CEO Decision Making under Crisis: An Agency Theory Perspective

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Abstract

Organisational resilience has gained increasing attention in recent years. This paper focuses on information systems resilience, which is an aspect of organisational resilience. Given the potentially devastating implications of disruptions to organisations, understanding the dynamics of the successful adaption of IS within organisations indicates an important avenue for future research. In this paper, we adopt Agency Theory to develop a conceptual framework, focused on decision making and planning for IS resilience. Concourse theory and Q-methodology were used to develop a Q-sort questionnaire, which was refined through interviews with researchers and IS professionals. The resulting 37 statements were then sorted by eight CEOs of Small Medium Enterprises (SME). Q-sort methodology identified three types of decision makers from the data, each representing distinct collective perspectives. These types are described and discussed, along with implications of findings as well as suggestions for future research.

Keywords: Information system resilience, Agency Theory, Small Medium Enterprises, Q-sort methodology, CEO decision making, disaster preparedness

Introduction

Natural disasters, pandemic disease, and terrorist attacks all pose a severe threat to the continuity of an organisation's operation. Disasters can cause challenges to organisations and it is essential that sufficient effort is directed into making them robust and resilient to withstand these uncertainties and challenges. To a large extent, most organisations are dependent on information systems in their activities. Should there be a major disruption to the information systems services, it is practically impossible for the businesses to function with snail mails and paper based accounting. Therefore, when examining the crisis resilience of organisations, one crucial aspect is to examine the continuance of stable and reliable IS services (Gibb and Buchanan, 2006).

Although resilience is widely recognised in related disciplines such as, Computer Science, Crisis Management or Safety Engineering, there is very little attention paid by Information Systems scholars to IS resilience. Today, only a very small body of IS resilience research exists (Muller, Koslowski and Accorsi, 2013). An IBM study reported how organizations are increasingly adopting integrated business resilience strategies in an uncertain environment and large organisations lead the way in business and Information System resilience (IBM, 2011). Most studies on organisational resilience have been made in the context of big business, with few attempts to study smaller businesses, and to our current knowledge none of that research was on the topic of IS resilience. However, given the unique challenges faced by SMEs as organizations, research results obtained from the study of large enterprise IS cannot necessarily be generalized and transferred to SMEs (Thong, 1999). While the broader aim for this study is to examine organisational IS resilience in SMEs, this paper focuses on the first step of developing an instrument to understand the decision priorities of owner-managers of SMEs in the context of IS resilience. Small and Medium Sized Enterprises (SMEs) make a significant contribution to employment generation and economic growth of a nation (OECD, 2010; Ministry of Economic Development, 2012). SMEs in New Zealand represent 99 percent of the business population (NZ Ministry of Economic Development, 2012), and 99.7% of employer firms in the USA (SBA Office of Advocacy, 2012). The SME sector is often referred to as the backbone of the economy of a nation. Traditionally, SMEs have several advantages over larger companies due to their flexibility in adapting to change. However, by comparison to large firms, SMEs are more vulnerable and susceptible to various types of disaster, thus making IS resilience a more critical priority for SMEs, and consequently making SMEs an ideal population for beginning an investigation of IS resilience decision priorities and planning.

In this paper, the emphasis is on a relatively overlooked area of research: the entrepreneurs and owner-managers who own and operate these firms and their efforts to make their businesses resilient with regard to information systems. Much research to date has focused on characteristics of the firm (e.g. size, sector, performance and practices, etc.), and characteristics of the entrepreneur and owner-manager in an attempt to understand firm survival, growth and failure (Massey, 2005). However, little attention has been given to the characteristics of the entrepreneur and owner-manager and how they make decisions in time of crisis to ensure resilience. This research gap is surprising, as resilience is often said to be a combination of organisational and technical qualities and, therefore, a research topic well suited for IS research (Muller, Koslowski and Accorsi, 2013). Furthermore, SMEs are highly dependent on the entrepreneur or owner-manager as a leader, decision maker, manager and day-to-day operator of the firm (Storey and Greene, 2010), and therefore a study of SMEs

should properly begin with their entrepreneurs and owner-managers.

Agency Theory has demonstrated significant predictive power with respect to the decision-making of business owners and managers by its proposition of the principal-agent relationship dynamics (Jensen and Meckling, 1976; Eisenhardt, 1989; Gurbaxani and Whang, 1991; Lee and Wingreen, 2010). Specifically, Agency Theory proposes that the misalignment of interests between the principals (owners) of a firm and the agents (managers) is a source of costs and losses to the firm (Jensen and Meckling, 1976; Eisenhardt, 1989). In the context of SMEs, where the owner and manager is frequently either the same person, or a small, tight-knit group of people, in theory there should be either very little or no misalignment of interests, and therefore very low costs associated with "agency problems", as they are called. For this reason, Agency Theory is adopted, since SMEs represent a theoretical ideal where principal-agent conflict is minimized.

The paper first reviews the literature on organisational resilience, SMEs, and Agency Theory. The paper then describes the research methodology, in which the methods and procedures prescribed by Concourse Theory are used to develop and test a set of Q-sort items. Further, we present the findings of our study. The paper concludes with the relevance of this research for both practitioners and academics and we propose some recommendations for further research in the area of IS resilience.

Literature Review

Definition of IS Resilience

The concept of resilience has been a prominent and emerging topic in various scientific fields, however, as resilience research encompasses a wide range of disciplines such as ecology, psychology or engineering, and different research contexts and topics, it is not surprising that the concept lacks an accepted common definition across disciplines (Muller, Koslowski and Accorsi, 2013). Rooted from the word *resilire,* meaning to spring back or to rebound, the term refers to "the ability to recover form and position elastically" (Muller, Koslowski and Accorsi, 2013). Against this background, resilience is defined as the ability of an organisation to not only survive but to thrive, both in good times and in the face of adversity (Seville, 2009). Vargo and Stephenson (2010) proposed that for organisations to invest in resilience, the business case for resilience investments has to go beyond insurance, and must be as good as the business cases for new equipment or new staff (Vargo and Stephenson, 2010).

