Integrated Response as a process for enhancing the Incident Command System

By

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Abstract

The devastating societal impacts of disruptive events have emphasised the need for more effective and unified emergency response arrangements. While policies that guide strategies, measures or approaches are not lacking in the emergency sector, they tend to be inadequate for response and relatively ineffective during response to large-scale or unprecedented events. This research critically examines theoretical bases and practice systems for emergency response, in order to identify useful community functions which can be integrated with emergency management response. The aim is to develop an integrated response framework that can be adopted to improve response to disruptive events.

The data for this research were gathered through case study analyses of communities in Christchurch, which provided context for and helped define the scope of community functions required for emergency response. Data were also collected in semi-structured interviews and focus group sessions with different community groups and organisations, emergency management professionals, and officials working in Christchurch City Council.

The analysis indicates that relevant functions exist within communities, and that four types of community functions can be used for improving emergency management response. Community functions identified were seen to possess relationships, interactions and qualities lacking in the emergency sector; characteristics that are essential for operational command and control response processes. The major research outcome is the development of a framework that integrates community functions with command and control structure as a contribution to improving response to disruptive events.

Keywords – Emergency Management Response, Command and Control, Integrated Response Framework, Community Functions, Disruptive events

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Terminology

This research is written for a mixed audience of emergency management practitioners, academics in hazard and disaster management and policy-informing researchers in the emergency and disaster management sector. Thus, definitions of major terms used in this thesis draw from both legislative documents and academic texts in the field of emergency and disaster management.

Disaster means "a serious disruption of function(s) of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR 2007).

Disruptive Events – see definition for **incident**

Emergency –

a. is the result of any happening, whether natural or otherwise, including, without limitation, any explosion, earthquake, eruption, tsunami, land movement, flood, storm, tornado, cyclone, serious fire, leakage or spillage of any dangerous gas or substance, technological failure, infestation, plague, epidemic, failure of or disruption to an emergency service or a lifeline utility, or actual or imminent attack or warlike act; and
b. causes or may cause loss of life or injury or illness or distress or in any way endangers the safety of the public or property in New Zealand or any part of New Zealand; and
c. cannot be dealt with by emergency services (fire, police or ambulance), or otherwise requires a significant and coordinated response under the Act. (CDEM Act, 2002).

Incident –

a. An event, accidentally or deliberately caused, which requires a response from one or more of the statutory emergency response agencies (Australasian Fire Authorities Council, 1997).
b. A sudden event which, but for mitigating circumstances, could have resulted in an accident (EMI Glossary).
c. An emergency event or series of events which requires a response from one or more of the statutory response agencies (EMA, 1998). *See also* **emergency** and **disaster**.

Emergency Management –

a. means 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, organization, co-ordination, and implementation of those measures, knowledge, and practices (CDEM Act, 2002)
c. The coordination and integration of all activities necessary to build, sustain, and improve the capability to prepare for, protect against, respond to, recover from, or mitigate against threatened or actual natural disasters, acts of terrorism, or other manmade disasters (FEMA, 2011).

Community –

a. A group with a commonality of association and generally defined by location, shared experience, or function (Australian Emergency Management Glossary, 1998).
b. A social group which has a number of things in common, such as shared experience, locality, culture, heritage, language, ethnicity, pastimes, occupation, workplace, etc. (Australian Emergency Management Glossary, 2nd Edition).

Function(s) –

a. The activities and actions required during response to an emergency or disaster that help to ensure continuity with the Emergency Operation Plan (EOP) is maintained during a response (FEMA, 2011).
b. Activities categorized into a day-to-day program that helps emergency professionals to organize and direct emergency management programs like hazard mitigation, resource management, training, logistics and facilities, operations and procedures, planning etc. (FEMA, 2011).

Community Functions means activities, actions and organised programs, resource management and coordination led and facilities by communities which are implemented and maintained for shared experiences within the community, but which may be utilised for response arrangements during disruptive events (Australian Emergency Management Glossary, 1998; FEMA, 2011; Fakuade, 2015).

Chapter 1 - Introduction

1.1 Introduction

Disruptive events by definition impact people, social activities, environment and economic activities. This compels many countries, especially those countries like Bangladesh, the Philippines, Australia and New Zealand that are prone to the impact of natural hazard events, to be proactive in adopting measures that can help mitigate the impact of disruptive events in communities. However, incidents such as 9/11, the Indian Ocean Tsunami, Hurricane Katrina etc. have also shown that problems exist when responding to disruptive events, in particular the coordination of response to events that overwhelm the capabilities of emergency services. This research aims to investigate the current systems used in responding to disruptive events, in order to improve society's ability to cope with and manage different types and magnitudes of incidents that may occur in the future.

Disruptive events that have occurred in the past, especially in the last two decades, have shown that regardless of the economic status of the affected countries, the impacts of disruptive events are severe when resources are stretched, when capabilities are uncoordinated, and when response arrangements are insufficient (Manoj and Baker 2007). It has also been witnessed that disruptive events may overwhelm existing Emergency Management (EM) arrangements, emphasising the need for continuous improvement and coordination of both resources and capabilities. There is no question that capabilities, resources and comprehensive EM arrangements are important for effective EM response, but the widespread and continued problems witnessed in the response phases of the above incidents deserve a critical investigation that goes far beyond a post-incident debrief.

Observations made from past incident response, and issues that influence response which are independent of economic status of a country, warrant further research, hence this thesis. Therefore, this chapter introduces the research area by explaining some problems identified with EM response, discussing the rationale, research objectives and questions, and providing a brief EM context of New Zealand as the country from which the case studies are selected. Section 1.7 explains the thesis structure and contents of each following chapter.

1.2 Background to the Research

Emergency Management (EM) is the coordination and integration of all activities necessary to prepare for, protect against and respond to incidents (Alexander 2005). Beyond this, EM also involves the ability to coordinate and manage resources for preparing to deal with an emergency, and to respond to and

recover from the impact it may have caused to life and environment (Fagel 2011). EM is viewed as a process that ensures that capabilities to deal with incidents is developed and coordinated, planned and reviewed in order to ensure the effectiveness of EM arrangements (Alexander 2005; Edwards and Goodrich 2007). In this sense, EM is a management process that aims to coordinate both human and material resources as well as procedures for emergency management (Alexander 2005). The central goal of EM is to minimise loss of life and prevent disruptive events from escalating, hence EM has a response task which strives to ensure that mitigating measures and preparedness activities put in place by emergency organisations are well coordinated to ensure public safety (Mendonca et al. 2001). Figure 1.1 illustrates the interactions between the phases of EM.

Figure 1.1 Emergency Management Phases

(Adapted from Canada 2010; FEMA 2006; CDEM 2009; Dillon et al. 2009; EMA 1998)

While response is an important phase, EM is a comprehensive model with specific consideration of how the other phases (reduction, readiness and recovery) influence response and how the response phase in turn influences the other phases (Turoff 2002). However, coordinating the phases and organisations of EM is often not as easy in practice as it may appear in theory or principle. This is because of the uncertainty and risk which characterise emergencies and disasters, and of EM's high dependence on the ability of people to manage issues of mitigation (reduction), preparedness (readiness), response and recovery (Erickson 1999; Fagel 2011). This is not to infer that human ability is not required in EM response, but that this ability needs to be utilised appropriately for response.

Nevertheless, there have been efforts for several years to improve activities which can prevent or reduce harm to society (Dillon et al. 2009). Efforts of this nature have motivated researchers in EM to study

past and current practices with the aim of identifying good principles, strategies and concepts which can be used to improve future practices and standards in EM (Canton 2007). For instance, the concept of using phases to describe EM has been in existence since the 1930s and has evolved from eight phases to five and then the current four phases (Neal 1997), characterised in New Zealand as Reduction, Readiness, Response and Recovery (the 4 "R" s) as shown in Figure 1.1. EM has evolved over many years as a global attempt to accommodate better management of resources and activities.

The four EM phases became the basis of improving coordination such that EM is comprehensive, covering all phases and all levels of government administration. In principle, the four phases provide a framework to examine, explain and understand the most appropriate way to organise EM practices as well as to increase the effectiveness of each phase. Despite the widespread use of the four phases to improve coordination of EM between different levels of government, emergencies and disasters continue to pose a major and increasing threat to lives, environments and livelihoods all over the world, in both developed and developing countries as more people are forced to live due to circumstances, in hazard-prone areas. The causes, occurrence and impacts of incidents have influenced emergency management to evolve significantly from its inception in piecemeal approaches in the 19th century to the present system which is motivated by civil engagement (Deal 2006). This means that the comprehensive practices of EM involve all stakeholders, which in principle includes government at all levels, and all organisations and communities who can contribute to the effectiveness of any phase in EM (Blanchard et al. 2007).

The four phases are thus linked together in a continuous process and activities carried out in each phase influence the next phase. Although views differ about the starting point of the EM cycle, some explanations of EM suggest that the starting point for the EM cycle depends on the phase which a community is in at the time (Fakuade 2015; Erikson 1999). For example, if a community has just suffered from a catastrophic incident, it is expected that the community recovers while they simultaneously consider prevention and mitigating measures in order to be better prepared for future incidents. While the overview of EM provides background for the present research, this study focuses on the response phase. The response phase is directly influenced by the reduction and preparedness (readiness) phases, and also influences the recovery phase post-emergency or -disaster. This makes the response phase very important to mitigating, preventing and reducing harm to people during any future incident. The response phase is at the heart of this thesis.

Although Alexander (2002; 2005) and Turoff (2002) argued that planning and preparedness efforts have been helpful in reducing impacts of incidents on people, environment and society as a whole, the magnitude of emergencies occurring in recent times continues to warrant improved response. Despite the positive results preparedness efforts have provided in some communities, the widespread misconception that documented plans and planning arrangements are strictly adhered to when major

emergencies and/or disasters occur has been critically debated in the last decade (e.g. Birkland 2006; Neef and Shaw 2013). Incidents such as Hurricane Katrina in US (2005) and the Japan earthquake and tsunami (2011), occurred at a scale that exceeded plans and planning arrangements. Responses to these incidents were insufficient to prevent loss of life and extreme damage, in spite of the level of planning or documented plans that existed before the incidents.

Although it can be argued that these disasters occurred in unprecedented and therefore unexpected magnitudes and complexities, the level of response performance, communication, and coordination and the delays in mobilising resources clearly demonstrated the challenges associated with the response phase of EM (Perrow 2011; Alexander 2013). While it can be argued in the case of Katrina that an exercise with a similar scenario was conducted a short time before hurricane Katrina occurred (Fournier and Bridis 2005), the exercise failed to involve the community at risk and subsequent planning arrangements did not prevent the disaster. Hence, improving the processes that guide the response phase is critical and needs to be subjected to continuous review. This thesis intends to contribute to this aim.

In developed societies, many agencies are involved in response, and this at times makes coordination of efforts very challenging, especially in the crucial but confusing immediate response phase (Dillon et al. 2009). It has been observed during response to some of the incidents mentioned earlier, that response challenges evolve from this unusual environment (Ronald et al. 2006). The challenges of response in navigating the unusual environment associated with the occurrence of a crisis might be difficult to 'command' and/or 'control' in a top-town fashion, requiring instead a synergistic approach. This possibility, and the evident problems associated with EM response, have motivated my research to focus in particular on the response phase. While command and control is necessary and inevitable in the confused stage of response, and in situations where prior planning has not been done, it justifies further investigation of the response phase. This EM phase also requires more rigorous theoretical examination in order to explain how response arrangements can follow a more synergistic "top-down *and* bottom-up" model with the embedded interdependencies of response entities made explicit (Turoff 2002; Dillon 2009).

While Fagel (2011) explained that response capacities built on 'command and control' are good for emergency response coordination, Deal (2006) argued that 'command and control' skills are insufficient in ensuring effective response due to the challenges experienced during response to emergencies and disasters. This is because the environment in which response to major incidents needs to take place is characterised by uncertainty, unfamiliarity, change and a great sense of urgency in which break-down of decision-making and communication systems makes operating procedures and standards ineffective or insufficient (Lewis 1998; Perrow 2011). It follows that EM, especially the response phase, requires an in-depth understanding rooted in research-based explanations and knowledge, so that EM response can be less problematic (Manoj and Baker 2007). While EM response may benefit from research

investigation, this might also appear to trivialise the roles, efforts and responsibilities of emergency organisations and government in planning and preparing to mitigate, prevent and reduce the impact of major incidents in society (Edwards and Goodrich 2007) such trivialisation is not intended. The outcome of this section is that response to an emergency of any nature requires a more integrated set of arrangements in order to reduce its impact (Blanchard et al. 2007).

1.2.1 Response Phase in EM

According to Canton (2007) emergency response can be described as a specialised and theoretical body of knowledge and practice used to determine emergency operations, tactics, resources and skills provided by a coordinated group of people and organisations. To ensure that the frontline responding agencies such as the police, fire, ambulance and military are well coordinated to work together, the initial response phase is driven by a 'command and control' (C2) model, namely ICS; the Incident Command System (Deal 2006). C2 is a widely-used response framework, adopted on the assumption that the incident or disaster zone is chaotic and with the aim of avoiding behaviours of organisations and communities which can hinder emergency response arrangements (Kapucu 2006; Patton and Swope 2005). This means that emergency response is based on the ability of a 'commander' or 'controller' to recognise what needs to be done during an emergency and ensure that the appropriate actions are taken to minimise or prevent loss and damage (Alberts and Hayes 2006). However, this also means that response can be problematic or less effective if the commander or controller is unable to mobilise response functions and procedures to achieve response goal.

Response processes can also be affected when actions and capabilities required to ensure the interactions of response entities are not well coordinated during an emergency (Green and Kolesar 2000). Above all, the commander/controller can simply be overwhelmed by the high cognitive load of the response situation, thereby leading to less effective response. Effective EM response requires a certain level of coordination between different agencies, organisations, and or services (Dillon et al. 2009). Agencies and organisations such as police, fire, ambulance, coastguard, armed forces, Red Cross and government at different levels of administration are usually required to cooperate to meet response needs (Dillon et al. 2009). Shen and Shaw (2004) state that response can often be more demanding than expected and this may be due to the common imposition of a hierarchical 'command and control' or rigid 'control' process. Such rigid controls are required for monitoring updates and to better manage the complex network of tasks, actors, and resources that make up the response process (CDEM 2009; Dillon et al. 2009). However, it can be inferred that because response is a process that is carried out based on the ability to gather critical incident information on the nature and extent of threats and impact, the process in reality needs to be flexible to accommodate updates of information.

According to Dillon et al. (2009) emergency response as an EM phase is further divided into two main phases, namely; the 'emergency' phase also known as the 'golden hour' (the onset of an emergency, when critically injured persons still have a chance of survival) and the 'recovery' phase (p93). The 'emergency' phase is coordinated by the frontline emergency agencies and is the initial critical stage of any emergency which requires the mobilisation of information, capabilities and personnel to save lives and minimise immediate impacts of incidents. Response at this critical time entails the activities that address the short-term and direct effects of an incident (FEMA 2011). Some of these activities include the execution of emergency operation procedures and of incident mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavourable outcomes (FEMA 2011).

The 'emergency' response phase requires premeditated and immediate activities typically led by emergency services. The second phase of response is less spontaneous and is led by organisations designated to lead recovery from such an incident into the phase where services and basic amenities are being restored (McEntire and Myers 2004). While the durations of the critical stage and transition period to the second phase of response vary, they are often jointly agreed by all participating emergency organisations after the emergency phase (Dillon et al. 2009). By contrast, the recovery phase of EM response is more about investigation, remediation, consolidation and recovery, and is led by agencies other than the emergency services (Dillon et al. 2009, p93). Response begins when an emergency incident is imminent or immediately an event occurs (FEMA 2011, p4.11).

Edwards and Goodrich (2007) affirmed that a comprehensive model that involves an acceptable process of coordination between agencies and organisations is required to make response to emergency or disaster effective. However, this might be difficult to achieve if there are coordination gaps making it difficult to mobilise and utilise resources. Factors such as political pressures, societal norms and regulations, finance availability, bad execution of response design, lack of evaluation of performance and number of people impacted by incidents contribute to coordination gaps (Department of Homeland Security 2006). While some of these factors are often identified during incident debrief processes (Dillion et al. 2009), they are understudied within an academic context.

Over the years, incident debrief processes have been strategic in identifying e.g. unpredictable developments, limited information, uncertainties, high risks and impacts of risk, and urgency (to mention a few) as major challenges which can make response ineffective. It is however insufficient to merely identify challenges in the area of evolving threats and risk. It is critical to research the causes of these challenges. As acknowledged in researches and documented reports on response failures to 9/11 in 2001, Hurricane Katrina (2005) and UK summer floods (2007), coordination gaps and response challenges further confirm the issues that make response ineffective (Townsend 2006; Dynes 2003; Pitt Review 2008), thus, emphasising the motivation for this research.

