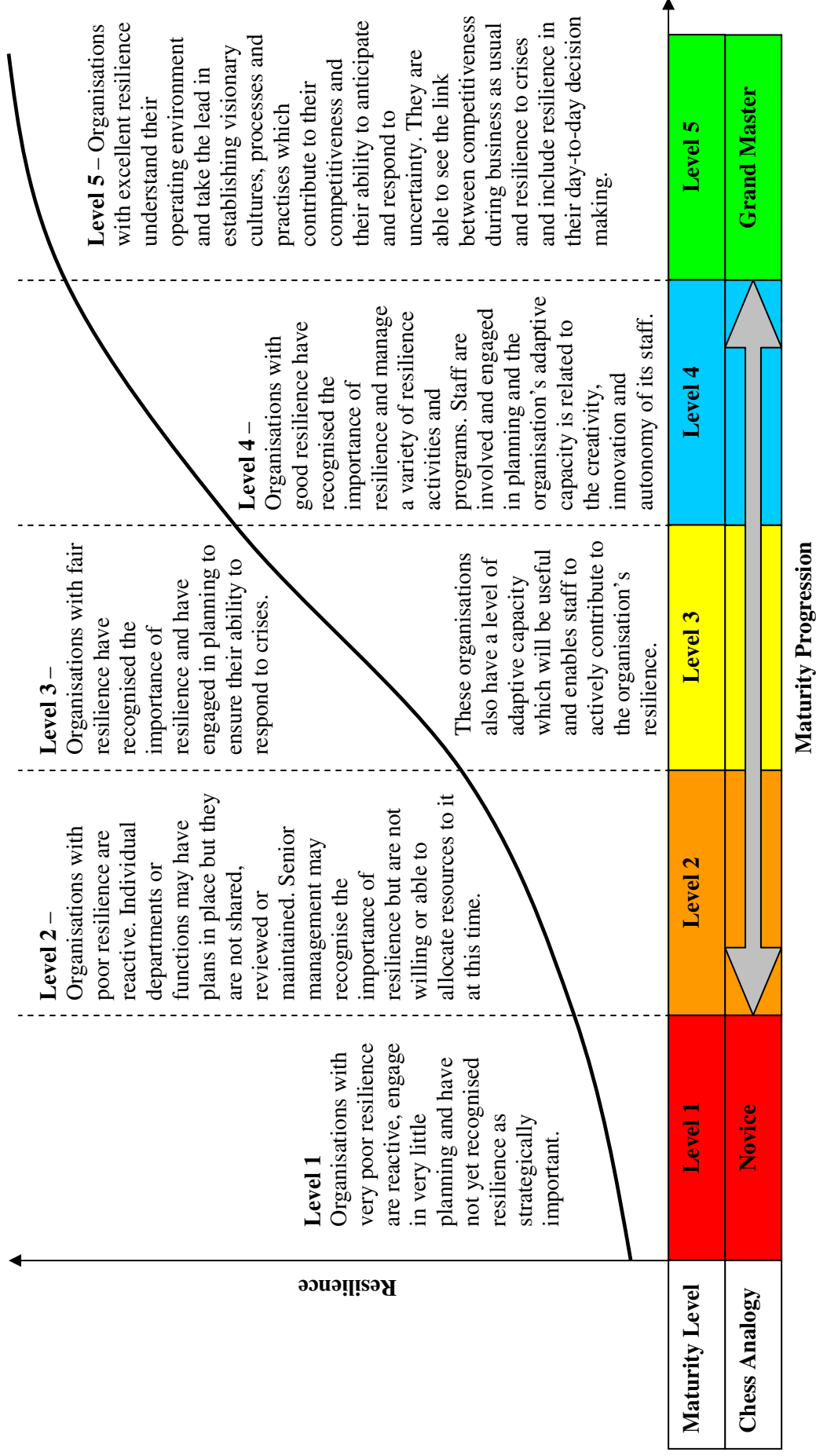
Appendix F

Appendix F1: Resilience Tracker



The diagrams above will enable you to track your organisation's resilience. You can plot your organisation's scores for each of the Planning indicators on the left and for each of the Adaptive Capacity indicators on the right. Joining the scores up, the lines show your organisation's resilience envelope - the bigger the envelope, the better! You can add a new line for each year you use the tool to track progress, or you can use it to set targets.