After an extensive literature review we have not been able to find a definition of IS resilience. However, organisational resilience has been studied extensively by researchers (Vargo and Seville, 2011; Hatton, Seville, and Vargo, 2012). In order to define IS resilience we have utilised six attributes as identified by McManus (2008), namely overall situation awareness, decreased vulnerabilities and increased adaptability, risk intelligence, flexibility and agility. These terms are defined in Table 1.

A definition of Information Systems resilience is introduced based on these characteristics for the purpose of our study, it is defined as:

Information Systems resilience is a function of an organization's overall situation awareness related to Information Systems, management of Information Systems vulnerabilities, and adaptive capacity, risk intelligence, flexibility and agility of Information Systems in a complex, dynamic, and interconnected environment.

Table 1 - Attributes of IS Resilience	
Set of Attributes	**Definition**
Situation awareness	It is the ability to identify and understand changes in the environment.
Management of Vulnerabilities	It is the capability to deal with the major vulnerabilities.
Adaptive Capacity	It is the capability to respond to and adapt to the changing environment.
Risk Intelligence	It is the ability to identify and anticipate risks.
Flexibility	It is the ability to change.
Agility	It is the ability to produce timely responses to changing environment and conditions.

Resilience of Organisations

Gibson and Tarrant (2010) presented the integrated functions model which suggests that organisational resilience is a goal that results from a combination of activities such as risk management and business continuity.

Gibson and Tarrant (2010) also presented the herringbone resilience model shown as Figure 1. This model suggests that resilience is enhanced by a combination of an organisation's characteristics or attributes and their activities and capabilities (Gibson and Tarrant, 2010). The herringbone model is important in the context of this research, since it incorporates many of the factors considered as possible indicators of IS resilience.
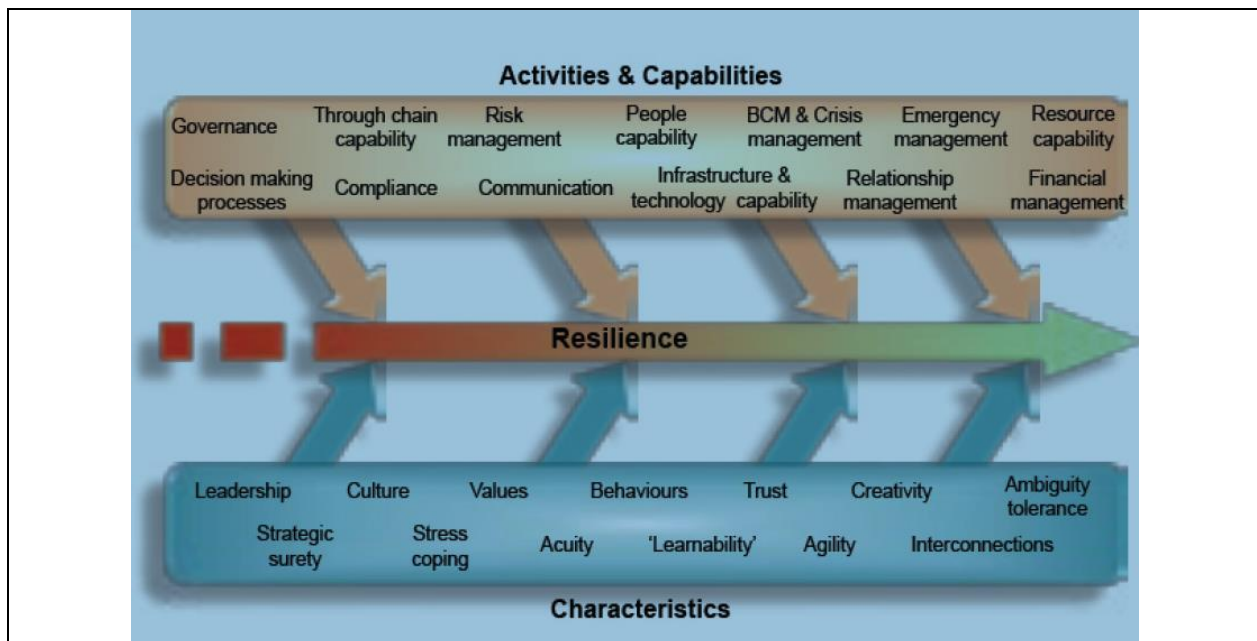

Figure 1 - Herringbone Resilience Model (Gibson and Tarrant, 2010)

The 'herringbone' recognises that an organisation possesses a substantial range of capabilities and undertakes a range of activities that will contribute towards improved resilience. Furthermore, the organisation also exhibits a number of characteristics that will affect its capabilities and activities to enhance the organisation's resilience (Gibson and Tarrant, 2010).

For most firms today, much business is done with vendors and customers on the Internet; they rely heavily on IT and data, and operate 24/7. For this reason, the line between business and information systems is blurred (Sayana, 2005). In such cases, continued availability of information systems is a *sine qua non* for business. Such businesses do not have any other alternate means of recording transactions and other data, hence cannot afford to be without information systems for long. All businesses that use information systems and data in their operations have a need for business continuity and a disaster recovery plan. Most large organisations, particularly all Fortune 1000 enterprises, conduct regular IS audits to ensure confidentiality, integrity and continuous availability of information systems (Singleton, 2011). Hence, continued availability of information systems is one of the major criteria for IS resilience.

However, a small enterprise that uses IT and whose business processes are reliant on IT is also at high risk (Singleton, 2011). Goodwin (2005) noted that SMEs are particularly weak in demonstrating their plans for the business continuity of their IT systems. Goodwin (2005) predicted that SMEs will soon be under pressure from large businesses, regulators, investors, insurers and their suppliers to demonstrate resilience. Thus, it will be hard for them to ignore business continuity in the future. Although structured planning processes can be good for SMEs (Cragg and King, 1993), SMEs are much less likely to carry out such planning processes than larger organisations and, when they do, the planning is likely to be less disciplined (Berman et al., 1997).