1.3 Problem Statement and Research Rationale

The problems associated with responding to emergencies and/or disasters, irrespective of the location they occur in, indicate that there are fundamental issues with response arrangements that need to be examined, evaluated and researched. Hurricane Katrina is a typical example of how response can fail, some of the reasons being lack of preparation for response, mismanagement and lack of leadership (Brennan 2009). Preparedness activities might be insufficient at times for response to a devastating disaster. This was seen prior to landfall of the hurricane, where an exercise was conducted to test an emergency scenario of similar type (FEMA 2004; Fournier and Bridis 2005). In spite of this, the actual response to Hurricane Katrina when it occurred was the worst in the US history (Johnson 2006). The impact of the hurricane caused far-reaching economic, environmental, social and physical damage estimated at 108 billion (USD) including hundreds of deaths, electricity outage for almost three million people, and incomplete remediation in some coastal communities (Johnson 2006).

The example of Hurricane Katrina also shows that preparedness activities are generally insufficient, especially when not carried over to response or effectively utilised for response (Alexander 2005). Similar to the Hurricane Katrina event, most of these reasons were reported to have been also responsible for the poor response to the summer floods (which occurred in Gloucestershire, Worcestershire, and other places) in England in 2007. The impact of this major incident left an estimated 350,000 people without water for a fortnight, caused difficulty of travel and forced closure of water treatment plants (BBC 2007; Pitt review 2008). While this flood was neither prepared for nor anticipated, serious problems resulted from the manner in which the initial response phase was coordinated (Pitt review 2008).

During the ‘emergency’ phase of response to the summer floods in the UK, the capabilities of first responders i.e. police, fire, ambulance and local authorities, were insufficient, thus requiring the need to mobilise more support from the army and other organisations. This limited capability to cope with large-scale incidents, and the frequencies of such incidents, informs the second rationale for this research. The increase in frequency of incidents and the magnitude with which they occur has often overwhelmed the existing resources and manpower in the EM sector (Neef and Shaw 2013). While incidents continue to be a frequent feature in many developed and developing societies, recruitment and investment in EM is not increasing at a sufficient rate to cope with EM response demand (Mitchell and Wilkinson 2012). This is evident from the multiple occurrence of incidents simultaneously in different locations (e.g. UK Summer Floods) or incidents with widespread impacts exceeding the capacity of local response arrangement (e.g. NZ Canterbury earthquake sequence, 2010-11).

For instance, the insufficient capability of first responders to respond to the summer floods in the UK necessitated the activation of the military (Pitt Review 2008). While this was well-intended, it

unfortunately led to the command structure being isolated from response needs (McMaster and Baber 2008). This resulted in the combined multi-agency resources, expertise and communication being under-utilised, delayed and characterised by confusion (BBC 2007; Pitt Review 2008). The continued challenges of facilitating EM have motivated emergency managers to recruit volunteers for firefighting, and to work more regularly with collaborative non-profit organisations (Dodge and Mullarkey 2006) such as the Red Cross, St John etc. Although these efforts have helped to relieve the burden of response, there have been issues of funding, and of expecting reliable unpaid volunteers to mobilise regularly for response (Mitchell and Wilkinson 2012; Dodge and Mullarkey 2006).

The inadequate capability of EM response demonstrated by these examples, which emphasises the need to increase capability and effectiveness of response to incidents, is the second rationale for this research. Although routine exercises are conducted to simulate emergency response in order to prepare response agencies to be familiar with their operations, the response phase is yet to function at a level required for dealing with most disruptive events. For instance, the 2011 earthquake in Christchurch resulted in the loss of 185 lives and an estimated total net cost of 13.5 billion (New Zealand Dollars) to the Crown (PLRP 2011). While the initial response to the earthquake sequence was reported to be inadequate (Britt et al. 2012), the impacts of subsequent incidents in a community like Lyttelton have also threatened the ability of the community to sustain capabilities which can help them respond more effectively to future disasters (Everingham 2014).

Therefore, there is need to critically evaluate existing theoretical explanations for EM response processes and problems. In spite of the problems with the 'emergency' phase of EM response, recovery activities for some of the examples cited have been reported to be more effective, utilising the collaborative networks of existing support (Gloucester City Council 2009; McCreight 2011; Ozanne and Ozanne 2013). It has been observed that disaster-affected communities are able to mobilise and coordinate essential resources for their community during disasters. However, the roles of organisations and community groups (i.e. Walmart during Hurricane Katrina, community groups and faith-based organisations during Hurricane Sandy, Time Bank in Lyttelton during the Canterbury quake sequence) within disaster-affected communities are merely acknowledged (Bucci et al. 2013; Ozanne and Ozanne 2013). In reality, the roles and functions of community groups, organisations and other stakeholders can significantly improve the ability of communities to self-organise and mobilise basic resources and capabilities during response to disaster.

The increase in self-directed involvement of communities in EM, especially during the response phase, in the last decade has inspired a global trend towards exploring more holistic approaches to EM (Betts 2007). It appears likely that knowing that resources are available within the community, and knowing the roles a community can play during 'emergency' and 'recovery' phases of EM response, can help improve response to emergency and disaster. A better understanding of EM functions within the

community, and of what communities can offer during response, constitute valuable information for setting priorities in the response phase. The identified problems with EM response, and the hypothesis that EM response can be improved by integrating useful community functions with official EM response, form the rationale for my research.

This research uses the Christchurch earthquake experiences to identify essential functions which can be utilised for optimising EM response. This is because the immediate impacts of emergencies, coupled with the cascading effects of disasters as seen in Christchurch, have strongly emphasised the growing need for more effective and coordinated response to any critical incident. Although not all areas in Christchurch suffered the level of damage experienced in Lyttelton and the Central Business District (CBD), the need to increase capabilities within communities and the application of more coordinated response during critical incidents is obvious. Thus, this research *examines community involvement in the response phase as a contribution to managing the problems associated with EM*. It seeks to identify community capabilities that can be utilised for EM functions in Christchurch. However, the application of the Integrated Response (IR) framework developed as a result of this research will not be limited to Christchurch or New Zealand. It is intended be a framework which can be adapted for use in any country or community with similar community functions and characteristics to the ones identified in this research. Having said this, the successful application of these functions is based on the willingness of the emergency sector to integrate community functions with EM response arrangements.

1.4 Research Aim and Objectives

The aim of this research is to develop an Integrated Response framework that combines existing community functions with potential to perform EM response functions in order to improve response to future incidents. The following questions and objectives have been derived from the research problem, rationale and aim. Questions which arise in the course of this research are:

1. How does Emergency Response work?
2. What community functions are potentially useful for emergency response?
3. What are the barriers and/or challenges which can hinder integration of community functions with emergency response?
4. How can emergency management (in NZ and generally) be modified to use community functions to improve response?

These questions are answered by fulfilling the following objectives:

- To critically examine the theoretical bases and practice systems for emergency management and EM response

- To identify and evaluate functions within communities which can be utilised for emergency response (using Lyttelton and Riccarton as case studies)
- To assess the barriers to and benefits of integrating community functions with response
- To develop an integrated response framework for enhancing EM response

1.5 Case study and EM in New Zealand

To achieve the research aim, response arrangements in the Lyttelton and Riccarton communities in Christchurch are examined. Overviews of the two communities are provided in Chapter Three; section 3.3.1. The case studies are examined through the lens of generic characteristics possessed by any community, regardless of their size, ranks and categories of people, hierarchy, status, power and/or wealth. In the event of any disruptive event at any location where people inhabits, emergency services have legislated responsibility to save lives, prevent loss and escalation of the event regardless of social stratification, hence the rationale for examining the case studies from this perspective. Furthermore, it is acknowledged that more functions may exist in these communities than the ones explained in this thesis. Due to the research scope, the community functions that align with or fits specifically into the Incident Command System (ICS) which is the focus of this research have been investigated, identified and evaluated. Thus, goal of this present research is to identify the existing community functions which contributed to EM response to disruptive events in 2011, that are similar in operations to ICS functions.

Lyttelton is selected for this research due to its exposure to different risks and hazards, its remote location from central city facilities, and the impact of the 2011 earthquakes. Also, Lyttelton and Riccarton are chosen based on the major roles they played during response to the 2011 earthquakes in Christchurch. Riccarton suffered less impact from the 2011 earthquakes than Lyttelton and the Central Business District (CBD) of Christchurch, but a coordinated city-wide response was mobilised from Riccarton through the self-organising role of the Student Volunteer Army (SVA) at the University of Canterbury. Riccarton is also selected as a case study because it possesses similar characteristics to the CBD with many business activities and residential areas. These characteristics present Riccarton as a typical district of a modern city anywhere in the world which requires effective EM response. Thus, while Lyttelton represents a community that is geographically predisposed to the impact of disaster, Riccarton models a typical modern city, with different dynamics, yet able to mobilise community response to incidents.

1.5.1 EM in New Zealand

New Zealand is a country prone to a broad range of hazards such as earthquakes, tsunamis, volcanic eruptions, landslides, drought and flooding, among others. This means that many residential, industrial and business areas and infrastructure are located in areas which are prone to the effects of one or more hazards. The CDEM (Civil Defence and Emergency Management) Act 2002 establishes a framework for building a resilient New Zealand (CDEM 2006). While events since 2010 in Christchurch have had major impacts on life and livelihoods, the evolving approach to EM in New Zealand indicates that improving readiness and response to hazard is a major priority of the government (CDEM 2006). New Zealand organises its EM cycle using a "4Rs" approach, namely, Reduction (mitigation), Readiness (preparedness), Response and Recovery (CDEM Act 2002). Despite the slight difference in the use of terminology, the National Civil Defence Emergency Management Plan is roughly equivalent to FEMA's National Response Framework in the USA.

Although efforts are ongoing to increase public awareness about the level of risks in New Zealand, ensuring the continued interest of the public in emergency management is equally an ongoing challenge for emergency practitioners (CDEM 2009). According to the Colmar Brunton (2008) survey, getting a large percentage of New Zealand's population both to be aware of the hazards they face and to commit preparedness activities was emphasised as a long-term goal (CDEM 2009). This has since informed the different approaches to public engagement and the training of local/community volunteers in public education programmes (Becker et al. 2011). While this has served reasonably well to date in New Zealand, the benefits of public engagement for readiness activities are not replicated for the response phase. New Zealand has continuously reviewed and reformed its emergency management structures and frameworks to shift the focus from response to community risk management and creating resilient communities (Britton and Clark, 2000).

While reforms are common practices in New Zealand and their purpose are to strengthen emergency management action across different government levels (Britton and Clark, 2000), they need to include equal level or opportunity that enable both community and emergency services to access relevant information and participate effectively throughout the response process (Mitchell et al. 2010). However, such level is yet to be achieved during the response phase despite the joint working demonstrated by community and emergency services during planning and readiness phase of EM. Mitchell et al. (2010) emphasised that the planning process is important, but also acknowledged that people within the community change throughout the planning process and may not stay committed to EM process to response phrase. Although authors like Britton (2001) examined reforms that widen the focus of EM from task specific to more generic social functions which are often required during disruptive events. Amidst such perspectives, it is still important to acknowledge that the response phrase require dedicated skilled personnel, functions and resources to effectively deal with some types of events. Therefore, the

specialised requirements for response phase and the gap between readiness, response and recovery and ability to engage community throughout EM phases continue to hinder the goal of New Zealand becoming a more resilient country.

In order to achieve the goal of becoming a more resilient country, there are needs for communities to be better prepared for any emergency so that they can continue their existence as a community. As emergency practitioners in New Zealand seek to develop a robust and sustainable response capacity, WREMO (2012) emphasised the need to consolidate preparedness arrangements in communities prone to disasters. While this suggests the need for developing community capabilities for coping with disasters, the need for this research has also been reinforced by the displays of inadequate response and insufficiency of current arrangements to ensure effective EM response to recent emergencies globally. Hence, my problem statement is based on the need to have a more robust response system shown by the sequence of earthquakes and the consequential recurring flooding events in Christchurch. Therefore, the urgent need in New Zealand to improve response to critical incidents, coupled with the global need to increase the effectiveness of response, justifies my research. The problems experienced during response to past critical incidents also emphasise the importance of this research in advancing and consolidating other ongoing researches in emergency and disaster management.

1.6 Theoretical Framework

Emergency response is a complex process which involves several research areas related to designing effective coordination strategies, communication and capability management (Shen and Shaw 2004; Sikich 2001; Perry 2003; Moynihan 2009; Hewett et al. 2001). It has been established thus far that response processes follow a coordinated plan in which resources, procedure, responders and information flow are mobilised and utilised. This chapter has provided background information on emergency response, and the systems which govern it. It has also emphasised the problems associated with response to emergencies and disasters while explaining the context in which EM and response are used in this research. This chapter has argued that there is strong need for response to be improved, which can be done without negating the role ICS play in facilitating emergency response during critical incidents.

However, the persistent problems experienced during response to major incident and frequency of disasters as observed in recent years have emphasised the importance of examining normative theories of emergency and disaster interventions. Normative emergency/disaster theory concerns itself with the presumption that disaster impacts are influenced by specific external factors at given times and places. These external factors also result in temporary disruption of normal functioning of a community which, inevitably, influences the ability of a community to recover over a period of time to its pre-existing state or better state (Mendonca et al. 2001; Coppola 2007). Thus, normative theories in fields related to my

study area, and research into emergency and disaster management, are used as a theoretical framework for explaining difficulties experienced in the response phase. Normative theories also provide scope for developing in-depth explanations and understanding of emergency response.

Prior work has suggested that coordination within the response phase involves arranging sets of tasks, capabilities, information and procedures for the purpose of preventing an incident from escalating, and mitigating its impact in the community (Brennan 2009; Chen et al. 2008; Deal 2006: Dillon et al. 2009). Emergency response is largely influenced by complex task flows, information flows, personnel coordination and resource coordination which are distributed as required across jurisdictions or geographical locations (Fagel 2011). This means that situation awareness and decision making are crucial to ensuring that the interdependencies of resource sharing, role delegations, response etc. capture the dynamics between activities, functions and actors involved in response. However, there is limited literature which explains how the structures and processes of interdependencies in EM response are coordinated. This gap also emphasises the importance of my quest to examine principles and theories which best explain the concepts of coordination, "integration" and collaborative working as basis for EM.

This gap emphasises the need to evaluate prescriptive theories which concern themselves with systems and processes such as command and control, Integrated Emergency Management (IEM) and community-based approaches to emergency and disasters. Thus, normative and prescriptive theories form the theoretical framework for this research, upon which improved understanding of EM response will be developed. This better understanding aims to contribute to the field of emergency management and in the management of structured coordination in response i.e. ICS and Emergency Operation Centre (EOC) operation. The EM procedures and plans for ICS and EOC prescribe the on-site management, practice coordination and chain of command for EM response phases.

1.7 Thesis Structure

The next chapter, which is the literature review, critically examines theoretical bases and practice systems of response in emergency management. It also reviews relevant literature and theories which explain normative and prescriptive theories of EM. Understanding the capabilities and significance of community involvement in EM are also explored in this chapter while the characteristics of community functions useful for emergency response are examined.

Chapter Three then describes, discusses and justifies the methods and data collection strategies used in this research. Issues such as informed consent and ethical considerations are also discussed in line with how data is collected from the location of study. This chapter also reviews case studies of EM response in Riccarton and Lyttelton during and following the February 2011 Canterbury earthquake.

Chapter Four presents the research findings and all primary data pertaining to research questions and objectives. It also presents additional professional views, experiences and current issues pertaining to EM response provided by the research responders.

Chapter Five draws inferences from research results in chapter four and discusses the implications of the research findings. The results are used to evaluate the potential barriers and benefits of utilising community functions with EM response.

Chapter Six uses information and themes from research findings to develop an integrated EM response framework that can be adopted for response to emergencies. This chapter also discusses recommendations for implementing the framework as well as areas that might require further research.

Chapter Seven summarises the entire research, and outlines the problems encountered during the research process. It also briefly explains the objectives achieved and how they were achieved.

The thesis appendices provide detailed explanations of terms and concepts analysed in Chapters two to five. It also contains research information such as interview questions, ethics documents and other information that supports the entire research process.

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Chapter 2 – Literature Review
Emergency Management and Response Strategies

2.1 Introduction

The aims of this chapter are to critically examine relevant literature in the field of emergency management with a focus on EM response, in order to examine principles, concepts and theories relevant to EM response and to the research objectives. The chapter is divided into four main sections; the first section examines the definition and core concepts of EM, while subsequent sections focus on relevant theories and practices in EM response, response strategies, community engagement for EM response and justification for integrated response. The final section summarises the chapter, emphasising the main contributions to achieving the research objectives, identifying gaps and justifying the importance of integrating existing community functions with EM response arrangements.