Appendix F2: Resilience Maturity Model



Appendix F3: Business Continuity Maturity Model

Increasing Business Continuity Competency Maturity

Maturity Model Levels	Level 1 Self-Governed Able to Crawl	Level 2 Supported Self-Governed Able to Walk	Level 3 Centrally Governed Able to Run	Level 4 Enterprise Awakening "Fit" Runner"	Level 5 Planned Growth Competitive Runner	Level 6 Synergistic Olympic Runner
Athlete Analogy	Able to Crawl	Able to Walk	Able to Run	"Fit" Runner"	Competitive Runner	Olympic Runner
Comparative Model	Organization "At Risk"		"Competent" Performer		"Best of Breed"	
Corporate Competencies						
Leadership	VL	L	M	H	H	H
Employee Awareness	VL	L	L	M	H	H
BC Program Structure	VL	L	L	M	H	H
Program Pervasiveness	VL	L	L	L	M	H
Metrics	VL	L	M	M	H	H
Resource Commitment	VL	L	M	H	H	H
External Coordination	VL	L	L	M	H	H
BC Program Content	VL	L	M	H	H	H

High (H), Medium (M), Low (L), Very Low (VL) – e.g. if your organisation’s employee awareness was assessed as low (L), your organisation would achieve level 2 for that competency.

(Virtual Corporation, 2005, p. 11)

Level 1 – Self-Governed: Business continuity management has not yet been recognised as strategically important by senior management. There is no Enterprise governance or centrally coordinated support function. If the company has a BCM policy, it is not enforced. Individual business units and departments are “on their own” to organise, implement and self-govern their business continuity efforts. The state of preparedness is generally low across the enterprise.

Level 2 – Supported Self-Governed: At least one business unit or corporate function has recognised the strategic importance of business continuity and has begun efforts to increase executive and Enterprise-wide awareness. At least one internal or external BCM professional is available to support the business continuity efforts of the participating business units and departments. The state of preparedness may be moderate for participants, but remains relatively low across the majority of the company. Senior management may see the value of a BCM Program but they are unwilling to make it a priority at this time.

Level 3 – Cooperatively-Governed: Participating business units and departments have instituted a rudimentary governance program, mandating at least limited compliance to standardised BCM policy, practices and processes to which they have commonly agreed. (Note: this is not necessarily an Enterprise BCM Policy). A BCM Program Officer or Department has been established which centrally delivers BCM governance and support services to the participating business departments and/or units. Audit findings from these participants are being used to reinforce competitive and strategic advantage for their groups. Senior management interest is being piqued. Interest in leveraging the work already done is being promoted as a business driver for launching a BCM Program. Several business units and departments have achieved a high state of preparedness. However, as a whole, the Enterprise is at best moderately prepared. Senior management, as a group, has not yet committed the Enterprise to a BCM Program, although they may have a project underway to assess the business case for it.

Level 4 – Enterprise Awakening: Senior management understands and is committed to the strategic important of an effective BCM Program. An enforceable, practical BCM Policy has been adopted. A BCM Program Officer or Department has been created to govern the program and support all enterprise participants. Each group has acquired its own and/or utilises the central BCM professional resources. BCM policy, practices and processes are being standardised across the Enterprise. A BCM competency baseline was developed and a competency development program is underway. All critical business functions have been identified and continuity plans for their protection have been developed across the Enterprise. Department conduct “unit tests” of critical business continuity plan elements. All business continuity plans are updated routinely.