Planning and Resilience

Discussion on resilience is incomplete unless we explore planning. A central theme of resilience research is the question of anticipation vs. resilience, and planning vs. adaptation. Anticipation involves predicting possible sources of failure or causes of crisis or disaster, so that they can be planned for, mitigated, or avoided altogether. Weick and Sutcliffe (2007) 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. Weick and Sutcliffe (2007) added that an anticipatory approach is more suited to environments characterised by stability and predictable outcomes.

In contrast, resilience involves being flexible in a changing environment. Weick and Sutcliffe (2007) 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 whole system. Both planning and resilience involve the evaluation and prioritization of a multitude of factors, the prioritization of those factors with reference to one another, and decisions that ultimately reflect the priorities of the decision maker. Therefore it is necessary to adopt a strategy and methods that support prioritization of a multitude of decision criteria.

Optimally, businesses should find the most efficient balance, or "equilibrium" between anticipation and resilience. Comfort (2001) argues that disaster management practices are moving towards a combination of anticipation and resilience strategies. "While we agree that resilience is the key to coping, it is necessary to organise for resilience" (Comfort, 2001). Research also suggests 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 (Teoh and Zadeh, 2013). Thus, instead of planning for an uninterrupted and continuous operation, a resilient organisation is able to recognise disturbances and circumvent risk with an ability to adapt and reconfigure as quickly as appropriate, either to bring the organisation to the optimal operational position, or to converge to a new optimal operating position (Teoh and Zadeh, 2013).

Definition of SMEs

Research has highlighted that there is no precise definition of SMEs (Bhamra et al., 2011). As SMEs differ in size, location, business, financial performance, maturity and management style, the definition of SMEs varies from country to country.

In New Zealand, for instance, government statistics define SMEs as those businesses having fewer than 20 full time equivalent employees (NZ Ministry of Economic Development, 2012), whereas in the USA an SME is a business with less than 500 employees (SBA Office of Advocacy, 2012). "Small" is culturally relative, but the generalised characteristics of these firms are that they have limited access to resources, personalised management styles and little formal structure (Battisti et al., 2009). Our research is conducted in New Zealand, and therefore we will define SMEs as businesses that are "*privately owned, have personalised management styles, little formal structures and employ less than 20 full time staff members.*"

It is well known that SMEs are different from large organisations in many respects, and organizational theories applicable to large firms may not be applicable to SMEs (Thong, 1999). It is important to remember that a small firm is "not a little big business," (Thong, 1999). Thus, care should be taken when studying technology issues in small firms (Thong, 1999). We will elaborate and explain some of these differences from the perspective of Agency Theory.

Agency Theory Effects in SMEs

Agency Theory applies to situations where one or more persons (the principals) engage another person or persons (the agents) to perform some service on their behalf, which includes delegating some decision making authority to the agent. "If both parties to the relationship are utility maximisers then there is good reason to believe the agent will not always act in the best interests of the principal" (Jensen and Meckling, 1976). Agency Theory predicts that the agency conflict may be reduced when the owner is involved in management (Fama and Jensen, 1983; Jensen and Meckling, 1976). Principal-agent conflict may be less pronounced in the case of smaller organisations where it is more likely that the principal and agent will have a close relationship. On the other hand, it is also true that managers in small firms may be more isolated from the market discipline due to a closer relationship with their principals. Such isolation may result in entrenchment. Entrenchment is, in turn, likely to have a negative impact on performance. Furthermore, isolation from market disciplines and entrenchment-induced inertia is likely to encourage a weak culture and weak leadership as well as a myopic strategy (Ghobadian and O'Regan, 2006).

However, in SMEs, the CEO is usually also the owner-manager. Since the CEO is the main decision maker, the managerial style and personal traits of the CEO could potentially influence the culture, leadership and strategic planning processes of an SME (Ghobadian and O'Regan, 2006). Therefore, in the case of an SME with a single CEO owner-manager, decision priorities reflect the risk tolerance or risk aversion of the owner-manager, and often do not include "agency effects" related to the misaligned interests of other decision makers. In other words, by definition there can be no principal-agent conflict when the principal acts on his own behalf as the manager of the business, and therefore SMEs with a single CEO owner-manager

represent a theoretical ideal in the context of Agency Theory.

The owner-manager's desire for autonomy and possible disposition towards social aspects of relationships should not be ignored when trying to better understand the dynamics of power within SMEs. Implementing change can be particularly problematic for organisations where power and authority are highly centralised (Paton, 2007). Competitor power is also of concern to SMEs, especially when buyers can at short notice switch suppliers (Saunders, 1997).

In summary, based on the arguments and predictions of Agency Theory, SMEs and large organisations are likely to behave differently. Moreover, Agency Theory predicts differences in leadership style, culture, the emphasis placed on different dimensions of the strategy making process, barriers to the implementation of strategy and performance between SMEs and large organisations. The transformational leadership style is more prevalent in SMEs, while the transactional leadership style is more prevalent in large organisations. SMEs and large organisations also differ across a number of culture constructs. Large organisations are more likely to have formal strategic plans than SMEs. The personal traits of CEOs could potentially influence the culture, leadership, and strategic planning processes of an SME.

Overall, it is evident from our literature review that the form of IS resilience in large organisations may not be directly applicable to SMEs. Whereas in large firms, a study of the firm involves the study of its network of principals and agents, their interrelationships, and decision structures intended to make them function as if they were of one mind and purpose; in SMEs we often find that the firm and the CEO owner-manager are one and the same. In other words, to study the decision priorities of SMEs is to study their CEOs, and to study CEOs of SMEs is to study their firms' decision priorities. In the context of this research, SMEs represent a theoretical ideal of a business that has minimal or no principal-agent conflict, but a greater exposure to threats from poor IS resilience on account of CEO entrenchment or isolation from market discipline. Therefore, a study of SME CEOs in a post-disaster context should predictably result in a very rich and deep understanding of the dynamics of IS resilience planning priorities.