2.2 Definition and Core Concepts of EM

Emergency management (EM) can be defined as the process of applying science, planning technology and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property or disrupt community life (Drabek 1991). The main emphases in this definition of EM are on *application, planning,* and *management* to deal with disruptive events. This infers the need to adopt and use a range of approaches, and combinations of approaches, in order to deal with events that constitute emergencies or disasters. This view of EM is also supported by EMA-Emergency Management Australia (1998) which defined EM as "a range of measures to manage situations involving exposure of community and the environment to danger" (p.39).

Definitions and explanations of EM in public safety and public administration focus mostly on approaches and the coordination and management of approaches needed for preventing or reducing the impacts of situations that expose communities and the environment to danger. For example, Alexander (2002), Waugh (2000), McEntire (2000) and Gordon (2002) all emphasise the need for coordination between emergency organisations so that consequences of risks and hazards can be better mitigated and their impacts prevented from escalating. Alexander (2002) and Waugh (2000) particularly stress the importance of early planning, and the application of coordination and communication for ensuring effective response to incidents. Effective response is used in this research to infer the coordination between emergency organisations to ensure that planning and response arrangements are sufficient for dealing with impacts of disruptive events and preventing their escalation.

While these proposals, recommendations and principles provided good early understanding of the intricate and essential elements of EM, subsequent events in the 2000s began to emphasise the importance of involving the community at risk as a major stakeholder in EM (Betts 2003). This is reflected in more recent explanations of EM which define EM as the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters (FEMA-EMI 2011). This definition reflects a more flexible and adaptable approach to EM in which the most appropriate framework can be developed using managerial functions (leading, organising, planning, and controlling) in EM. It also infers the inclusion of the community at risk in the EM process which Findley (2012) emphasised as one of the essential concepts that has driven the EM concept in recent times.

Jensen (2010) states that the core concepts of EM provide a basis for studying and understanding the phases of EM such as mitigation (reduction), response, preparedness (readiness), recovery and their perception by community, and communication and management by emergency organisations. The core concepts also informed the eight principles outlined by International Association of Emergency Managers (IAEM), which were agreed by a working group comprising EM academics and practitioners. According to IAEM (2007) and FEMA-EMI (2011), the principles of EM must be comprehensive, progressive, risk-driven, integrated, collaborative, coordinated, flexible and professional. Explanations of these principles, and their relevance and importance to EM practice are provided in appendix 1.

However, the observable impacts of extreme events and routine emergencies show that the practice of EM, especially the response phase, continues to experience major problems. Canton (2007) explained that practitioners and academics in emergency, hazard and disaster management are able to observe trends of events and then use these data to anticipate or predict occurrence of major events, a process which has contributed significantly to advancement in the field. However, this objective anticipation and planning might be limited without synergistic planning using both the "top down" and "bottom-up" approaches or models (Lewis 1988; Sylves 1991; Alexander 2005). "Top down" relates to a hierarchical system and process that originates from the highest level of operations and leadership to the basic or lowest level of the process (Lewis 1988; Sylves 1991). Contrasting with this is the 'bottom-up' approach where local actors or the basic unit participate in decision making, selection of strategy and priorities in EM process (Sylves 1991; Alexander 2005). The "bottom-up" approach to planning and response has been emphasised in recent years in order to make response to disasters more effective (McCreight 2011).

Therefore, integration of resources and efforts prior to any major event is important so that demands and response activities can be less overwhelming during the event (McCreight 2011). In addition, the synergy of resources and efforts of all stakeholders, as emphasised through the coordination, flexible, integrated and comprehensive principles of EM, is also key in ensuring that the local knowledge of

communities at risk can contribute to enhancing response (Dillon et al. 2009). This thesis draws from the integration principle as well as other principles of EM to utilise existing community resources, functions and efforts for the purpose of improving EM response. The principles of EM developed in recent years emphasise the importance of community engagement in ensuring that the practice of EM effectively protects the community at risk and ensures public safety (Becker et al. 2011; IAEM 2007). However, this position seems to contradict earlier accounts of EM which presented a community as; victims of disaster who panic, prone to be self-centred, shocked into passivity, leading to breakdown of social order, unable to care for themselves and others and severely traumatized (Berke and Conroy 2000; Lewis 1988).

While advances in EM such as emphasised by Becker et al. (2011) also correspond with the bases of the eight principles of EM, countries often have to prioritise principles which are peculiar to their own hazard scenarios, complexity of emergencies, structure of response and political tools and governance (Handmer and Dovers 2007). For instance, EM in the United Kingdom (UK) is approached as Integrated Emergency Management (IEM), through which six essential activities (anticipation, assessment, prevention, preparation, response and recovery) are carried out (Cabinet Office 2010). In EM in Australia and New Zealand; Reduction, Readiness, Response and Recovery (4Rs) aim to be both 'comprehensive' and 'integrated' prioritising the comprehensive and integrated principles due to their exposure to a wide range of natural and other hazards (EMA 2004).

Furthermore, McEntire (2004a) proposed that theories such as systems or chaos theories, should be examined and their usefulness in dealing with complex EM issues should be acknowledged. Authors such as Drabek (2004), McEntire (2004), Alexander (2002), Waugh and Tierney (2007) examined theories and practice systems with reference to the underpinning concepts and principles of EM. For instance, Drabek (2004) differentiated between theories which can help emergency managers in their professional practice of EM and general theories of disaster/emergency/hazard management and responses. His perspective is utilised in this research because it combines normative and prescriptive overviews of EM. The approach of Drabek (2004) will also be examined and analysed against the position taken by McEntire (2004) who examined the bases of EM as "causal relationships" between the components of EM principles. The arguments presented by Drabek (2004) and McEntire (2004) will be critiqued using other theories relevant to EM in order to identify and better understand gaps in EM response. The next section examines and critically analyses the theories relevant to emergency response.

2.3 Theories Relevant to Emergency Response

EM response is a very practice-oriented field. From a practice perspective, EMA (1998) defined EM response as the "actions taken in readiness for, during, and immediately after an emergency to ensure

that its impacts are minimised, and that people affected are given immediate relief and support" (p.94), to ensure that the impacts of emergencies are minimised (EMA 1998). The New Zealand Ministry of Civil Defence and Emergency Management (MCDEM 2014) defined response as the actions taken immediately before, during or directly after a civil defence emergency to save lives and protect property, and to help communities recover. While all these definitions are practice-focused, an academic definition of response explains it as the attempt and involvement of various organisations in attempts to reduce the negative consequences of a sudden perturbation in a society in which life, property, social values, and the environment are threatened (Uhr et al. 2008). The components of both practice and academic definitions of response suggest that EM response entails the specific sets of activities and actions listed in table 2.1.

EM Phase	Required activities, actions and functions
Response	Plan implementation, Emergency declarations, Warning messages, Public information, Registration and tracing, inform higher authorities, activate coordination centres, Evacuation, Mobilise resources, Damage assessment, Search and rescue, provide medical support, Institute public health measures, Provide immediate relief

Table 2.1 Activities, functions and actions for EM response

(Adapted from Haddow et al. 2008; Dillon 2009)

Table 2.1 suggests that EM response is made up of activities that involve affected populations, different stakeholders at different levels and various types of resources. Thus, McEntire (2004) and Drabek (2004) warned against using empirical deductions made out of context, or references that lack connection with EM operations or activities that relate to resource mobilisation, people management and understanding of procedures. Thus, theories examined in this section are selected based on their relevance and relationship to activities, actions, functions and responsibility that improves response.

Drabek (2004) states that theoretical bases for EM can be examined using classes of theories like **normative theories, broad perspectives, micro theories and embryonic theories,** which focused on practitioners and their responsibilities for response. However, McEntire (2004) examined the bases of EM response using theories such as **system theory, management theory, chaos theory and decision theory** to explain coordination and management of resources, people and functions. These eight theories will be used as foci for analysing EM response as well as for identifying gaps that exist in response**.**

2.3.1 Normative Theories

Normative theories are "theories which are considered relevant and useful to principles of EM, which emergency managers can apply to ensure effective EM" (Drabek 2004 p.2). Drabek (2004) explained

that emergency managers tend to use frameworks which have been designed based on specific actions needed in an emergency. Theory refers to a fusion of concept and frameworks which are understood and that guide the actions carried out by emergency managers within comprehensive emergency management (McEntire 2003).

Normative theories emphasise the application of preparedness concepts for response, which involves a variety of efforts by emergency managers and the development of operational plans of action for dealing with emergency situations (Lindell et al. 2007). This indicates the relevance of normative concepts to EM as a set of theories that can influence decision-making processes, plan development and planning processes that translate into actions which increase the effectiveness of response to an emergency (Weick and Sutcliffe 2001). Normative theory may be applied to components of comprehensive emergency management, management of EM phases, use of legislative and guidance documents, and tactical and operational management tools such as the Incident Command System (ICS) (Drabek 2004).

ICS is an established management tool that is used to facilitate leadership, coordination and information flow between individuals and organisations involved in rescue and relief operations in an emergency (Rimstad et al. 2014). The ICS management tool provides important theoretical foundations or rationale for the actions of emergency managers and stakeholders when responding to emergencies regardless of complexity and scale. However, the level of uncertainty that surrounds many disasters and emergencies can make responders and people susceptible to injury, disruption, death and other adverse effects of disasters (Perrow 2011). These can influence the level of preparedness, training and technical processes for response, but also make it easy to blame disaster impacts and adverse effects for ineffectiveness of response.

However, McEntire (2004) argued that it is lack of information during events that makes response more complex, rather than just the impacts, thus stressing the importance of using decision-making theory and models during EM response. Other factors which can make response more challenging are risk perception, political factors, policies, availability of resources and structure of governance to mention a few (Pine 2007). Regardless of the limitations of these theories, they are still vital in understanding the normative aspect of EM response. Thus, this research aims to use the explanations from these theories to justify the relevance of community functions and their ability to contribute to improving response.

2.3.2 Broad Perspectives

The broad theoretical perspectives discussed by Drabek (2004) drew inspiration from the social sciences, and reflect substantive theory formulated to explain and predict human interaction and behaviour during disruptive or threatening events. For instance, *social constructionism* has been used

to interpret how people act in response to or understand earthquake threats (Stallings 1995) and terrorist threats (Jenkins 2003). Social constructionism relates to how people perceive and rationalise their experience in the world and the purpose and function of such understanding of the world (Young and Collin 2004). The interpretation people ascribe to their experiences of threat or disruption can be understood from the way they *communicate* them to others and subsequently used to inform response arrangements to similar experiences (McEntire 2007b). This theory and others in the social sciences have been used by e.g. Green and Kolesar (2000), Phillips (2005), Handmer and Dovers (2007), Walker et al. (2006) to interpret and explain patterns of community response to disaster events.

Thus, communication models or theories form a key aspect of broad theoretical perspectives given that perceptions of reality are often communicated to other people especially when they relate to response to disruptive events. Broad theoretical perspectives have also been demonstrated through the application of *symbolic interactionism* to interpret public perceptions of disaster (Quarantelli 1960), *structural–functional theory* to interpret community responses to disaster events (Dynes 1970), and *emergent norm theory* to explain the rationale for the 1993 terrorist bombing of the World Trade Centre in New York (Aguirre et al. 1998). Although many of these theories focus on interpretation, and community perceptions of disasters, they do not explain integration of EM concepts for enhancing response. In spite of Denis' (1997) explanation of response by emergency response agencies using organisational theory, it can be inferred that the broad theoretical perspectives in EM response tend to be mono-perspective and need to be further explained using other concepts or theories. For example, organisational theory can be described as a fusion of approaches used to analyse organisations and their operations (Daft and Armstrong 2009).

According to Perrow (1991) organisational theory is made up of different theories, themes, methods and diverse explanation modes, for examining and interpreting practice, management styles, actions, disagreement, organisational culture etc. that occur in an organisation. Although broad theoretical perspectives to explain EM response are important in understanding organisations and the proneness of a community to disruptive events, organisational theory - like other broad perspective theories does not provide explanations that link patterns of community response with the operations of emergency services. Nevertheless, broad theoretical perspective may be used to explain actual problems during the response phase and in EM practice as a whole (Pine 2007; McEntire, 2007b), since they allow the use of different theoretical dimension for explaining concepts of EM practice and response.

2.3.3 Micro Theories

Micro theories are theories that help to provide better understanding and prediction of human or societal behaviour with respect to impacts of disruptive events (Drabek, 2004). Responses to emergencies or disasters have also been explained by adopting micro theories. Unlike broad theoretical perspectives of

EM response which have several embedded theories, micro theories are selected based on their relative abilities to explain societal reaction to the risks that disruptive events present. For example, communication theory is used to explain risk communication, communication of response arrangements and management of communication within communities, which varies from community to community (Rottman, 2000).

Similarly, Lindell and Perry (2004) emphasised that environmental risks need to be communicated in consideration of social factors that exist in a community, e.g. a multi-ethnic community. Drabek (2000), Sorensen (2001) and Dow and Cutter (1998) further emphasise that social factors potentially affect how people respond to disaster warnings. These authors used case studies of responses to floods, hurricanes and other types of disasters to demonstrate the role social factors play in determining risk perception and response pattern. The explanations from micro theories based on 'cause and effect' relationships, suggest that understanding societal behaviour, resources and possible response patterns to disruptive events can be crucial in identifying community functions which can be adopted for EM response.

Thus, micro theories which explain risk perceptions can draw on communication theory to emphasise impacts of disasters and how they are communicated to mitigate possible impacts, rather than emphasising the likelihood or probability of disaster occurrence. As explained by Perrow (2011), extreme events such as disasters or complex emergencies have the potential to cause social, environmental, economic, political and organisational problems whenever they happen. In the explanation by Perrow risk perception, communication or management are not considered in terms of the likelihood or probability of disaster occurrence, but rather in terms of the certainty of its impact whether it occurs tomorrow or after 1,000 years.

Micro theories in this sense explain risk perception and management from a presently relatively unconventional perspective suggesting that impacts of risks ought to be managed and communicated to community with special consideration of risk perception and social factors. While this analysis has the potential to influence the implementation of response activities, it is equally important to understand how micro theories can be used to improve response communication.

2.3.4 Embryonic Theory

Drabek (2004) explained that the "... investigation of disaster case studies have since resulted in the formation of various preliminary models of disaster response" (p.104) called *embryonic theories*. Embryonic theory can be defined as a framework which has been conceptualised using elements of systems derived from an actual emergency or from disaster response scenarios (Drabek 2004). Usually embryonic theory can draw its context from comparative analyses of disaster case studies by identifying useful and/or developing theoretical bases for practices observed in EM and response (McEntire 2007b).

An embryonic framework can be developed to consist of interrelated pre- and post-disaster concepts, which leads to the prediction of impacts, preparedness elements and structural outcomes for EM response (Kreps et al. 1994; Drabek 2004). Drabek (2003) justified his model for effective disaster response by calling it an embryonic framework which had been conceptualised using a range of theories (p.147 -152). The robust explanations which embryonic theory can offer have also influenced one of the objectives of the present research to develop an integrated response framework for enhancing EM response.

Drabek (2004) emphasised that embryonic frameworks are not EM theories, but rather frameworks that provide a useful starting point for creating theory which can be expanded to reflect an approach to improving a specific phase or all phases of EM, or to obtain the desired outcome of a comprehensive principle of EM. While the embryonic model developed by Drabek (2003 p.149) focused on all the phases of EM in the context of natural disasters and terrorist attacks, the present research aims to use the idea of embryonic theory to develop a framework which focuses on the response phase by applying the concept of an integrated principle of EM. The intention is to do this by applying relevant theories which have been evaluated herein, EM response functions, and identified existing community functions identified, to improve and optimise EM response.

2.3.5 Systems and Management Theory

Systems theory can be used for describing and explaining the integrative levels of elements within a system, the interplay between systems and their elements in determining their respective functions (Leydesdorff 2001). Systems theories have significant effect on understanding and management of organisations. Like the science of management within an organisation, a system theory refers to a collection of parts which are unified to accomplish an overall goal (Osborne 2000). Management theory is defined as the careful specification and measurement of all organisational tasks; tasks standardized and organised based on division of hierarchies and defining of lines of authority and control (Mele et al. 2010). The understanding of systems and management theory is therefore considered relevant to EM response procedures, which require good interplay of elements and activities as well as the implementation of activities through standardised hierarchies of authority. For instance, standard operating procedures (SOP) are official documents which describe specific actions, policies and decisions to be executed by emergency responders (Waugh and Tierney 2007).