Level 5 – Planned Growth: All business units and departments have completed tests on all elements of their business continuity plan and their plan update methods have proven to be effective. Senior management has participated in crisis management exercises. A multi-year plan has been adopted to continuously “raise the bar” for planning sophistication and Enterprise-wide state of preparedness. An energetic communications and training program exists to sustain the high level of business continuity awareness following a structured BCM competency maturity program. Audit reports no longer highlight business continuity short comings. Examples of strategic and competitive advantage achieved from the BCM Program are highlighted in periodic Enterprise communications. Business continuity plans and tests incorporate multi-departmental considerations of critical Enterprise business processes.

Level 6 – Synergistic: All business units have a measurably high degree of business continuity planning competency. Sophisticated business protection strategies are formulated and tested successfully. Cross-functional co-ordination has led participants to develop and successfully test upstream and downstream integration of their business continuity plans. Tight integration with the company's change control methods and continuous process improvement keeps this organisation at an appropriately high state of preparedness even though the business environment continues to change radically and rapidly. Innovative policy, practices, processes and technologies are piloted and incorporated into the BCM Program.

Note: at each Level, companies may progress to the next Level or if they lose momentum, fall back one or more Levels. As with any business process, if the supporting infrastructure is removed or significantly diminished, the effectiveness of the BCM Program will deteriorate and with it the company's state of preparedness.

(Virtual Corporation, 2005, p. 7)

Appendix G

Appendix G1: Suggested Alternatives for Dropped Items

Dropped Items	Original Item	Suggested Rewording
RE1.2	In our organisation, there is an appropriate balance between short and long term priorities	Our organisation balances short and long term priorities
RE2.1	Our organisation actively participates in industry or sector groups	Our organisation understands the relationships within our supply chain
RE2.3	Management see our organisation as having a leadership role in our industry	Our organisation has a leadership role in our industry
SA1.1	Most people in our organisation have a clear picture of what their role would be in a crisis	Most people know what their role would be in a crisis
SA2.3.1	Think of the overall highest risk facing your organisation; which of the categories provided does it fit into? (please tick one)	Our organisation understands the impact that loss of our main office, site or location would have on us
SA2.3.2	Thinking of the risk that you identified in the question above, to what extent do you agree or disagree with the following statement? Our organisation fully understands the impact that this risk would have on us	
SA3.2	Our organisation has a good understanding of how quickly we would be affected if one of our target customers or suppliers went out of business	We know how quickly we would be affected if one of our suppliers went out of business
SA4.1	If our organisation was unable to operate for three months, I believe that our current level of insurance would safeguard the organisation	Our insurance would protect our organisation if we had to close for 3 months
SA4.2	If our organisation sustained significant physical damage, I believe we would have sufficient funds to re-start operations until our insurance claim was settled	Our organisation has enough money that we would be able to re-start our business before our insurance claim was settled
SA7.1	Our organisation is prepared to invest to ensure that decisions are made on the basis of the most up to date information	Our organisation invests in training
KV1.2	Our organisation prepares for crisis through: (please tick one) –	Our organisation prepares for crisis through planning

	planning (1), insurance (2), a combination of planning and insurance (3), our organisation does not prepare(4), don't know (5)	Our organisation has insurance to help us get through crises
KV4.1	I am confident that our staff have enough contacts that we would be able to access external resources at short notice if we needed to	We can access resources from outside of our organisation if we need to
KV5.1	People in our organisation actively manage areas of their work that rely on other organisations	We know how our organisation relies on other organisations
KV6.2	People in our organisation report significant mistakes even if others do not notice that a mistake is made	People in our organisation report mistakes
KV6.3	People in our organisation are rewarded if they spot potential trouble spots	We are rewarded for reporting potential problems
KV7.1	People at all levels of the organisation often think about what could go wrong so that they can create ways to manage those challenges	Our organisation's ability to operate is everyone's responsibility
AC2.3	If our organisation was unable to operate for 3 months, the relationship we have with our suppliers and customers would help us to recover rapidly	Our relationship with our suppliers is a strength for our organisation
AC3.1	Our organisation has a vision or mission and it is formalised in a written statement	We know what our organisation is about and who we are
AC3.2	When I read my organisations vision or mission statement I recognise it as reflecting the values that we aspire to	Our organisation has a shared vision which I aspire to