Research Model

A conceptual framework of determinants of IS resilience, and therefore what ought to be the decision priorities for one who is responsible for IS resilience, is presented in Figure 2.

Internal and external factors presented in the above framework of IS resilience for SMEs were derived from the literatures discussed in the previous section. In the context of this research, the model provides a guide for the development of instrumentation, and interpretation of the results.

Figure 2 - IS Resilience Conceptual Framework
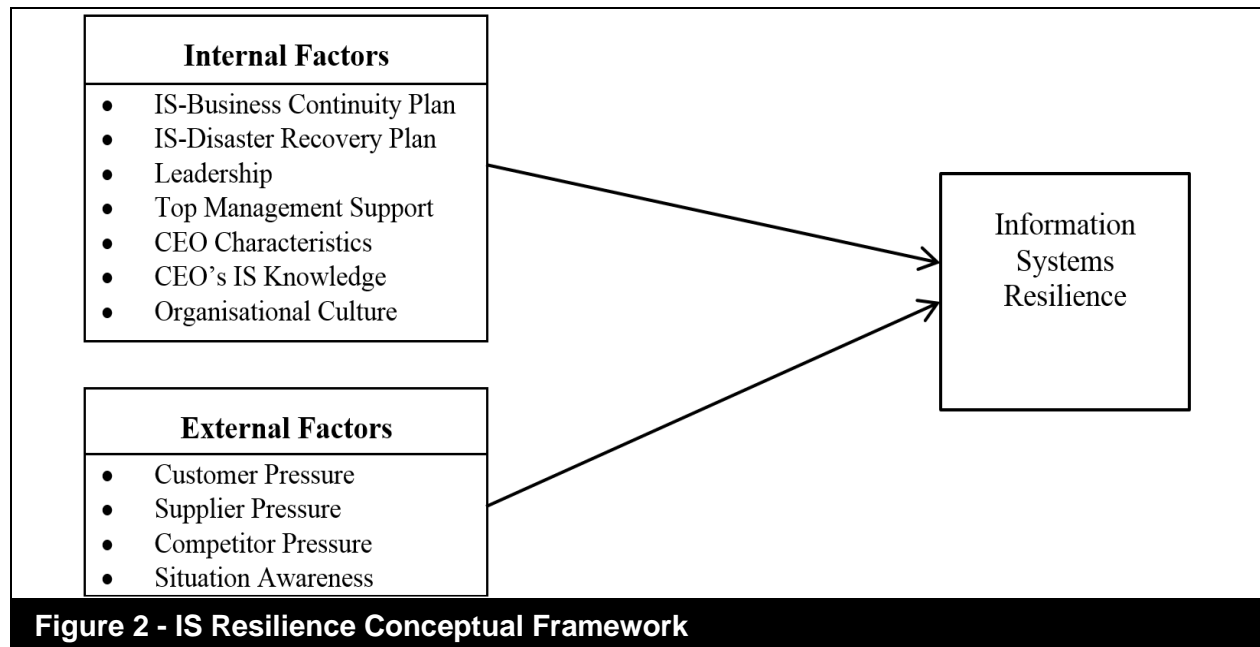
Research Method

Concourse Theory is a theory of communicability which proposes that people live their lives within a universe of possible thoughts, ideas, feelings, and related referential material (Brown, 1980; Stephenson, 1986a & 1986b; Wingreen and Blanton, 2017). The universe of possibilities for any given topic is a "concourse", and each person possesses a unique perspective of the concourse that is reflected by their own personal prioritization of the content of the concourse. Concourse Theory prescribes Q-methodology as the principal means of operationalizing a concourse, and the perspectives of people with reference to the concourse. To operationalize the person's unique perspective of a concourse, Q-methodology proposes the Q-sort and Q-factor analysis (Stephenson, 1986 - 1988; Wingreen, Lerouge and Blanton, 2009; Klaus, Wingreen, and Blanton, 2010; Wingreen and Blanton, 2017). A Q-sort requires the person to sort through a field of statements that represent the concourse, and to classify those statements into a quasi-normal distribution, typically between "most important" and "most unimportant", or "most

desirable" and "most undesirable". In doing so, the Q-sort captures the person's priorities with respect to the concourse, and operationalizes their unique perspective. Therefore, Concourse Theory, Q-methodology, and the Q-sort are also appropriate to operationalize the decision priorities of CEO owner-managers in SMEs, since in their planning and decision making, they also work within a "concourse" of criteria related to IS resilience.

Instrument Development

The Q-sort instrumentation, a set of 37 Q-sort statements, was developed according to the guidelines delineated by previous research (Brown, 1980; Stephenson, 1986a, and 1986b). The concourse is the unit of analysis, and therefore a set of Q-sort statements should represent the concourse of interest in the same way that a sample of people should represent the population in a classical correlational study. Therefore, certain prescribed guidelines are adopted in the selection of statements so as to achieve the highest probability of "representativeness" of the domain of the concourse: 1) review of the literature, 2) conversations and interviews with people who participate in the concourse, and 3)

input from domain experts about the content of the sample of Q-statements (Brown, 1980; Dennis, 1988).

Furthermore, if there are areas of theoretical interest, as there are in this research, then a "structured q-set" may be developed, which balances the number of Q-statements in each theoretical category, in much the same way as experimental participants are assigned to groups for balanced experimental designs in classical experimental research (Watts and Stenner, 2012). To accomplish this, we selected statements from figures 1 and 2 to represent the various dimensions of IS resilience which should be reflected in the decision priorities of SME CEOs. These items were then coded according to whether

they might be desirable for small firms according to Agency Theory, and risk tolerant or risk-averse decision makers. Therefore, the final set of 37 items was both representative of the larger concourse and well-balanced with regard to all the theoretical categories of interest in the current research.