Traditional response arrangements are routine operational processes for dealing with incidents (McEntire 2007). SOP are in place to address and ensure that the types of equipment required for emergencies, the actions assigned to each response unit, the training needs and the preparedness levels are adequate for actual events (Moore and Lakha 2006). This means that SOP address daily operational procedures which are subsequently adopted for routine incidents (Weick 1993), while additional

documents such as emergency response plans guide the actions of responders during response to emergencies (Alexander 2002). Thus, traditional response arrangements and SOP are often effective enough to mitigate the impact of most routine emergency situations (Mendonca and Wallace 2007; Schneider 1992; Turner 1995). Routine emergencies may also be referred to as incidents that require response of one or two emergency services (Dillon et al. 2009). However, procedures or arrangements for routine emergencies might be insufficient to deal with the large-scale emergencies or disruptive events as more resources, coordination and communication are involved (Kapucu 2006).

The relevance of management skills and theory in EM response have been emphasised by Hamra et al. (2012). According to them, the interrelationships, and coordination required for plans, improvisation of arrangements, resources, people and equipment require good management and application of management theory. The coordination of all these elements, functions and interrelationships have also been explained using *systems theory* (McEntire 2004). Systems theory and management theory are relevant to EM response because of the complex interrelated impacts of disruptive events and interactions between the built, natural, social, political, economic and environmental factors (McEntire 2004). McEntire (2004) did not develop systems theory, he merely borrowed from the unified perspective that systems theory (e.g. Checkland 1981; Gharajedaghi 1985; Flood and Jackson 1991; Heines 2000; Gharajedaghi 2006 and Cilliers 2007) can provide for understanding the interrelated and interdependent parts of EM processes and response activities. Systems theory has been applied to a vast range of areas, disciplines and factors, which means that the position taken by McEntire (2004) is not peculiar, but is similar to the broad theoretical perspectives recommended by Drabek (2004).

However, the difference in McEntire's argument lies in the coordination of interrelationships, which can also be adopted for explaining systems within EM process and for managing the response phase. The integrative levels are not new, as the idea is widely employed in comparative psychology, biology and environmental science but more common in explaining the activity theory of adaptation in the environment and development of human culture (Hjørland 2002). In relation to adaptation, system theory is used in the context of how components of biological, social, technological or material systems cooperate to achieve a common purpose (Gilad and Kanfer 2006). Within a societal context, system theory is useful in explaining activities in society, in critical public spheres and in complex and institutional processes especially in reference to disruptive events (Ryan and Bohman 1998; Leydesdorff 2001). For example, system theory can be used to explain the relationship between the location and construction of a building in a community and the cultural preferences, risk perception, urbanisation or policy enforcement which influenced the building structures (Stallings 1995; Quarantelli 1995).

Understanding the interaction of various elements within a community and their relevance to dealing with disruptive events can potentially influence response to a disaster (McEntire 2004). Furthermore,

the level of stakeholders' understanding of their environment is key to ensuring effective application of EM principles (IAEM 2007). Level of understanding is also significant for and influences response arrangements, concepts of EM, and the coordination and management of organisations that contribute to response (Kapucu 2006). This understanding is also true for incident situation awareness and in all the organisations that contribute to EM response.

Thus, the application of systems theory and management theory based on informed situation awareness emphasises its relevance and connection to EM response (Leydesdorff 2001). As explained by McEntire (2004), understanding the diverse interactions that take place when trying to respond to and mitigate the impacts of disasters is crucial. However, Comfort and Haase (2006) and Kapucu (2006) emphasised that certain issues like communications and information management (Comfort et al. 2004) are factors which often hinder EM response, but which could be addressed in the pre-disaster period. The argument presented here supports the relevance of management theories and concepts prior to and during EM response.

However, the purpose of the present research is not to state the preference of system theory over management theory, but to draw concepts and contributions from both to better understand EM response. For example, the holistic approach and concepts of system theory can be adopted to understand phenomena such as EM response (Hamra et al. 2012). Similarly, management theory can be key in understanding how elements and functions within a community interact with each other. However, management concepts which focus on how structures, processes and resources are coordinated, controlled and utilised to achieve a goal or objectives (Rimstad et al. 2014) are also necessary for EM response. The complementary contributions of these two theories demonstrate that while it is important to understand elements within a system and how they interact, it is equally important to be able to coordinate them in the most effective manner in order to achieve results.

McEntire (2004) argued that systems theory plays a significant role in understanding EM processes, but that some problems caused by disasters can be better dealt with by using management theory. Pine (2007) states that management theory is relevant and useful for effective planning so that EM goals can be achieved. However, McEntire (2004) argued that it is the application of management concepts that ensures that impacts of disasters or emergencies are mitigated. Planning in itself can be ineffective when not based on cooperation between emergency agencies, stakeholders and community at risk (Hamra et al. 2012). Pine (2007) stressed the role that elements of management play in ensuring effective leadership, planning, situation awareness and goal setting, and in coordinating programs that help emergency managers to take steps which may enhance preparedness and response in their jurisdiction.

This brief analysis of systems theory and management theory suggests that the ability to manage EM components and processes is assisted by understanding elements such as interactions of parts,

organisational tasks, and standardised and organised hierarchies that interact within societal context (McEntire 2004). Hence understanding of how these elements interact needs to be present before, during and after extreme events, while the ability to effectively coordinate the necessary EM components is very important for ensuring effective EM response. However, this is not always easy during response because response is characterised by constantly changing and urgent demands and tasks which require collaboration between all emergency response agencies (Rimstad et al. 2014). Thus, communication within and across agencies is as important as communication with the community (Comfort and Kapucu 2006). The impacts of disasters in recent years have shown that there is always a limit to meeting the ever-changing and overwhelming demands that emergency response agencies experience during major incidents, thus emphasising the relevance of community support and resources as proposed by this research.

2.3.6 Chaos and Complexity Theories

Chaos theory is a mathematical approach for studying and predicting future behaviours of dynamic systems that are sensitive to their initial conditions (Basener 2006). Although chaos theory is essentially mathematical and only applicable to deterministic systems (i.e. systems whose behaviour can be described mathematically; Kellert 1993), it has been applied in several disciplines such as biology, economics, sociology, and philosophy, to explain tensions that arise from relationships that exist in many natural, social and organisational systems (Werndl 2009). Emergencies or disasters are complex events that involve, among many other things, security and public safety issues, communication, information and public affairs, hazard and risk modelling, mapping, legal affairs and coordination among several organisations. The necessity of management theory as essential for achieving the level of coordination required to effectively manage any form of emergency or disaster was established in the previous section. However, emergency management (especially the response phase) often involves many local, regional, national, private, non-profit and community, groups or organisations that interact in interdependent ways (Pine 2007). The confusion and multiple factors that response presents indicate the relevance of *complex system theory*.

Factors such as national security, business and international affairs can interact and influence one another during a disaster or aggravate the impact of disasters when response arrangements are insufficient (Webb 2004). The types of relationship and process peculiar to EM response coordination have been explained through *complex adaptive systems theory*. Understandings of relationships in EM are important because they can be used to provide better understanding of the complex mechanism of the multi-agency response (i.e. response which involves many agencies and organisations). This also stresses the need to effectively coordinate the relationships for the purpose of EM response. In this sense, the relevance of complex adaptive system theory refers to the application of its concepts which emphasises the importance of being aware of the initial conditions and the development of capacity

required to cope with, respond to and recover from the impacts of disruptive events (Manyena et al. 2011).

According to Basener (2006) minor disruption resulting from a perturbation can have an impact that leads to significant change in relationships. This concept stresses the need to better understand the nature and types of relationships that exist in communities affected by an emergency or disaster. Other concepts of complex adaptive systems also emphasise the value of adopting tools which can help to interpret or understand relationships between people, nonlinear structures, and internal and external forces (Elaydi 1999). This stress the relevance of studying relationships within complex systems in order to identify system factors which can be used to minimise future uncertainty (Werndl 2009).

However, although the relationships within complex systems may vary from one system (community) to another, the application of complex adaptive systems theory concepts to EM response suggests the relevance of community and stakeholder engagement prior to responding to emergencies or disasters. Such engagement is important for better understanding of the complex dynamic and the adaptive systems in communities at risk of and responding to disruptive events. Although pre-planned procedures have involved communities in some capacities (Mendonca and Wallace 2004), there has been limited involvement of communities during EM response. This suggests that EM response can also benefit from community engagement as for pre-planned procedures and for disaster risk reduction strategies (Mendonca and Wallace 2007). While community involvement is evidently important, response has been described by Webb (2004) as a situation with 'ambiguity and confusion' between responders and their goals (p.47) that can complicate community involvement. It however implies that relationships within communities and the nature of relationships required for emergency services ought to be better understood to facilitate decision making.

2.3.7 Decision Theory

Decision theory comprises the rational concepts of decision-making that are based on intelligence, design, choice and review (Turpin and Marais 2004). Due to the stressful and time-pressured conditions of disruptive events, rational decision models can be ineffective during the response phase of EM (Boin et al. 2005). The challenges and demands experienced during this period have inspired the use of different *decision-making models* for implementing plans and coordinating resources for effective response (Klein 2008). For instance, Markov Decision Process (MDP) models have been considered applicable to the emergency management context because of their characteristics of helping to focus on the goal of response (Yu et al. 2014).

MDP model provides a mathematical framework influenced by situations and outcomes which are either random or controlled that informs incident decision making (Meyn 2007). This decision-making process is useful for studying a range of optimisation problems (Guo and Hernández-Lerma 2009).

During EM response, the characteristics of the MDP model are based on different but related real time decision making; such as achieving the goal of response and managing the evolving state of the event and the actions of participating agencies (Yu et al. 2014). The goal of response is to prevent the event from escalating, and to mitigate the impacts on people, properties, environment and other societal components (Boin et al. 2005).

However, MDP models have been observed to be too quantitative and computer-driven to be effective in all disaster scenarios (Boin et al. 2005), because disasters often occur within complex social settings and scenarios which evolve without necessarily corresponding to probabilistic factors (Perry and Quarantelli 2005). This limitation of MDP, and of similar decision models like it, led to consideration of *Naturalistic Decision Making* (NDM) and *Recognition-Primed Decision* (RPD) models in EM response, which fit more into the wider community context of how people make decisions in stressful real-world settings (Klein 2008). NDM is based on the concept of human decision making which operates from an independent approach domain and is widely used by armed forces (Molino 2006).

RPD models are based on how people use their experience in the form of a repertoire of behaviour patterns (Klein et al. 1986). Klein (2008) further explained that RPD is a blend of intuition and analysis based on the ability of people to make decisions without comparing options, but by matching the situation at hand with the patterns of scenarios which they have learned from. This description justifies the use of such models in response. For example, the RPD model is widely used by the fire, search and rescue services because the nature of their operations requires urgency and rapid response, but also careful consideration of how best people can be saved and supported during an incident (Molino 2006).

Crandall et al. (2006) suggest that NDM has been greatly influenced by RPD models, showing that military planning guidance uses RPD models as the strategy for reducing planning time without sacrificing plan quality. The RPD model illustrated in Figure 2.1 shows the influence that situation awareness has in the decision-making process (Klein 2008), which potentially helps to determine the required collaboration, coordination, communication and organised actions for decreasing or eliminating the impact of disruptive events.

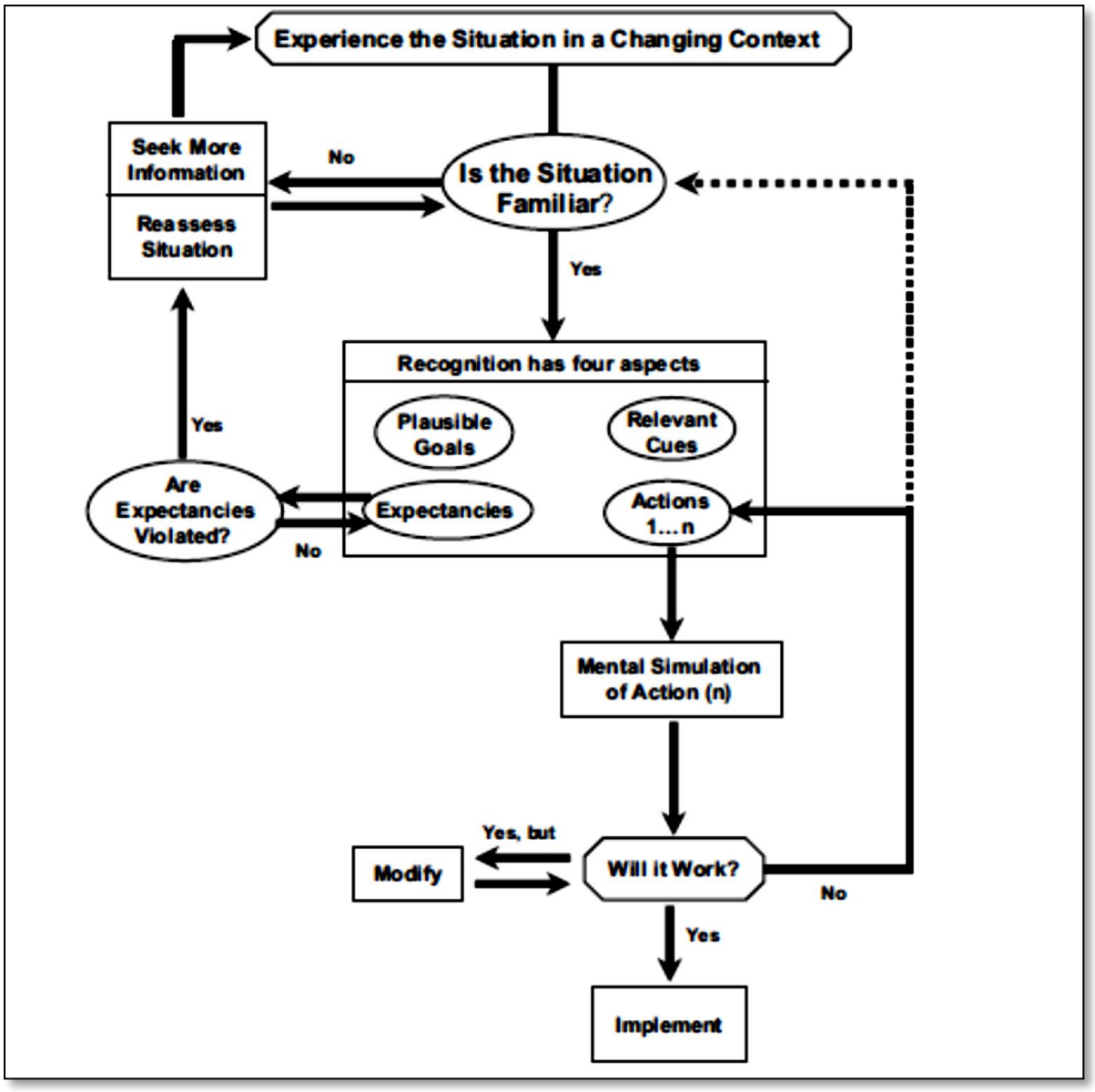

Figure 2.1. Model of recognition-primed decision making (PRD) (Klein et al. 1993)

Figure 2.1 shows that any situation needs to be assessed to determine whether it is familiar or not. This assessment determines the next step which is either to seek more information or to proceed if four aspects (plausible goals, relevant cues, actions and expectancies) can be identified. According to Klein (2008) and as observed in the RPD model diagram, there are other factors like actions, expectancies, cues, goals, information, situation awareness etc. which must be considered in order to decide and implement actions during response. Furthermore, the RPD models have important questions such as; 'will it work?' as critical determining factors in deciding whether actions will be implemented, discarded or modified. Such determining factors portray the RPD model as suitable for allowing certain

levels of improvisation without sacrificing the quality of planning, operational procedures or EM response arrangements. According to Turner (1995), improvisation "provides responders with the 'ability to react to the unexpected, by creating new meanings' during response" (p.463).

Although some argue that improvisation is used in EM and by responders to maintain the principle of flexibility (Kreps 1991; Mendonca 2007), Kendra and Wachtendorf (2006) emphasised that response improvisation is a "significant feature of every disaster" (p. 1). While the former focuses on the EM and responders, the latter focuses on the incident; but both indirectly infer that improvisation is critical to the effectiveness of RPD. As argued by Akgün et al. (2006), improvisation to improve EM response entails "simultaneous planning and implementation of an action" (p. 212). This suggests that planning decisions are interrelated to cognitive activities and response actions as well as coordination of response actions and people (Comfort et al. 2004b). It also suggests that the processes of setting the actions in motion to both mitigate the impact of disruptive events, and to ensure that people affected are provided with appropriate support, are interrelated (Drabek 1985; Comfort and Kapucu 2006).