The Q-Sample

The complete set of Q-sort statements is also known as the "Q-sample", since it represents a sample of the universe of the concourse. The Q-sample consists of thirty-seven statements related to CEO decision priority on IS resilience in SME context, as noted below.

Table 2 - IS Resilience Factors, Agency Theory Explanation Mapped to Q-Statements		
IS Resilience Factors	**Agency Theory Explanation**	**Q-Statements**
Business Impact Analysis / Organisational Culture	Large Organisations	Organisational vulnerability and capacity assessments carried out which provide comprehensive picture of vulnerabilities and capacities.
CEO Characteristics	Risk Averse & Large Organisations	Ability to identify key risks
CEO Characteristics	Risk Averse & Large Organisations	Ability to anticipate surprises and crises
CEO's IS Knowledge / Aligning IT with Business Strategy	Large organisations	Adapting technology to strategic change
Commitment / Leadership	Large Organisations	Committed, effective and accountable leadership of IS resilience planning and implementation.
Commitment / Top Management Support	Large and Small Organisations	Top management support and commitment to IS resilience.
Commitment/ Risk Management / Monitoring	Large Organisations	On-going monitoring of hazards and risks and updating of plans.
Communication	Large and Small Organisations	Use IS network to communicate with the customers.
Communication	Large Organisations	The extent of follow-up with customers for feedbacks.
Communication / Relationship Management	Large Organisations	Organisation's IS resilience plan shared with all suppliers.
Competitor Pressure	Small Organisations	Our competitors are developing and enhancing their IS resilience capabilities.
Connection	Large and Small Organisations	Use IS networks to connect to supplier's databases.
Decision making process	Large Organisations	Select suppliers with robust resilience plan.
Financial Management	Small Organisations	A sound IS resilience plan will help us to win more business contracts.
Financial Management	Small Organisations	A sound IS resilience plan will help us to pay lesser insurance premium.

Infrastructure & Technical Capability	Large Organisations	Resilient and accessible critical facilities (e.g. back-up systems, redundancy of data).
Infrastructure & Technical Capability	Large Organisations	Setting up information disaster recovery system (e.g., disk redundancy, backup facility).
Infrastructure & Technical Capability	Large organisations	Capability for disaster recovery
Infrastructure & Technical Capability	Large organisations	Providing the organizational units with information for 24 hours a day, 7 days a week
Infrastructure & Technical Capability / CEO's IS Knowledge	Large and Small Organisations	Use cloud computing to back up organisational data.
Leadership / CEO's IS Knowledge	Large Organisations	IS resilience can provide an organisation with an edge over its competitors.
Leadership / CEO's IS Knowledge	Large Organisations	Long-term IS Resilience, Business Continuity, Disaster recovery justification and planning.
Learnability	Large Organisations	Full scale Competitor analysis.
Learnability	Large Organisations	Study resilience strategies of competitors.
Organisational Culture	Risk Averse & Large Organisation	The level of customer involvement in preparing resilience, business continuity and disaster management plans.
Organisational Culture	Risk Averse & Large Organisation	The level of supplier involvement in preparing resilience, business continuity and disaster management plans.
Organisational Culture	Large organisations	Aligning IS strategies with the strategic plan of the organization
BCM Planning	Large Organisations	Organisation IS Continuity plans, developed through participatory processes, put into operation and updated periodically.
DR Planning	Large Organisations	IS Disaster Recovery plans informed by understanding of underlying causes of vulnerability and other factors outside organisation's control.
Planning	Risk Averse & Large Organisations	IS resilience plan that is well defined and structured
Planning	Risk Tolerant & Small Organisations	IS resilience plan that is flexible and adaptable
Planning / Resource Capability	Large Organisations	A sound IS resilience plan will help our organisation to make more efficient use of resources.
Risk Management / Situation Awareness	Large Organisations	Organisation hazard/risk assessments carried out which provide comprehensive picture of all major hazards and risks faced by organisation (and potential risks).
Situation Awareness	Large organisations	Understanding the strategic priorities of top management
Trust / Organisational Culture	Large and Small Organisations	Ensuring data security
Trust / Organisational Culture / Customer Pressure	Large and Small Organisations	Providing reliable and consistent services to customers
Trust / Organisational Culture / Supplier Pressure	Large and Small Organisations	Providing reliable and consistent services to Suppliers

The P-Sample

The people who participate in a Q-method study are referred to as the "P-set" or "P-sample".

After the 2010 -2011 earthquakes in Christchurch, private sector CEO owner-managers of local SMEs were recruited to assist as evaluators with the item selection phase. Following the guidelines for

instrument development, feedback from the evaluators was incorporated into the Q-statement and Q-Sort instrumentation. After several iterations of the instrument development guidelines, the evaluators confirmed that the instrument is representative of the concourse and should function as intended.

We then approached eight (8) private sector CEO owner-managers of local SMEs, who provided their own Q-sorts. A short questionnaire was distributed to all participants to gather demographic and contextual information, such as industry sector they operate in, tenure in position and budget allocations to ensure P-sample variation. All eight (8) participants responded to the questionnaire and thus were included in the P-sample. Although the goals of Q-method research do not require a representative P-sample, since the concourse is the unit of analysis rather than the person, the P-sample is nonetheless sufficiently diverse with respect to each of the major demographic factors. In addition, the restriction of the sample to Christchurch local CEOs was intentional, in order to serve as a control for region variations, and to ensure that all participants were in fact involved in post-disaster planning.

The data gathered was analysed using the PQ-method software that is commonly used in Q-methodology research (Wingreen and Blanton, 2017).

Organisation Exposure to Crisis

The Christchurch Earthquake was in fact a sequence of earthquakes from September 2010 to mid-2011. The earthquake that caused the most damage occurred in February 2011, several months after the first earthquake in September 2010. Prior to the Sept. 2010 earthquake, none of the organisations had earthquake plans in place, because it was widely believed that earthquakes were extremely unlikely, or not possible in Christchurch. By the time this study was conducted, all companies in this study had earthquake plans in place.

The organisations in this study experienced a variety of challenges as a result of the Christchurch earthquake. Common to all of them was trouble with the communications network, electricity outages, and employee personal issues that followed in the days after the earthquake. All companies had subsequently developed and put in place a robust and rehearsed system for earthquake safety measures, with assigned duties, floor announcements and evacuation zones. Business Continuation Plans and Disaster Recovery plans had been prepared, special control rooms been set up, and a task list and contact tree for emergencies had been drawn up. Therefore, no company was taken entirely unawares by the February 2011 earthquake. All of the companies had their primary activities or core units within the earthquake-hit Christchurch area, and as a result all of them suffered a devastating blow to their operations. The scale of the disaster was shocking even for these well prepared New Zealand companies.

Research Findings and Discussion

This section presents the findings of this research that were reached through analysis of Q-sort data. The Q-sort data was analysed using a centroid factor analysis, as suggested by prior research. Two, three and four-factor solutions were examined at first, however, since the four-factor solution converged to a three-factor solution, there was no need to continue, and a three-factor solution was adopted.

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Table 3 - Z-scores and statement rankings by factor type						
Statements	**Type 1**		**Type 2**		**Type 3**	
	z	*rank*	*z*	*rank*	*z*	*rank*
1. IS DR plans informed by understanding of underlying causes of vulnerability and other factors outside organisation's control.	1.49	**5**	1.3 6	**6**	0	**21**
2. Organisation ISCP plans, developed through participatory processes, put into operation and updated periodically.	0.49	**11**	0.68	**12**	-0.54	**29**
3. Organisation's IS resilience plan shared with all suppliers.	-0.75	**30**	-2.04	**37**	-1.12	**35**
4. Organisation hazard/risk assessments carried out which provide comprehensive picture of all major hazards and risks faced by organisation (and potential risks).	0.3	**17**	0.68	**12**	0	**21**
5. On-going monitoring of hazards and risks and updating of plans.	0.24	**18**	1.36	**6**	0.78	**9**
6. Organisational vulnerability and capacity assessments carried out which provide comprehensive picture of vulnerabilities and capacities.	0.3	**17**	0.68	**12**	0	**21**
7. Resilient and accessible critical facilities (e.g. back-up systems, redundancy of data).	1.55	**3**	2.04	**2**	1.22	**5**
8. Top management support and commitment to IS resilience.	0.22	**20**	0.68	**12**	1.22	**5**
9. IS resilience can provide an organisation with an edge over its competitors	-1.24	**33**	-1.36	**36**	-0.34	**26**
10. Our competitors are developing and enhancing their IS resilience capabilities	-2.29	**36**	-1.36	**36**	-2.34	**37**
11. A sound IS resilience plan will help us to win more business contracts	-0.67	**29**	-1.36	**36**	0.34	**14**
12. A sound IS resilience plan will help us to pay lesser insurance premium	-0.8	**31**	-2.04	**37**	-1.9	**37**
13. A sound IS resilience plan will help our organisation to make more efficient use of resources	-1.68	**36**	-0.68	**32**	0.44	**12**
14. Long-term IS Resilience, Business Continuity, Disaster recovery justification and planning	-0.53	**27**	0	**26**	-0.34	**26**
15. Competitor analysis	-1.49	**34**	-1.36	**36**	-1.32	**36**
16. Setting up information disaster recovery system (e.g., disk redundancy, backup facility)	0.54	**8**	2.04	**2**	0	**21**
17. Study resilience strategies of competitors	-1.83	**35**	-0.68	**32**	-1.12	**35**
18. Select suppliers with robust resilience plan	0.45	**13**	0	**26**	1.56	**3**
19. Use IS network to communicate with the customers.	0.47	**12**	0	**26**	-0.34	**26**
20. Use IS networks to connect to supplier's databases	0.39	**14**	-0.68	**32**	-0.88	**32**
21. Use cloud computing to back up organisational data	-0.1	**24**	0.68	**12**	0.1	**15**
22. The level of customer involvement in preparing resilience, business continuity and disaster management plans	-1.17	**32**	0	**26**	-0.68	**30**
23. The extent of follow-up with customers for feedbacks	-1.22	**33**	-0.68	**32**	-1.12	**35**
24. The level of supplier involvement in preparing resilience, business continuity and disaster management plans	-0.14	**25**	0	**26**	-0.78	**31**
25. Ensuring data security.	-0.17	**26**	1.36	**6**	1.02	**7**
26. Providing reliable and consistent services to Suppliers.	0	**22**	-0.68	**32**	-0.2	**22**
27. Providing reliable and consistent services to customers.	1.97	**1**	0	**26**	1.12	**6**
28. Capability for disaster recovery.	0.76	**6**	0	**26**	0	**21**

29. Providing the organizational units with information for 24 hours a day, 7 days a week.	0.5	**10**	-0.68	**32**	2.34	**1**
30. Understanding the strategic priorities of top management.	0.11	**21**	0	**26**	0.34	**14**
31. Aligning IS strategies with the strategic plan of the organization.	0.5	**10**	0	**26**	0	**21**
32. Adapting technology to strategic change.	-0.61	**28**	0	**26**	-0.34	**26**
33. IS resilience plan that is well defined and structured.	0.76	**7**	0	**26**	-0.44	**28**
34. IS resilience plan that is flexible and adaptable.	0.3	**15**	0	**26**	-0.44	**28**
35. Ability to identify key risks.	1.52	**4**	0.68	**12**	0.88	**8**
36. Ability to anticipate surprises and crises.	1.61	**2**	0	**26**	0.44	**12**
37. Committed, effective and accountable leadership of IS resilience planning and implementation.	-0.03	**23**	0	**26**	2	**2**