However, Findley (2012) emphasised that the term "simultaneous" suggests that little time elapses between the planning and action components of improvisation. The limited timeframe emphasised by Findley (2012) demonstrates the need to identify and understand prior to disruptive events the functions, stakeholders, resources and mechanisms which exist within a system, for the purpose of improving response. It also highlights the importance of the present research aim to identify existing functions within communities, in addition to emphasising the relevance of systems theory in understanding the potential interactions between stakeholders, functions, resources and mechanisms. Therefore, the importance of examining the societal context in which all these factors or elements operate amidst the overwhelming confusion that disasters create cannot be overemphasised, both in the present research and in providing theoretical bases for EM practice systems.

It is also important to examine the overlapping and interrelated relationships between community functions, resources, stakeholders etc. which can facilitate the RPD decision process and improvisation, so that EM response can be improved. Subsequent sections in this chapter will carefully examine the level of collaboration which can help mitigate the challenges experienced in EM response, and the potential barriers to integrating functions from communities which can contribute to response arrangements and decision processes in the RPD model.

This section has established that EM response can be explained using normative theories, which justifies the application of basic EM principles and why emergency managers are obliged to use such principles. The explanation using the normative theory provides background for broad perspectives that draw from theories and concept in social sciences, and micro theories to predict patterns of response to disruptive events. Other theories include embryonic theories which are frameworks developed by using essential

elements of different theories for the purpose of ensuring effective response, thus emphasising the relevance of system theory, management theory and concepts, complex systems theory and mode of decision making. The objective process of identifying expectations during response makes decision making models like RPD more relevant to this research area. Elements such as recognition and expectancies make the RPD model relevant for analysing existing functions in communities which can be integrated for improving EM response.

2.4 Response Strategy and Management

In theory and practice, the principles that govern EM are similar. Whether mitigation, preparedness, response and recovery (IAEM 2007) are referred to as PPRR - prevention, preparedness, response and recovery (EMA 2004) or 4Rs - reduction, readiness, response and recovery (CDEM Act 2002), the requirements for each phase are similar. Recovery may also mean rehabilitation, reconstruction, renewal, restoration to adaption and resilience building (Coetzee and Van Niekerk 2012; Comfort and Kapucu 2006). However, it can be observed that the term used for the response phase is consistent in many countries with response arrangements to incidents. Although this might be due to the convenience of the word 'response' itself, it shows the strategic importance of the phase to both pre-event activities and arrangement and post event programs and activities. EM response can thus be explained as the sets of skills, expertise and organised actions undertaken to decrease or eliminate the impact of disruptive events which are occurring or have occurred to as to prevent further sufferings and loss (Brito 2012; Comfort et al. 2004).

Response may also be defined as the actions taken in anticipation of, during and immediately after an emergency to ensure that its effects are minimised, and that people affected are given immediate relief and support (NDO 1990). In many instances, response is relatively short as compared to the other phases of EM (Cabinet Office 2005). EM response can last for hours for some incidents, while it can also last for days during others, depending on the complexity, scale and potential impact of the emergency or incidents (Alexander 1993; Bigley and Roberts 2001). Regardless of the duration of EM response, it is the implementation of rapid response influenced by collaboration, coordination and communication of resources, people and arrangements that is vital (Cabinet Office 2005). This indicates that response encompasses the efforts to deal with both the direct effects of the emergency (such as rescuing people, firefighting etc.) and the indirect effects (such as disruption to safety, security etc.) of the emergency (Auf der Heide 1989; Comfort et al. 2004b).

According to Dillon et al. (2009), the arrangements for response depending on the scale could be single agency for incidents and multi-agency response for large scale or major emergencies. Multi-agency response requires the collaboration between 'core responders' such as police forces, fire, search and

rescue, ambulance services, local/regional/national authorities, military etc. and the involvement of 'cooperation bodies' or 'supporting responders' such as utility organisations, NGOs, community groups, and any appropriate agencies for the emergency being responded to (Dillon et al. 2009; Drabek 2003; Cabinet Office 2005; Findley 2012). Multi-agency responses require collaboration within a network of agencies (organisations) using a centralised, militaristic framework based on stipulated hierarchies; C2 (Kapucu 2006b; Patton and Swope 2005).

C2 is simply a management style for EM response (Kapucu 2006), drawing from the management component of EM. The management style of C2, despite its military origin, attempts to balance autocratic and democratic management styles (Tannebaum and Schmidt 1973). Perhaps because of this dichotomy, C2 continues to cause confusion especially during decision making for EM response (Molino 2006), making it in practice an arguably limited concept for response (Salmon et al. 2011). Another criticism of C2 is that it establishes the conditions under which execution takes place, but with limited consideration of the overlapping interests of the people affected during the incident (Schneider 1992). This criticism suggests the need to re-examine the strategy of "what", the tactics of the "how" and the implementation and operation of the "doing" of coordination, communication and collaboration in response (Mendonca and Wallace 2004; Mendonca 2007; Reddick 2011). It also suggests that the use of C2 as an essential "dominant model" (Dynes 1994) during EM response can also be problematic without understanding its application in integrative layers (Meadows 2008). For example, Figure 2.2 illustrates the integrative layers and relationships necessary for execution of operation during response.

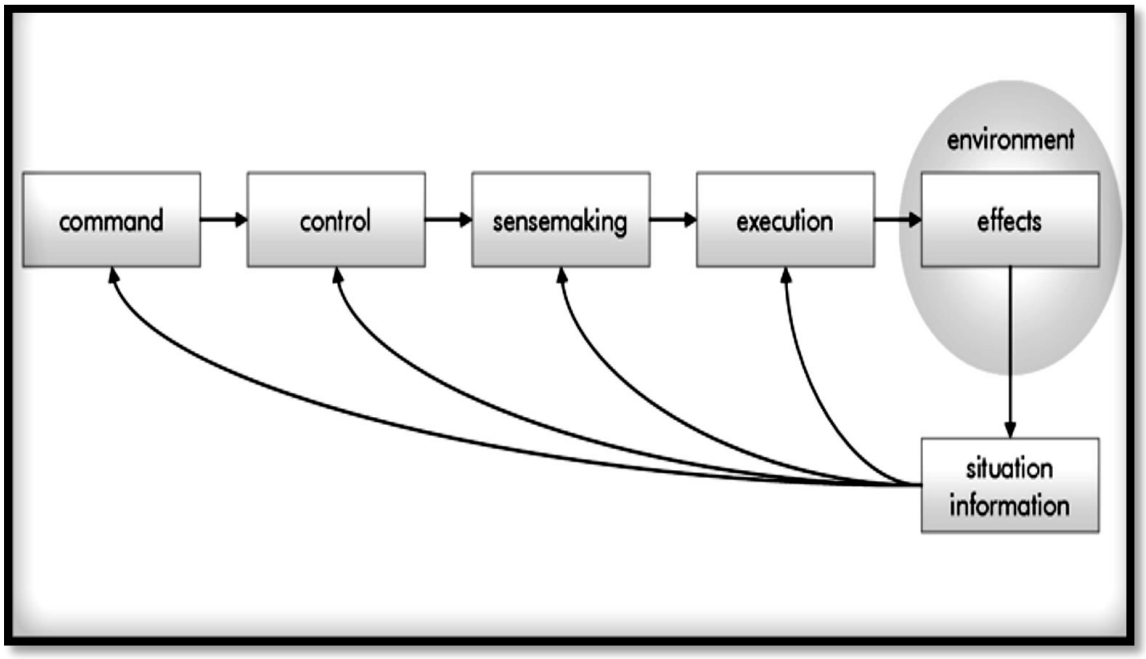

Figure 2.2 Conceptual process Model of C2 (Alberts and Hayes 2006 p.68)

Figure 2.2 shows the serial one-way process between command, control, sensemaking and execution of response within the affected environment i.e. the community. This process shows that there is no direct feedback received from the community except to identify situation information and awareness of the effects of the disruptive event (Alberts and Hayes 2006). While situation information informs command, control, sensemaking and execution independently, it also indicates how problems might arise from breakdown in communication. The lack of interchange of information between these elements and action during EM response, also indicates the complete lack of community involvement or participation in EM response.

However, C2 has hitherto been rigidly adopted as a "traditional model' or structure for EM response (McEntire 2007), but should rather be applied as a framework that enable improvisation in reaction to disruptive events when they occur (Mendonca and Wallace 2007). While opinions may vary on the views of Mendonca and Wallace, it can be inferred from the definitions and explanations of EM response provided in this research that a framework that will enable response functions will incorporate;

> collaboration, coordination and communication of skills, expertise, resources and organised actions carried out by core responders and supporting responders to eliminate or decrease the impact of disruptive events, in order to prevent further sufferings and loss, and to ensure that people affected are given immediate relief and support (Alberts and Hayes 2006; Kendra and Wachtendorf 2006; Findley 2012).

For example, Figure 2.3 shows the areas where C2 can be flexible in order to allocate certain EM functions. It shows that decision rights can be allocated based on relationships and collaboration already created in the social domain and patterns of interactions created in the information domain. Characteristics such as relationships and collaboration can provide strong enough bases for improving response (Mendonca and Wallace 2007), as against the one directional process indicated in Figure 2.2. Thus, the creation or existence of a relationship and collaboration pattern that provides an avenue for distributing information can provide sufficient flexibility for C2 to incorporate other stakeholders or functions (McEntire 2007). However, it is important for any function incorporated on this basis to be able to enhance command, control, sensemaking, and execution in order to better manage the effects of disruptive events.

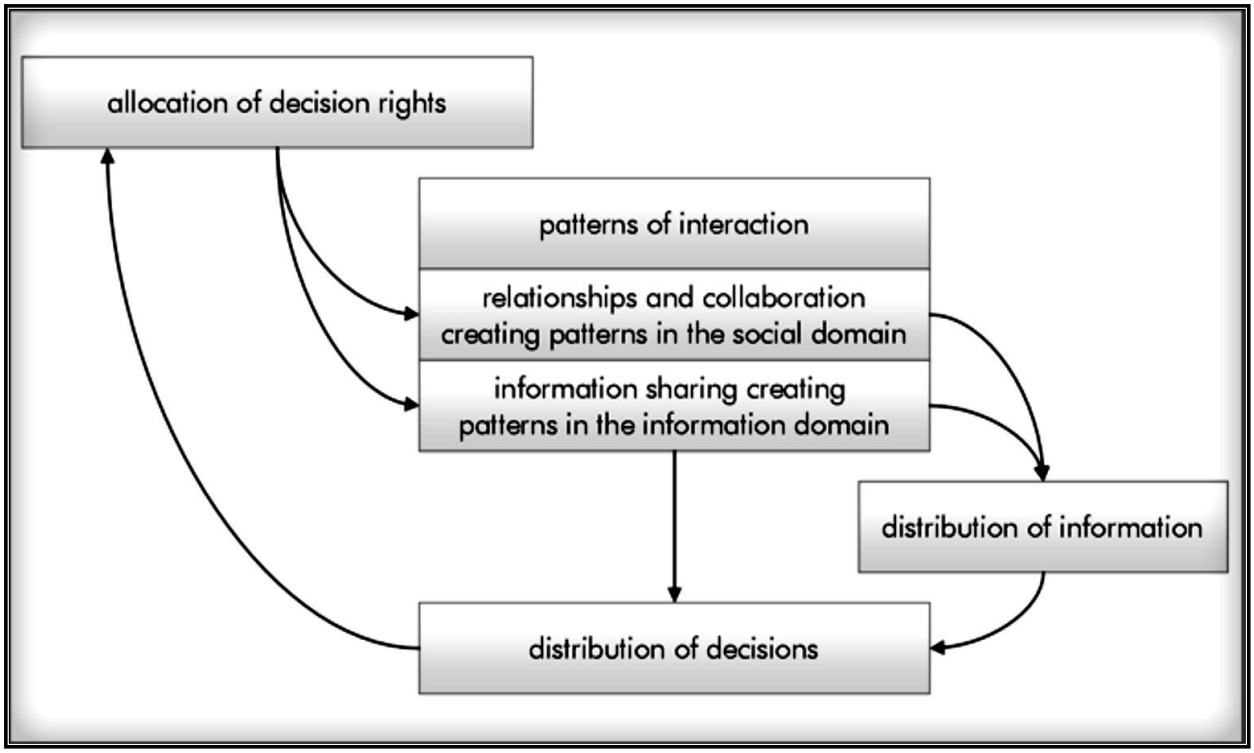

Figure 2.3 Key Dimensions of C2 Approach (Alberts and Hayes 2006 p82)

The interactions in Figure 2.3 indicate that where such domains exist outside of traditional EM organisations, C2 has the potential to adopt such domains for response (Mendonca and Wallace 2007; Alberts and Hayes 2006; IAEM 2007). Emergency response agencies lead or are responsible for information sharing and possess the necessary level of relationship required for the information domain to be widely spread to affected communities and other stakeholders (Alberts and Hayes 2007). Since communities thrive on social relationships and activities generated by networks, economic groups etc. it can then be inferred that communities possess functions that can be suitable for sharing EM information during response. This inference is drawn from the command and control function domain illustrated in Figure 2.4

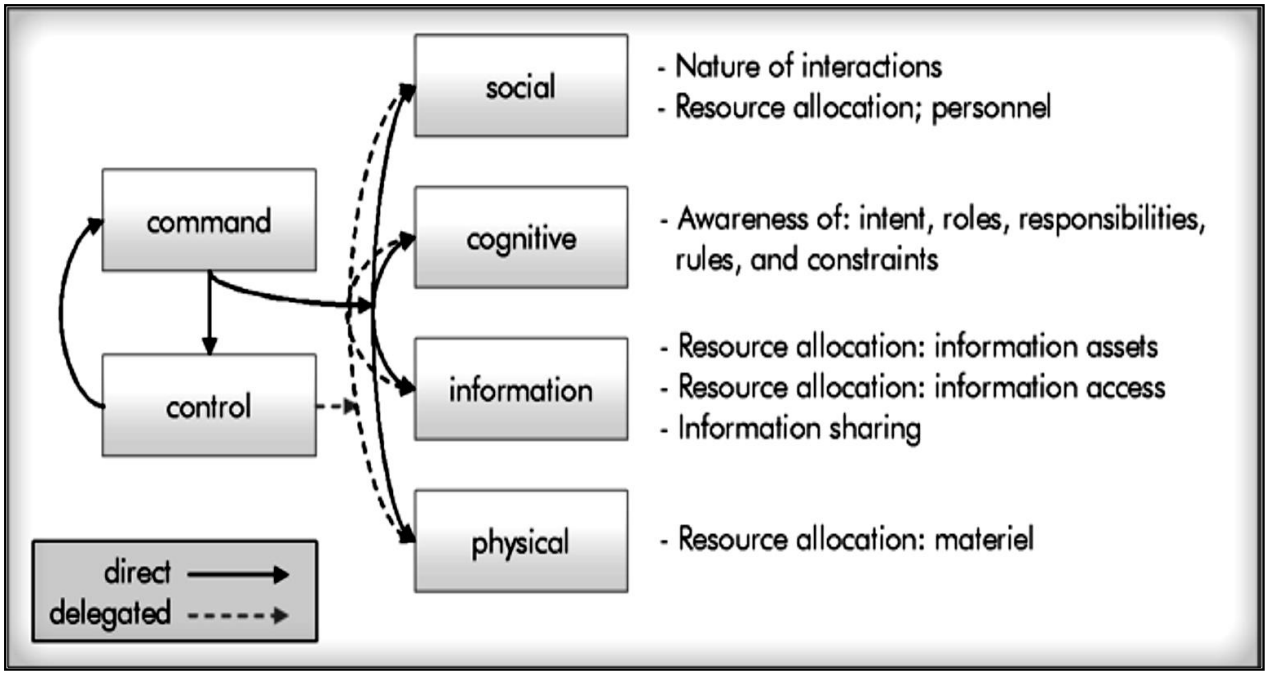

Figure 2.4 Command and Control as a function of domain (Alberts and Hayes 2006 p.60)

This diagram shows that social, cognitive, information and physical areas have potentials for delegated functions to be carried out. These function domains have the responsibilities for resource and personnel allocation, clarity of roles and responsibilities, and even constraints (Alberts and Hayes 2006). Figure 2.4 shows that resource allocation during response is facilitated by information assets, access and sharing. Information also influences cognitive (i.e. awareness of roles, responsibilities, rules and constraints) functions, and both are directed by command. However, it can be noticed that these two functions can also be subsequently delegated and controlled by assigned personnel who have awareness of roles, responsibilities, rules and constraints. It can also be observed from Figure 2.4 that social and physical function domains are directly linked to the control domain, but delegated rather than directed by command.