Table 3 reports the results of the factor analysis, which reveals three "types" of decision priorities held by the CEOs who participated. The z-scores are the average z-statistic for where the statement was ranked on the Q-sort distribution by those who comprise that factor, and as such represent the probabilities associated with each priority for their respective decision type. The "rank" is the average ranking of that statement by those who represent that factor. The highest and lowest rankings are highlighted so as to illustrate the decision priorities that represent each type. A type is defined by both the high and low priorities, since both distinguish any given type from others, and therefore the analysis proceeds by interpreting and defining the types based on their respective priorities. At this stage, the existence of a type means only that the type exists among those participating in the current study. A larger study will almost certainly reveal additional types. Further research with larger data sets will eventually reveal the relative proportions of these types among the population of decision-makers and the probabilities associated with each type.

Type 1: Forward Looking and Plan Oriented Pragmatist

Type 1 decision makers may be characterised as forward looking and plan oriented. This group clearly preferred well defined and structured plans over a flexible and adaptable IS resilience plan, as exemplified by this particular highly-ranked statement: "IS resilience plan that is well defined and structured" (rank 7). It is evident that type 1 decision makers were more concerned about anticipating events in advance, as exemplified by these two highly ranked statements: "Ability to anticipate surprises and crises" (rank 2) and "Ability to identify key risks" (rank 4). Another important characteristic of this type is that they are forward looking and pragmatist. This is supported by the group's intention to provide reliable, continuous and consistent service to their customers and also want to assure that the IS resilience plan is well integrated with their business strategy.

Type 2: Mindfully Managing the Unexpected

This CEO showed some very interesting, pragmatic, unique and mindful characteristics and thus emerged as a separate type. He is a CEO of a small medium enterprise whose core business is to provide software solutions. He has been running this company for 30 years, and has a significant client base both in New Zealand and overseas.

According to him, "Resilient and accessible critical facilities (e.g. back-up systems, redundancy of data)" and "Setting up information disaster recovery system (e.g., disk redundancy, backup facility)" are of utmost importance. He also mentioned that the critical resources to his company are the staff members. "If something happens to

them then we will lose the intellectual property. [As a consequence]   cannot maintain connection with our customers. Staffs are 'key' to us [SMEs]". When probed on this and questioned about whether his company maintains a knowledge repository, he said that, "if you do not have a staff member then you cannot do anything. Maintaining knowledge repository is not going to solve this problem.   Another important aspect of his business is to "ensure data security", when probed on this he mentioned that "our business is Data; we have to do everything possible to make sure that it is secured." He mentioned that he is not a process oriented person. His leadership style is empowering and supportive and he has always been like that. In other words, he has not changed his leadership style after the earthquake. In his own words, "…you have to remember that you are dealing with intelligent peoples…they do not required to be micro-managed rather they want a supportive leadership in place. I employ people who are capable of learning and doing jobs. I support them to do their job. While employing staff I make sure that they are smart, bright…I mean quick learner, flexible and adaptable."

As mentioned before this CEO is not a process driven person while probed on this he mentioned that, "planning is important until the disaster struck, while in crisis mode then you have to start thinking the unthinkable." After the series of devastating earthquakes he has done three things which he thinks will make his company more resilient. Firstly, he has put a formal succession plan in place. His company now has a person who he has mentored for years who can look after this business without compromising the business values. Second thing that he has done is, setting up a second location where the whole team can move within two hours and continue business as per usual. Lastly, he has started diversifying his business to more locations, "…I am diversifying my client base. Your business can be resilient and

have very little downtime but your client's business can be liquidated, so we are now entering new markets." He further explained that, "Providing the organizational units with information for 24 hours a day, 7 days a week" is absolutely not critical as they have offsite remote back up facilities and they have stored procedures and triggers which will take care of the day to day business of their clients. If they require them to make any alterations then they can do it as long as they can go to their second location and have all the knowledge resources (primarily the staffs) intact.

On one hand, any type of planning is absolutely not a priority for this decision maker and he neither consider "ability to anticipate surprises and crises" nor "Ability to identify key risks" as the top priorities rather he thinks it is far more important to "Practice thinking the unthinkable". He is strong advocate of resilient and accessible critical facilities (e.g. back-up systems, redundancy of data), setting up information disaster recovery system (e.g., disk redundancy, backup facility) and setting up information and disaster recovery system, which includes reliable back up facilities and redundancy and replication of data. He showed significant level of mindfulness-based resilience and decision making under crisis situation. We will discuss about mindfulness-based decision making in detail at the end of this section.

Type 3: Myopic and Process Oriented Pragmatist

The members in Type 3 are concerned about organization and structure. "Providing the organizational units with information for 24 hours a day, 7 days a week" (rank 1), "Committed, effective and accountable leadership of IS resilience planning and implementation" (rank 2) and "Select suppliers with robust resilience plan" (rank 3) were factored as the top three most important statements. These decision makers place greater value upon resource allocation and internal efficiency of the organisation, they are more focused on

keeping the operations reliable and efficient, and they also want to see a responsible and reliable leadership structure in place. The comments suggest that the members in this group are interested in efficient business process and data security, as exemplified by "Providing reliable and consistent services to customers" (rank 6) and "Ensuring data security" (rank 7).

It is evident from that Type 1 and Type 3 are routine based approaches, but Type 2 demonstrates mindfulness based reliability. Routine-based approaches are commonly advocated in the Information Systems literature. This approach is designed in advance, usually by top managers (in our case CEOs) and applied by the staffs. Procedures are designed to decrease the need for creative human involvement in the moment of need, so that errors, unwanted variation and wastes can be prevented. Routine-based approaches depend on a match between situation and response. This process may work very well under normal conditions, but is questionable under crisis or uncertain situations. On the other hand, mindfulness-based approaches focus on promoting highly situated human cognition as a solution to organisational problems. According to Weick and Sutcliffe (2007), mindful response to a particular situation is not an attempt to make the best choice from among available options but to create options, which echoed the words of the Type 2 CEO when he mentioned "practice thinking the unthinkable."