The nature of interactions and relationships shows that while C2 is directed by command, the four main domains can also be delegated based on awareness and understanding of the cognitive and information domains. This shows how C2 can work with communities affected by disasters or emergencies, and the conditions (understanding of cognitive and information domain) which can make such arrangements possible. It is also important to understand the activities and operations performed within each domain. The social domain for example includes the nature of interactions between stakeholders involved for response and resource allocation especially allocation of personnel or manpower for response activities (Alberts and Hayes 2006). The cognitive domain focuses on the affected community and environment,

the roles and responsibilities required for effective response, and the rules and constraints that ensure safety of all concerned (Alberts and Hayes 2006).

The cognitive domain also requires that responsibilities are coordinated to prevent an event from escalating, while simultaneously ensuring the safety of responders, the affected community and the built and physical environments (Dillon et al. 2009). The information domain entails resource allocation using information assets such as community mechanisms, platforms and experts in place to share information between and among response stakeholders (Alberts and Hayes 2007). The physical domain focuses on resource allocation, in particular allocation of material such as equipment, food, shelter and other humanitarian support required to reduce the impact of disruptive events on people and ensure safety (Alberts and Hayes 2006; Mendonca and Wallace 2007). This explanation of response domains indicates the need for coordination, collaboration and cooperation between many stakeholders. It also suggests that some domains (e.g. cognitive) might require technical skills or training and education on constraints, rules, what constitutes good intelligence for action, and mobilisation of resources (personnel or material).

The reliance of the cognitive and information domains on situation assessment of the disruptive event exposes the areas where gaps exist, and also the underutilisation of community functions for EM response. Figure 2.4 indicates that delegation of tasks provides opportunities for response agencies to utilise community functions for better situation awareness. For example, seeking information on the affected community (i.e. impact, and humanitarian and safety needs) through existing community functions can be more beneficial to the community than C2 structure, and also be less time and resource consuming for response agencies.

However, because community functions do not have defined roles and responsibilities in EM, they are ignored in traditional EM response arrangements. Also, not identifying and defining information assets, access and sharing mechanisms and platforms in communities suitable for EM response prior to any incidents makes it impossible for emergency organisations to use them during response. Thus, identifying existing community functions is important, and a better understanding of community functions and their integration with EM response arrangements is fundamental to improving EM response.

While Figure 2.4 illustrates C2 as a top-down, one-direction response process, it also illustrates that it is a structure that is yet to utilise the delegated arm for improving response (Alberts and Hayes 2007). It is possible that the problem statement in Chapter One can be solved by integrating community functions with EM response through the delegated arm of C2 by adopting existing functions that are able to perform all or any of the four domains in Figure 2.4. This section on response strategies and management suggests that certain terms such as collaboration, coordination, communication, skills,

expertise, resources and organised actions are the minimum components of EM response which need to be considered in order to improve response. These minimum components are also important in identifying the characteristics of existing community functions suitable for EM response.

2.4.1 Concept of EM Response

Emergency management in general can be challenging due to difficulty in predicting the occurrence of extreme events and the multiple needs that result from the impact of such events (Curnin and Owen 2013). Plans, policies and activities are accordingly developed, to mitigate, plan and respond to identified risks and threats. The requirements of Comprehensive Emergency Management (CEM) are that readiness activities are carried out based on the foreseen occurrence of any emergency (McCreight 2011). But the scale of disasters and the complexity of emergencies have shown the deleterious consequences of over-reliance on plans (Haddow et al. 2008) instead of building relationships and drawing from institution-wide, "bottom-up" collaboration to combine with "top-down" comprehensive and synergistic planning (Aguirre et al 2005). According to Canton (2007), emergency managers, planners and academics in hazard and disaster management are able to follow disaster trends, and on this basis able to develop an event-driven perspective to plan in anticipation of any disruptive event. However, this objective anticipation and planning might be limited (Alexander 2005), without the "bottom-up" collaboration and planning for more effective response to disasters (McCreight 2011).

Consequently, there is need for multi-agency response arrangements to extend beyond the boundaries of traditional response arrangements by emergency agencies, and to include mechanisms which involve more stakeholders as specified in the collaborative, integrated and comprehensive principles of EM. Given that it has been established that multi-agency response can be challenging to coordinate, it also means that adding more response actors to existing arrangements without solving (or at least addressing) the current challenges will not achieve much. The literature which has been examined and analysed in this chapter has helped to identify one of the major problems of multi-agency response to be lack of coordination in decision making for achieving the common goal of EM response.

Coordination takes place at various stages of EM response (Comfort et al. 2004), and it requires that entities with abilities to perform response tasks interact for response regardless of their independently structured systems (Bharosa et al. 2010). This means that multi-agency management deals with the coordination of various organisations or groups, each with its own processes, information, systems, capabilities and functions. The decision-making process that can potentially facilitate effective coordination was explained by Bots and Sol (1988), who argued that there are three perspectives through which coordination can be undertaken. First, a micro-perspective which focuses on coordination among individuals. Second, an intermediate perspective focusing on organisations; and third, a macro-perspective which is based on inter-organisational factors (Bots and Sol 1988; Bharosa et al. 2010).

Given the scope of the present research, the focus in this section will only be on the inter-organisational approach - which is also called 'community-level coordination'. According to Bots and Sol (1988), community-level coordination involves the management of networks of interdependent agencies, groups or organisations, which are based on established and trusted interactions. Within the context of EM response, it usually involves unprecedented interactions (i.e., which have never occurred previously) within the network of organisations and community stakeholders, with the aim of implementing actions to support, provide relief and mitigate the impact of a disruptive event (McEntire 2002; Bigley and Roberts 2001).

However, EM response is often driven by the process of "doing relief and response activities" *to* the affected community without significant consultation (Alberts and Hayes 2007). Although this military-style approach rooted in the C2 concept is often necessary in a catastrophic disaster scenario (Comfort and Kapucu 2006), it can potentially generate tension between the military-style EM response approach and a civilian engagement process.

This suggests the importance of community coordination at two different but interrelated and simultaneous stages;

1. Stage one - communication between agencies within the network who are involved in mitigating the impact of a disruptive event (Comfort and Kapucu 2006)
2. Stage two - communication between the network of agencies and the affected community (Drabek and McEntire 2002).

Understanding the relationship between agencies and communities, and how best to coordinate these stages of communication, is crucial to successful use of the RPD model (Salmon et al. 2011). While stage one is strategic to determining the available capability and responsibilities of core and supporting responders (Cabinet Office 2005), stage two is key to the operational response of 'how' it will reach the affected community (Reddick 2011). Although understanding these stages of communication is useful, in any real emergency they are interrelated and overlap (Vogt et al. 2011). This suggests that the relationships between coordination and communication also require pertinent and timely information in order to function more effectively (Vogt et al. 2011). According to Curnin and Owen (2012), communication and coordination help both core and supporting responders to gain accurate situational awareness in an emergency event.

Curnin and Owen (2012) emphasised that certain typologies in multi-agency response help to conceptualise multi-agency coordination, so that coordination can be significantly improved by system enablers such as community actors and stakeholders, by providing relevant information for facilitating EM response; which further ensures that multi-agency coordination is more successful. While this process can be challenging to manage due to issues regarding privacy and information- sharing policies

(Handmer and Dovers 2007), Curnin and Owen (2012) argued that the capability of stakeholders can provide the synergy required to facilitate effective and successful communication, and thus coordination for multi-agency response.

Based on this explanation from Curnin and Owen (2012) and the understanding derived from the minimum requirements for facilitating effective multi-agency response discussed earlier in this chapter, the following themes have been identified in Table 2.1 as the core aspect of EM response.

Themes	EM response activities theme is applicable to
Coordination	Communication, collaboration, arrangement, decision making, organised tasks
Collaboration between Stakeholders (core, supporting responders & affected people)	Interoperability, dissemination, relationship, arrangements
Communication	Decision making, suitable medium, reliable, known and accessible
Capabilities	Resources, tasks for safety, information sharing, needs, relief, support, situation awareness,

Table 2.2 Research themes and description

(Klein 2008; Comfort et al. 2004; Webb 2004; McEntire 2007; Bharosa et al. 2010)

These themes and corresponding activities are managed through the decision-making models, which further suggests that decision-making in action will be ineffective as long as these typologies continue to function below requirement (Klein et al. 1993). These typologies also indicate that EM response involves human aspects of EM which influence SOP, coordination etc. and hence the importance of managing the relationship and EM response systems as carefully as possible (Van De Ven and Walker 1984).

A sensitive, engaging approach is central to being able to coordinate relationships since relationships and coordination can follow the sequence of creation, growth and decline (Van De Ven and Walker 1984). Potential tension can be created as a result of this sequence within the C2 model, but by considering EM response as the sets of actions that require the distribution, allocation and sharing of resources and information it is possible to minimise these tensions and confusion. The role of EM relationships is key to mitigating the challenges experienced from the themes in Table 2.2. Essentially EM responses are defined and determined by the capabilities and responsibilities of core and supporting responders (Dillon et al. 2009). The level of coordination, communication and collaboration required for EM response to be effective goes beyond traditional response arrangements or SOP (Weick 1998). Crucially, it also includes drawing support from the understanding and existing expertise of all stakeholders (including communities) which can be utilised for improving response (Vogt et al. 2011; Webb 2004; Weick 1993).

According to Sylves (1991), several factors within the community can influence EM arrangements especially during an extreme event where the needs of the affected community can vary, yet are interrelated. Comfort et al. (2004) explained coordination of relationships as an important factor for ensuring cohesive and efficient emergency coordination process. This suggests that, regardless of the diversity of needs, all typologies of EM response are still required to function for the purpose of achieving the goal of improving EM response.

However, Van de Ven and Walker (1984) argued that the coordination of relationships for effective response can be challenging. This is because the structural authority and systems in many EM organisations are based on vertically-integrated hierarchies which are not conducive to creating and coordinating the required type of relationship for EM response (Kreps and Bosworth 1993). However, McEntire and Myers (2004) explained that the types of relationships, capabilities and processes required for improving EM response are present in communities. It can be inferred that benefits and functions from existing relationships, capabilities and processes within community and among emergency organisations can be adopted for EM response.

2.5 Community Engagement for EM Response

Engaging communities in the paradigm of EM practice has gradually developed from informing and educating a community about community involvement in EM practice (Janssen et al. 2010). This improvement on the traditional EM practice suggests a willingness to involve the community in EM. However, it also depicts a form of top-down transmission model rather than a conversation/dialogue among all stakeholders (Ozanne and Ozanne 2013). According to Betts (2007), partnerships between EM practitioners and communities are usually one-way with the community being presented with ready-made, regulation-driven and training-obligated EM processes.

In recent years, the overwhelming impacts of extreme events have motivated communities to self-organise for emergency service activities (Mendonca and Wallace 2004). Within traditional EM practice, the roles of EM organisations and services have been to provide the public with information in the form of warnings, advice, instructions and general information (Alexander 2002). However, recent evaluations of the roles of communities in EM response have demonstrated the capability of communities to manage the relationships required for effective multi-agency coordination and response (Fakuade 2014; Betts 2007; Crandall et al. 2006). Further examination of current researches also indicates that the engagement of communities in EM practice has seen communities demonstrate good leadership and carry out operational roles in EM response (Betts 2007). The research by Cretney (2016) provided more evidence of the role of pre-existing community led activities that support response to disasters. This research provided further evidence of the value of identifying and utilising the activities

created, led and driven by community organisations as mechanism for aiding integrates response to disaster events (Cretney, 2016). Similarly, Kenney and Phibbs (2015) emphasised that community values, knowledge and practices embedded in Maori culture and response arrangements may enhance formal disaster response mechanisms.

The evaluation of the Maori response during the Christchurch earthquake sequence also demonstrates the ability of community to self-organise rapidly to address urgent needs during response phrase as well as longer term recovery concerns (Kenney and Phibbs, 2015). The spontaneous organisation of Student Volunteer Army, Rangiora Express, Timebank, Farmy Army to mention a few are all examples and confirmations of recent and continued ability of community to support and perform response activities (Cretney, 2016; Kenney and Phibbs, 2015). Through the lens of these authors and many more, the ability of community to perform response functions is undeniable and demonstrates ability of community to make significant contributions to the response phase. However, these researches and others similar to it have made it difficult to contextualise community functions within the EM response framework such as CIMS. While emergency services understand, and use CIMS (or its more generic version ICS), the role and functions of communities are yet to be evaluated through the lens of EM response framework.

Vallance and Carlton (2014), Kenney and Phibbs (2015), Cretney (2016) explained the roles of community in terms of their ability to cope with and recover from impacts of disruptive events, the social capital used to support one another within a community during disruptive events, and their community based risk reduction and resilience strategies. In their works, the roles and participation of community during response is well acknowledged, but it fails to promote the technical capability of communities and their inherent tendencies in relation to the CIMS response arrangements. While community efforts have had good outcomes for the community post-disaster, and are acknowledged by EM practitioners, EM practice is yet to integrate these efforts or functions within the response framework used for dealing with disruptive events. For example, Mitchell et al (2010) acknowledge the ability of community-led emergency planning and response in Northland, but the role of community is yet to appropriately integrate in the Coordinated Incident Management System (CIMS) used in New Zealand.

The gap identified in the operationalisation of integration, and the potential benefits of utilising existing and potentially useful community resources for EM response and ensuring that planning process align with response framework and guidelines, emphasise the significance of the present research and its potential contribution to knowledge and practice. In the views of Webb (2004) and Waugh and Tierney (2007), collaboration, relationships and communication during response tend to shift from the community to the government and emergency services indicating a dependence on emergency services. Due to the demands of community engagement, and pressure and urgency of response to limit impacts of disruptive events, effective collaboration and integration have been challenging to initiate and

maintain (McEntire 2007). The ones that have been maintained have been influenced through strong messages to communities, appropriate activities, diplomacy in communication and encouragement about safety and preparedness (Betts 2007). Furthermore, research has shown that communities who have shared with emergency agencies/services their understanding about risk, foreseeing emergencies and preparedness tend to utilise public warning messages in response to emergencies more effectively than communities with little or no understanding or shared participation for safety (Mitchell et al. 2010; OESC 2006; Betts 2002; Betts 2003).

An example of this is the Lyttleton community in Christchurch, who demonstrated a high level of EM understanding of safety knowledge, coordination, communication, collaboration and organised actions in reaction to the disruptive events in their community in 2010 and 2011 (Jefferies 2012; Ozanne and Ozanne 2013). Through an already existing set of relationships, networks and functions within their community prior to the earthquake sequence, they were able to make decisions and utilise resources to mitigate the impact of the disaster and provide immediate relief and support in their community (Ozanne and Ozanne 2013). This shows that effective coordination and management of all the response challenges outlined in Table 2.1 can be developed through relationships initiated and maintained between stakeholders for the purpose of improving EM response, even though useful for other purposes.

Communities who have been successful with such relationships can be explained by a range of different principles from community development, ecology, exchange theory and systems theory, to mention a few (DSE 2005). By so doing, such communities have been able to develop sustainable functions which became useful in supporting their community during emergencies. According to Owen (2003), some sustained community functions, relationships and networks have been formed beyond interactions for recreational activities. Some of the platforms for developing such sustainable relationships and functions include (but are not limited to):

- Activities with common purposes, goals and shared values
- Contextual activities or projects
- Activities embedded in social environment responsibilities
- Activities involving the use of resources, mode of operations/activities and division of tasks and duties similar to organisations
- Activities embedded in history that provides possibilities and restrictions
- Activities or projects that often analyse history, context, tensions and contradictions, providing insights into encouraging change (Owen 2003; Mendonca et al. 2001; Lindell and Perry 1992).

The activities that lead to sustainable relationships in a community tend to be those that reflect culture, context, rules, values, division of labour, and tensions in the community (Gilad and Kanfer 2006). According to Betts (2007), very rarely does an EM organisation reflect on its own history, context of operations, rules, values and elements which constitute division of tasks and performance, except when obliged to do so. However, when such reflections are done, the aim is not to foster or build relationships, but as a mechanism for evaluation, monitoring and assessment for promotions (Gilad and Kanfer 2006). The vital contribution of community engagement in EM response is the ability of a community to create, maintain and initiate coordination (Betts 2007; Geis 2000). Such coordination has been observed to be influenced by relationships within the community as well as utilising functions within the community for community support or survival (Findley 2012; Fakuade 2014; Dynes 1994). Thus, it is important for EM to approach community engagement for EM response by drawing from EM principles of collaboration, integration and flexibility in order to achieve the relationships required for the essential domain of C2.