Interestingly none of the types found "supplier involvement to plan for IS resilience" to be critical, the reason may be that all our participants are from service industry and supplier involvement may not be very essential for them. If we include respondents from the manufacturing industry then supplier involvement may emerge as an important attribute. According to Zhu and Chen (2014), organisations have a tendency to imitate each other when it comes to strategy, particularly in times of uncertainty. Copying what other companies do gives their decisions legitimacy and

saves, or at least reduces the cost of search and experimentation. Contrary to our expectation, however, one thing that appeared consistently from the analysis is that none of these types are interested on competitor analysis in order to prepare for IS resilience. When probed on this they mentioned that "it [planning] is very specific to your organisation and it is best to know your strengths and weaknesses, so [there is] no point copying your competitor's strategy. …though while planning your own keep an open eye and refer to the best practices within the industry."

Conclusion

We have identified a gap in research related to information systems resilience in SMEs. Accordingly, we conducted an extensive literature review to identify differences between large-scale enterprises and SMEs with respect to IS resilience and undertook an empirical study using Q-sort instrumentation to analyse key issues. We used Agency Theory to establish the decision priority differences between SMEs and large organisations. This study contributes to the limited body of knowledge on IS resilience in SMEs in four ways. Firstly, we have developed and tested an instrument to capture the decision priorities of SME CEOs. Secondly, we propose a definition of organisational IS resilience. Thirdly, our research shows that Agency Theory is predictive to interpret decision priorities of SME CEOs. Lastly, this is the first attempt to understand the IS resilience decision priorities of SME CEOs in lens of Agency Theory, and it appears to be valid.

The Q methodology does have some weaknesses. It is a small-sample technique, and the sample of items and participants is usually purposive, and the results lack generalizability. However, since the goals of Q-methodology are interpretive, and the concourse is the unit of analysis rather than the people, this is usually not considered a weakness by Q-method practitioners. This study is a starting point for further research

into the IS resilience in SMEs. Also, the sample was restricted to service SMEs.

There are a number of avenues of future research, including examining a greater range of organisations. Future empirical research should attempt to understand the IS resilience decision priorities and characteristics of resilient organisations.

Finally, results have implications both for researchers who are looking for theories that explain the importance of IS resilience and business managers and owners who are challenged with decisions about how to design resilient information system framework for their organisation.

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Appendix A

Q-SAMPLE

Let us imagine a scenario, such as:

"Your business has been interrupted by a major incident. You have no access to your premises, IT systems and business records. Some of your employees are injured or dead. You do not know how long the outage is going to last. If you are trying to plan ahead, anticipating this scenario, what would your priorities be?"

Q-sort distribution:

Keeping in mind the above scenario, rate which statements are important according to your experience *during Information Systems Resilience planning*. Assign the statements "from the outside in", that is, decide on two "very important" and "very unimportant" statements first, then select *four* statements each for the "important" and "unimportant" categories, and *six* statements each for "somewhat important" and "somewhat unimportant". The last *thirteen* statements need not be sorted, and will be categorized as "neutral". Enter the number to the left of each statement in the spaces provided. Please ensure that you enter a statement only once for each set of priorities.

Very Important (2 items)						
Important (4 items)						
Somewhat important (6 items)						
Somewhat unimportant (6 items)						
Unimportant (4 items)						
Very Unimportant (2 items)						

Q-Statements

1. IS Disaster Recovery plans informed by understanding of underlying causes of vulnerability and other factors outside organisation's control.

2. Organisation IS Continuity plans, developed through participatory processes, put into operation and updated periodically.

3. Organisation's IS resilience plan shared with all suppliers.

4. Organisation hazard/risk assessments carried out which provide comprehensive picture of all major hazards and risks faced by organisation (and potential risks).

5. On-going monitoring of hazards and risks and updating of plans.

6. Organisational vulnerability and capacity assessments carried out which provide comprehensive picture of vulnerabilities and capacities.

7. Resilient and accessible critical facilities (e.g. back-up systems, redundancy of data).

8. Top management support and commitment to IS resilience.

9. IS resilience can provide an organisation with an edge over its competitors.

10. Our competitors are developing and enhancing their IS resilience capabilities.

11. A sound IS resilience plan will help us to win more business contracts.

12. A sound IS resilience plan will help us to pay lesser insurance premium.

13. A sound IS resilience plan will help our organisation to make more efficient use of resources.

14. Long-term IS Resilience, Business Continuity, Disaster recovery justification and planning.

15. Competitor analysis.

16. Setting up information disaster recovery system (e.g., disk redundancy, backup facility).

17. Study resilience strategies of competitors.

18. Select suppliers with robust resilience plan.

19. Use IS network to communicate with the customers.

20. Use IS networks to connect to supplier's databases.

21. Use cloud computing to back up organisational data.

22. The level of customer involvement in preparing resilience, business continuity and disaster management plans.

23. The extent of follow-up with customers for feedbacks.

24. The level of supplier involvement in preparing resilience, business continuity and disaster management plans.

25. Ensuring data security

26. Providing reliable and consistent services to Suppliers

27. Providing reliable and consistent services to customers

28. Capability for disaster recovery

29. Providing the organizational units with information for 24 hours a day, 7 days a week

30. Understanding the strategic priorities of top management

31. Aligning IS strategies with the strategic plan of the organization

32. Adapting technology to strategic change

33. IS resilience plan that is well defined and structured

34. IS resilience plan that is flexible and adaptable

35. Ability to identify key risks

36. Ability to anticipate surprises and crises

37. Committed, effective and accountable leadership of IS resilience planning and implementation.

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