While this indicates the potential benefits of community engagement in EM response, it also demonstrates the potential contribution of communities in helping to solve the problems associated with response typologies as well as contributing to the process of improving response. However, community engagement has also been found to possess its own challenges which are often caused by the social dimensions of disasters (Drabek 2004b). Such social dimensions often influence the ability of a community to continue engagement and retain motivation to participate (Kreps and Drabek 1996). However, continued engagement with communities is important for enhancing EM capability for dealing with subsequent disruptive events.

2.6 Justification for Integrated Response

The theoretical bases of EM practice, systems and response discussed in this chapter, have been crucial in establishing the context of EM and EM response. The epistemology of EM draws from complex adaptive systems theory, because of the interrelated and network of relationships required by both community and EM organisations. However, the theory indicates the strong need to better understand the application of concepts used for EM response in order to develop an approach that can facilitate the utilisation of existing relationships and functions for EM response in any given scenario. Summarising the theories of EM and EM response in this chapter helped to identify C2 merits and limitations and the relevance of theories in better understanding the field of EM. The relevance of broad perspectives in social sciences, and the interplay between systems and decision making theories, showed areas from which potential solutions to some of the challenges experienced in EM response can be developed.

The importance of decision-making theory and systems theory in EM response emphasises the need for the ability to coordinate and facilitate relationships for the purpose of multi-agency response. Although multi-agency response relationships can be challenging (Alberts and Hayes 2006), the type of relationship required for optimising EM response and solving challenges of multi-agency response may be found in communities. Experience from community engagement in EM over the years in different parts of the world serves as inspiration to draw from this resource and provides motivation for seeking potentially useful EM response functions from within communities (Comfort and Haase 2006). While EM organisations or agencies do not operate in a similar manner to communities (Kapucu 2003), the characteristics of community activities and projects examined in this chapter have demonstrated that communities are capable of initiating, maintaining and utilising relationships to achieve the goals and purposes of EM response (Kapucu 2007).

It is important to note, however, that the goal of this chapter, and the present research, is not to suggest that community engagement in EM response is more important than EM organisational response. The goal is, by contrast, to integrate the quality of relationships and the functional components which communities possess into EM response arrangements. The rationale for developing an embryonic framework of integration is based on the need to mitigate the impact of extreme events when they occur, increase the rapidity of providing support and relief to affected people, reduce the challenges of multi-agency response and improve EM response. By examining the relevance of community engagement in the concept of EM response, it has become clear that while multi-agency EM responses have struggled to build and utilise the required level of coordination, collaboration, communication and relationships required during extreme events, communities are able to draw from existing capabilities, stakeholders (networks), mechanisms and coordination in their community to achieve this.

The context in which communities exist possesses the level of 'flexibility' that, while mandated in the principles of EM, might however be difficult for EM agencies or organisations to purposefully build within daily legislated duties (Mendonca and Wallace 2004). The EM framework for response often omits the involvement of community in response, even though there is general acknowledgement of role of community. For instance, EM framework in New Zealand have been evolving for decades in reaction to occurrence of different disruptive events. While reviews conducted help to identify lessons that need to be learned, and recommendations identify areas and how improvements ought to be made, vagueness still abounds in addressing recommendations that relates to EM response and integration of community response level. For example, the Ministry of Civil Defence and Emergency Management (MCDEM) review by McLean et al. (2012) recommended that;

"*New structures are developed to modify the Coordinated Incident Management System (CIMS) so as to better link the response to emergencies with community and community organisations*" (McLean et al. 2012, p202).

CIMS has been revised and a manual published in 2014, but the revised version still does not include a formal structure or arrangements that illustrate HOW response to emergencies by community and emergency services and Civil Defence groups are integrated. The template CIMS functions which had been revised to include community volunteers does not link, integrate nor illustrate how to co-create community capabilities and functions which spread across all CIMS functions with the CDEM and emergency services arrangements. The relationships between the different response levels (CIMS manual, p. 16) does not include any communication links nor connections with community, while the explanations on integrated response coordination (p. 20) completely leaves out community participation and involvement in response.

It is worth noting that response to disruptive events may be demanding such that high level of technical competencies are required for search and rescue operations and other lifesaving operations that may exceed the capability of communities. Regardless, there are other functions such as planning, operations, welfare etc. which communities are capable of performing in collaboration with emergency services. This suggests that both communities and EM organisations/agencies have complementary functions appropriate for EM response, but unfortunately, EM response framework in many countries especially in New Zealand has not been implemented in this manner and as examined in this thesis. The following concepts have been drawn up as summary from the analysis of the EM response functions and capabilities of EM organisations and community:

EM response concepts in EM Agencies	**EM Response concepts in Communities**
1. Professional capabilities and functions for EM response 2. Legislated stakeholders with challenges maintaining relationships 3. Coordination often characterised by confusion and facilitated by C2 4. Defined principles of EM 5. Resources and capabilities are structured and continuous support by government 6. Decision making is defined by principles and legislation and bound by duties & responsibilities of responders/organisations	1. Existing community functions and capabilities for EM response 2. Established networks and relationships with stakeholders 3. Coordination & mechanism for information sharing facilitated by trust between people 4. Principles defined by nature of community interactions 5. Resources are generated from within the community and by community members 6. Decision making is informal and community-based and influenced based on needs

Table 2.3 Relationship between functions (EM organisations and Community)

Given the unusual and often unexpected situations presented by disruptive events, common and shared goals of EM response can provide a basis for integration and synergy for collaboration between all stakeholders.

As related by Betts (2003; 2004; 2007), communities are able to commit to the achievement of common purposes and goals for EM response even in large-scale events with significant impacts. This emphasises the importance of the "integration" principle of EM which stresses that emergency managers should ensure the unity of efforts among all levels of government and between all elements of community. Integration among all levels and between relevant stakeholders is key to knowledge transfer and ensuring that capacity for response is developed and collaboration between all stakeholders are effective towards achieving the goal of response (Doyle et al. 2015). In the approach suggested by Doyle et al. (2015) there are guiding principles that may facilitate community engagement for response capacity development. The Wellington Regional Emergency Management Offices (WREMO) uses End-user focus, inclusiveness, purposeful outcomes and proactive engagement among other principles to foster community participation and integration for developing capacity for response (WREMO, 2012).

End-user refers to preparedness focused on solutions which are developed based on best practice and research findings, but adapted for community use. Doyle et al. (2015) explained that the process needs to be inclusive so that there is collaboration between all stakeholders for preparedness need to be easy to use and include messaging that convey positive outcome expectancies. This approach promotes community engagement for preparedness, but yet to be tested during response to a disruptive event in Wellington. While this does not dispute the potency of the approach, it however justifies the need for and relevance of community engagement for integrated response based on the assumption that collaboration at readiness phase can be transpose into the response phase. This assumption also draws from the principle of purposeful outcomes emphasised by WREMO (2012), which states that any engagement with community will have clear purpose and measurable outcome. Measurable outcome in this case will be the eventual onset of a disruptive event, which further emphasises the relevance of proactive engagement principles operated by WREMO. Doyle et al. (2015) recommended that stakeholders who are able to work with and actively follow up on issues relating to readiness should be sought out.

The principle of proactive further emphasises the need for direction, control and coordination to be provided regardless of the hazard, location, complexity or size (IAEM 2007). The 'integration' concept in EM involves collaboration between all stakeholders in decision-making processes and coordination of efforts between government and all stakeholders (Sylves 1991). Again, the word "integration" further reiterates the importance of themes or activities such as:

1) **Coordination** (relationship, networks, tasks and interdependent relationships) - which can contribute to the creation of social, cognitive, information and physical domains.

2) Communication mechanism and decision making – which is vital to the creation and sustenance of social, cognitive, information and physical domains.

3) **Collaboration between stakeholders** (emergency managers/organisations, government, community including community groups and non-government organisations).

4) **Capabilities** (flow of task, resource utilisation and management, dependencies etc.) – important for the effectiveness of all four domains, especially the cognitive domain.

These themes formed the basis for identifying existing functions and capabilities within communities during the present research fieldwork, and in analysing the case studies selected for this research. These words have also helped to define the context and theme boundaries within this research, for identifying the characteristics and pattern of existing community functions. Table 2.4 summarises the functions, characteristics, description and codes.

EM Function Domains in C2 (Alberts and Hayes 2006)	**Activity**	**Description**	**Code**
Cognitive, Information & social	Coordination, collaboration, coordination, communication	Response, plan implementation, emergency declaration, activation of emergency centre	F1
Information & Social	Communication, decision making, coordination	Issuing warning messages, public information, informing higher authority	F2
Social & Physical	Collaboration	Logistics and resources related functions such as evacuation, mobilise relief resources, provide immediate relief	F3
Cognitive	Capabilities	Technical capacity related functions such as registration and tracing, activate coordination centres, damage assessment, search and rescue, provide medical support, institute public safety measures	F4
Social, information & physical	Communication, decision making, coordination, collaboration	Combined functions such as working with other agencies to implement F2 and F3	F5

Table 2.4 Description and Summary of functions

The description and codes in Table 2.4 are crucial for data collection and analysis process. They are also vital in enabling the researcher to identify community functions that have potentials for improving EM response.

2.7 Chapter Summary

This chapter has provided theoretical bases for EM and explained the concept of EM response. It has used literature review and discussion in the fields of EM, public safety and social sciences to identify theories relevant to EM and EM response. Using the explanation of normative theories and embryonic theories identified through the critical analysis in section 2.2.1, response strategies and management concepts were identified and examined in section 2.3 in order to expand both practical and theoretical bases for EM response. Through the review in section 2.3, RPD was identified as a relevant model for EM response based on its flexibility to improvise and adopt simultaneous planning and implementation of response actions. The theoretical bases for EM also provided focus on function domains that are crucial for effective response, and the characteristics they possess. All these sections were key in achieving the first objective and in answering the first research question.

The concept of EM response evaluated in section 2.4 emphasised how the challenges experienced during EM response, especially in a multi-agency response framework, can be potentially addressed using community engagement. This section also identified certain themes in multi-agency response which often fail to achieve target goals due to challenges of coordination. The last section in this chapter justified the importance, relevance and benefits of integrating community functions with legislated EM response arrangements, by identifying the areas of synergy and themes for the functions which can be integrated. These themes have been determined as the basis for identifying existing community functions which can potentially solve problems of multi-agency response and for optimising EM response. The chapter results are summarised in appendix 1. The main result, however is that this chapter has helped to answer the first research question which is linked to the first objective, by providing both theoretical and practical explanations for how EM response works. These explanations guide the investigation process especially in the next chapter, which examines the research design.

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Chapter 3 – Methodology and Research Design

3.1 Introduction

Previous chapters have outlined the research questions and objectives of the present study. The literature review has also examined, evaluated and discussed the theoretical context for Emergency Management (EM) and EM response. The purpose of this chapter is to explain the research design, approach, data collection, analysis and interpretation used to answer the research questions and achieve the research objectives.

3.2 Research Design

Research methodology is the systematic way in which methods and techniques are combined to collect and analyse data with the purpose of obtaining new knowledge in a study area (Saunders et al. 2009). Comprehensive EM utilises a multi-disciplinary perspective to address issues relating to emergency management (Phillips 2005). This infers that research in EM can be influenced by knowledge from a wide range of disciplines. It can also be influenced by the interdependencies and the multiple dimensions of issues that relate to emergency preparedness, response, recovery and mitigation/protection (Phillips 2005).

According to McEntire (2007) and Phillips (2005), researchers in EM can explore emergency and disaster events from social dimensions depending on the aspects of EM being researched. This possibility, and the importance of understanding the dynamics of the social world where emergencies occur, influence the way EM researches are conducted (McEntire 2007). McEntire (2007) further states that the ability to acquire reliable and valid data which can advance the field of EM is dependent on use of a multi-disciplinary approach.

3.2.1 Exploratory Research

The present research requires in-depth exploration of existing community functions which can be potentially useful for improving EM response. Since existing community functions might well not be EM-specific, the research design has helped to determine suitable methods for engaging with the community in order to identify the functions which are relevant to EM response. This emphasises the relevance of an exploratory research strategy, which is key in helping the researcher navigate the unknown in order to answer the research questions (Creswell 2009; Saunders et al. 2012). An exploratory research strategy can be used to better understand a research problem, to investigate issues

that relate to people or to conduct an investigation into an area with several possible causal factors (Symon and Cassell 2012).

Exploratory strategy and research design is a type of research conducted in order to know enough to make conceptual distinctions or establish relationships between elements within the phenomenon being researched (Symon and Cassell 2012; Creswell 2009; Saunders et al. 2012). This strategy applies to this research since the community functions that can be utilised for EM response are yet to be identified and may not have been developed to meet EM functions. Bloomberg and Volpe (2008) explained that research with exploratory design can be carried out using quantitative, qualitative and mixed methods. *Quantitative research* in this context is a systematic empirical investigation of observable phenomena using statistical, mathematical or numerical data and/or computational techniques (Bloomberg and Volpe 2008).

By contrast, *qualitative research* is a systematic inquiry process which asks broad questions and collects non-numerical data from participants or phenomena, by examining themes and patterns in data provided by participants or derived from phenomena (Bloomberg and Volpe 2008). *Mixed methods research* involves data collection and analysis carried out using a mixture of qualitative and quantitative approaches (Tashakkori and Teddlie 1998). However, "the role, purpose, methods of data collection and analysis peculiar to quantitative research are used to examine a topic in order to quantify results, and to verify theories and variables" (Bloomberg and Volpe 2008 p. 13). Quantitative research is unsuitable for the present research area which involves identifying community functions and exploring their use for EM response. Qualitative methods on the other hand seek the essence of a topic or problem peculiar to that topic, and use methods which allow qualitative data to be gathered using multiple methods (Bloomberg and Volpe 2008 p. 14).

Given (2008) emphasised that qualitative research design is consistent with an exploratory research approach, making it a preferred and appropriate method for this study area. The persistent problems identified within EM response require a process which delves into the 'essence' of possible solutions rather than merely testing or refuting EM theories. The use of qualitative research design is therefore justified by the exploratory nature of the research questions. The research design for this study area has followed an interaction and reflection of dialogue between strategies, approaches and methods. It is chosen to allow a rigorous investigation in the study area, and to help examine issues directly tied to the research problem, objectives and questions (Morse and Richards 2002).

The context of the data provided in this research allows for critical reflection and interpretation, which would have not been possible if quantitative research were used. Finally, the research findings need to be transferable to other similar contexts, justifying the use of qualitative research. The characteristics of qualitative research design then informed the data collection strategy, instruments, protocol and

analysis methods used. Qualitative design serves as guide to ensure that data of similar scope are analysed by triangulating the themes they generate. Triangulation is a broad strategy of data collection and analysis within which a variety of techniques are used in order to enhance confidence in the findings (Krueger and Casey 2009).

According to Bryman and Bell (2011), qualitative data are known to help create themes through *inductive* reasoning. This is a "bottom-up" approach which starts with observation of a problem, which is then subjected to in-depth investigation leading to development of explanations for the phenomena being investigated (Trochim 2006). The reverse of this process is *deductive* reasoning which is called a "top-down" process, and aims to test a hypothesis already formulated; a process which can either lead to rejection or conditional confirmation of the hypothesis (Trochim 2006 p.19). Understanding of the inductive process influenced how data provided by research participants in the present study were triangulated with the data derived from literature review. This helped to increase the validity of the research results.

3.2.2 Positionality Statement

The inductive process is also known to help improve the validity and reliability (Creswell 2009) of qualitative data, because there is the possibility of biases from the researcher or research participants. In a qualitative research, the question "who is the researcher" must be answered, because the researcher is both the data gathering agent as well as the analysing agent, whose biases can influence the research process (Bernard 2000). Thus, while the declaration of the researcher clarifies the purpose of the study and problems being addressed, it also examines the extent to which potential bias on the part of the researcher can influence the research process (Feig 2010). The involvement of the researcher in the present research is evident in the steps taken to identify, monitor and manage the research process.

As the researcher, my background before embarking on this research has been in operational and tactical emergency management in the United Kingdom. My work in this field has been with first response agencies (fire service, police, ambulance through the British Red Cross, local authority and Non-governmental organisation responsible for EM activities). My work with these agencies was mostly in identifying factors responsible for the increase of incidents in communities and in identifying how response can be more effective in mitigating the impacts of incidents. Other experiences are in enhancing preventive strategies in communities and in teaching public safety tactics and measures to the general public, especially to vulnerable or at-risk communities. Along with this, I gained four-year experience working in a refugee and migrant centre managing and advocating the cases of asylum seekers and European migrants in the UK.

It was through these combined experiences, in addition to taking the lead on an international campaign on peace using sports, that I identified response challenges in different forms and within different

emergency agencies. Personal and organisational investigation into response to critical emergencies in different countries via my work also confirmed that problems existed during EM response to both natural and human-induced hazards. My experience in different emergency agencies and organisations who are involved in reduction, readiness, response and recovery has confirmed to me that even when reduction and readiness measures are put in place, ineffective or problematic response can complicate the recovery phase. While these experiences may lead to pre-empting the pattern of answers professionals may provide in this research, the interview questions are designed in a non-leading way and the data collection involves more community stakeholders than EM professionals.

Having prior practical experience has helped to narrow the research scope to the area where the problem lies and the issues which have motivated this research, without undervaluing the other elements that may contribute to knowledge. The effects of my biases have been mitigated through triangulation of data collected from multiple sources especially existing theories of EM knowledge, methods and scope, and in making a clear distinction between justified belief and opinion. This approach to dealing with biases is similar to that which Bryman (2008) explained as consideration of research activities and process based on practical experience and knowledge of the subject area.

3.2.3 Justification for Research Design

The research design is important to the inquiry process of data collection, and to data analysis that leads to either acceptance or rejection of a hypothesis or observation. There are three possible research designs that could have been used for researches in this subject area, and depending on what is being investigated. They are quantitative, qualitative and mixed methods (Bloomberg and Volpe 2008). Quantitative research is considered as a systematic empirical investigation of observable phenomena using statistical, mathematical or numerical data or computational techniques (Given 2008). This process is central to measurement and having large data sets which can be used to test or reject a theory, but this process can be limiting for a research of the present nature. The difficulty in measuring human relationships and interactions between networks of organisations and community groups, as done in this research, would have made computational techniques unsuitable and discouraging for participants to engage.

By contrary with the quantitative research approach, qualitative research is a systematic inquiry process which asks broad questions and collects text data from participants or phenomena by examining themes and patterns exclusive to the set of data provided by participants or derived from phenomena (Bloomberg and Volpe 2008). The method which combines both qualitative and quantitative methods is called mixed methods (Bloomberg and Volpe 2008). With this generic understanding of both

quantitative and qualitative research, their roles, purposes, methods of data collection and analysis informed the decision to use qualitative method for this study area. This is summarised in Table 3.1.

	Quantitative	**Qualitative**
Research purpose	Seeks consensus (norm) and examine topic in order to quantify results	Seeks variation in findings and delves into the 'essence' of the topic or problem
Research role	Seeks to test or verify a theory, identifies variables, makes predictions based on quantified variables to support or disconfirm hypothesis	Seeks to discover and understand meaning of experience, adopts a flexible, but reliable stance and is open to change as study evolves. Acknowledges personal values and researchers' own experience as factors in the study process
Method of data collection	Uses existing instrumentation and follows a rigid experimentation guideline. Instruments yield performance data, observed data, and census data.	Instruments include observation, survey, documents, focus group, and critical incidents, etc. Multiple methods are combined to achieve triangulation
Method of data analysis	Deductive design reduces data to precise numerical indices, statistical analysis with analytical process being linear and unidirectional	Inductive design leads to holistic, richly descriptive findings. Analysis is based on identifying themes and patterns. Phenomena are understood as holistic and complex systems and are viewed within specific social and/or historical contexts.

Table 3.1. Comparative review of quantitative and qualitative research method (Adapted from Bloomberg and Volpe 2008; p 13 -15)

This comparative review of quantitative and qualitative research methods has convinced the researcher to use qualitative methods to conduct this research. This is because the nature of problems pertaining to EM response requires a method of inquiry which allows a process that explores an understanding of why the problem exists, and how the problem can be managed, rather than verifying the existence of problems. Due to the persistence of the problems within the EM response phase, a process which delves into the 'essence' of possible solution is more beneficial than merely testing or disconfirming EM theories or bases for EM. Thus, decisions for this research design is based on the nature of the research problem, rationale and issues peculiar to EM response. The researcher's experience in EM has also

influenced the research design to an extent which is what Bryman (2008) explained as consideration based on practical experience and knowledge of the subject area. The influence of the research paradigm and the characteristics of qualitative research is also very prominent in determining the research design. The combined factors influencing the choice of research design are illustrated in Figure A2.

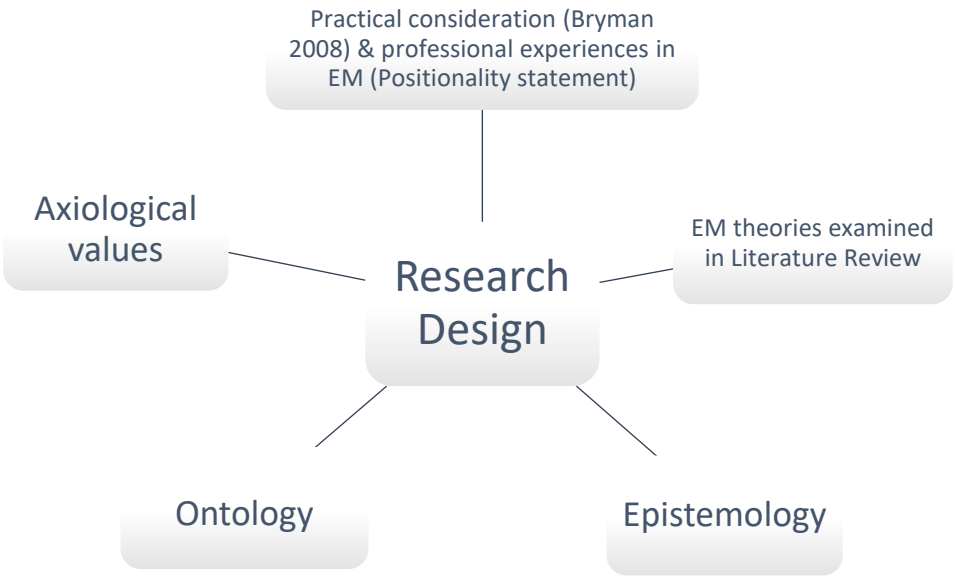

Figure 3.1. Influences on Research Design (Adapted from Bryman 2008 p24)

The exploratory approach taken in this research has helped to follow the lead of information to answer the research questions and to better understand issues of EM response. Creswell (2009) explained that issues which involve social phenomena can be better understood and explained using branches of philosophy such as epistemology, ontology and axiological.

Creswell (2009), Bryman (2008) and Saunders et al. (2009) all affirm the significant role philosophies such as positivist, phenomenology, realism etc. play in determining research techniques and procedures i.e. data collection and their ontological implications in data interpretation and analysis. The assumption of any researcher about the world will lead to embracing a particular paradigm based on biases, rational thinking and/or experiences (Creswell 2009). Any paradigm or assumptions are based on epistemology, ontology and axiology that influence such positions about knowledge and what is valued (Bryman 2008; Saunders et al. 2009).

The research design selected for this study area has followed an interaction and reflection of dialogue between options of strategies, approaches and methods which can be used for studies in the sciences and social sciences. While other options abound, the research options have been narrowed down to applicable ones to the study area. Among these applicable methods, the most appropriate for a study which is recursive with unspecified theory has been selected. The success of conducting a rigorous investigation in this research area is directly tied to the research problem, objectives and questions and

methodological congruence (Morse and Richards 2002). The justification for conducting qualitative research is informed by the strategy and genre of inquiry process which is more appropriate for answering the research questions. Furthermore, the context of data provided in this research allows for critical reflection and interpretation which would otherwise have been impossible using quantitative research. Above all, the researcher seeks to explain transferability of findings to other similar contexts; this further justifies the use of qualitative research whose methods of data collection and analysis will facilitate the ability to do so.

3.3 Data Collection

The first part of this section examines EM response in two communities chosen as the case studies for this research. The second part discusses the primary source of data and how the case study has helped to determine participant selection. The data collection instruments which were used are:

1. Literature review (secondary data source)
2. Case studies (Secondary data source)
3. Semi-structured interviews (primary data source)
4. Focus group discussion 1 & 2 (FGD 1 is with CDEM, while FGD 2 is with communities) (primary data source).

The data gathered using these instruments were triangulated to eliminate bias and unrelated results, to confirm salient results through multiple sources of data and to relate them to the study area. The objectives and questions were central to all data collected which also helped to maintain consistency and relevance of data to research area. The ability to triangulate data collected from multiple sources linked back to existing knowledge in EM and also helped to increase the result validity. The relationship between the research design, scope and the central role played in achieving the objective of this research is illustrated in table 3.2.

Research question	Data Source	Purpose/Justification
How does EM work?	Literature review (secondary source)	To evaluate the academic and practice framework for EM in order to identify gap(s), and to establish the specific area within EM into which this research outcome fits
What community functions are potentially useful for EM response?	• Case study analysis (secondary source) • Semi-structured interview (primary source) CDEM A • Focus Group Discussion (FGD) 1 (Primary Source) – CDEM B & C • FGD2 (primary source) – Community organisations/groups/CCC – A & B	1. To use case studies to identify community functions used for response to 2011 earthquake, and to evaluate the roles of these community functions for EM response. 2. Semi-structured interview and FGD 1 & 2 are used to identify other existing functions which can be used for EM response and to confirm the prospects of using community functions used in 2011 and other existing community functions for response to future incidents.
What are the barriers and/or challenges which can hinder integration of community functions with EM response?	• Literature review • Case study analysis • Part of semi-structured interview • Part of focus group discussions 1 & 2	To identify and assess barriers and challenges found in EM literatures, case studies and interview, focus group discussion about capabilities of community involvement in EM response. Evaluate the implications of this for EM response.
How can EM (in NZ & generally) be modified to use community functions to improve EM response	Data from literature review, semi-structured interviews, and FGD 1& 2 and case study analysis were all triangulated.	To develop an integrated EM response framework which combines EM response elements and applicable community functions

Table 3.2 Data sources and justification

As illustrated in Table 3.2 each research question is answered by sourcing data using specific data collection method(s) suitable for answering the question. Table 3.2 was also key to ensuring that the research was conducted in a timely manner and that all data sources and collection methods interact to achieve the purpose of the research.

3.3.1 Case Study Analysis

To contribute to the discussion in the literature review chapter, this subsection uses the case studies of EM response to the February 22 2011 earthquake in Christchurch, to examine the features of response arrangements provided in Lyttleton and Riccarton. The decision to use case studies was influenced by the need to compare and contrast different communities with different demographic properties. These two communities both played significant roles during response to the 2011 earthquake. While many reports recorded the successes of the Time Bank (TB) and Student Volunteer Army (SVA) in mobilising and coordinating response to the earthquake sequence in Christchurch, many also failed to document challenges and lessons which can be learnt from how these community functions operated during and after the quake.

National and global acknowledgement of the EM response contribution by the TB and SVA not only informed the selection of these two communities as case studies for this research, but also serves as motivation for the quest to examine their response from an EM perspective. Such EM relevant tendencies within communities informed the need to, and provided direction for, identifying other existing community functions in these two communities. This investigation can help to identify existing community functions in other communities elsewhere in the world which can be potentially used for EM functions. This analysis also examines the characteristics of the community functions, defines the function domains for identifying other existing community functions, and helps to establish that community functions can potentially be used for EM response.

Lyttelton

Lyttelton is located 13 kilometres from Christchurch and accessed by a single road tunnel (Ozanne and Ozanne 2013). For instance, the Summit road was closed after the February earthquake, (Ozanne and Ozanne 2013), which means any disruption that forces the closure of the road tunnel literally cuts Lyttelton off from Christchurch and essential services and aid. This isolation contributed to the strong culture of self-sufficiency, community cohesion and community responsibility in Lyttelton before the 2010 - 2011 quake sequence (Everingham 2014). The proximity of Lyttleton to the sea, the Port Hills topographic barrier and its remote location from the central city of Christchurch are distinguishing characteristics of Lyttelton. Lyttelton is built on sloping terrain but has an international seaport, trade and commercial centre with communities at Corsair Bay, Cass Bay and Rapaki (CCC 2014). Lyttelton

benefits from the support and services of community development organisations, recreation groups, community facilities and resident/business associations (CCC 2013). In particular, the role of the Lyttelton Time Bank in supporting and sustaining the community prior to the quake sequence and during the 2011 earthquake is widely acknowledged (Everingham 2014; CCC 2014).

Existing Community Function: Lyttelton Time Bank (TB)

The Lyttelton Time Bank was initiated in 2005 to foster the spirit of self-sufficiency in Lyttelton (Everingham 2014). The Time Bank (TB) comprises coordinated non-reciprocal trading services as an alternative form of money exchange called community currency (Seyfang 2004; Ozanne & Ozanne 2013). The TB model of exchange is operated on the understanding that every member and the time unit of labour they provide is equal in value regardless of the service provided (Ozanne and Ozanne 2013). Therefore, any labour provided by a TB member is measured in hours and rewarded in corresponding hours of credit time (Ozanne and Ozanne 2013).

Figure 3.2 Time Bank Organisational network before 2011 quake
(Adapted from Ozanne and Ozanne 2013 p.9)

Figure 3.2 shows the classification of organisations that are part of the TB network. This interaction is further divided into organisations/groups that are part of the TB as active contributing members or those who support TB activities as shown in Table 3.3.

Classification	Organisation/Group	Nature of Relationship
Communication Organisations	1. Information Centre 2. Volcano Radio	Members
Educational Organisations	1. Primary School A 2. Diamond Harbour Playcentre 3. Kindergarten	Members
Social & Economic Organisations	1. Farmer's Market 2. Community Garden/Grow Local	Members
	1. Youth Centre/community house 2. Harbour Cooperative 3. Lyttelton Tag busters 4. Lyttelton Tennis Club 5. Lyttelton Parks Committee 6. Holy Trinity Church 7. Torpedo Boat Museum 8. Hibiscus Group 9. Diamond Harbour & other Time Banks	Members
Health Care Organisations	1. Medical Centre 2. Lyttelton Plunket 3. Healthy Christchurch	Members

Table 3.3 Classification and explanation of TB cluster (Adapted from Ozanne and Ozanne 2013 p.9)

There are certain organisations such as the Christchurch City Council, Lyttelton business association and Lyttelton News who are not members of the TB, but support and recognise the role the TB plays in engaging Lyttelton residents. The type of membership (i.e. strong or member) also shows the level of involvement and commitments of other organisations to TB activities. The TB initiative and its consequential interactions were valuable during response to the 2011 earthquakes and subsequent incidents such as flooding, pollution etc. in Lyttelton. By having an exchange platform that fosters and strengthens relationships, interactions and continued engagement between people living within Lyttelton, the TB has indirectly helped to build a fused network of groups and to develop, organise and sustain critical resources, as well as developing a database of people with skills and local knowledge, capable of responding to basic needs.

Riccarton

Riccarton comprises Riccarton, Upper Riccarton, Ilam, Avonhead Riccarton West, Mona Vale, Wharenui and Middleton (Christchurch Council 2014). Riccarton suburb is located in the Riccarton/Wigram Ward. Riccarton and Blenheim roads are two major arterial routes into the city and are busy retail zones (CCC 2014). Riccarton area benefits from support provided by community organisations, recreational/leisure groups, faith-based organisations, residents' groups and other social forums and organisations (CCC 2014).

The University of Canterbury (UC) located in Riccarton proved useful in coordinating EM response during the February 2011 earthquake. Besides this, having the Emergency Response Team and a dedicated Emergency Operations Centre (EOC) at UC were strategic in facilitating response to the 2010 - 2011 earthquake sequence. The role of a student movement born from a Facebook page, called the Student Volunteer Army (SVA) was also critical in the Christchurch earthquakes response (Lewis 2013).

Existing Community Function: Student Volunteer Army (SVA)

The Student Volunteer Army (SVA) is an organisation facilitated by community action through youth engagement to respond to disasters and community service (SVA 2014). The organisation evolved from the massive "clean-up" need which arose from the impact of the September 2010 and February 2011 earthquakes in Christchurch. The Facebook group promptly mobilised over 2500 volunteers to undertake the clean-up which was effective to the extent that the UC Student Association President formally created the UC Student Volunteer Army (SVA); a student club focused on student volunteering (Law 2011). The structure and activities of SVA revolve around response to requests for community service and ability to mobilise student volunteers who were able to use their skills to support affected communities.

3.3.2 Response by TB and SVA to the February Earthquake

The February 2011 earthquake caused major disruption, threats to individual and public safety, and lack of communication in Lyttelton and Christchurch City. However, the already established 'trusted networks' of the TB were activated to inform, warn, mobilise support and resources and to drive operational response in Lyttelton (Ozanne and Ozanne 2013; Everingham 2014; Jefferies 2014). The TB was also used along with the support of other community groups, to evacuate and provide immediate relief for residents of Lyttelton (Ozanne and Ozanne 2013; Everingham 2014).

These EM activities were self-organised by the community without the involvement of the CDEM in Canterbury. It can be inferred that both response needs and lack of access to the main city can be said to have motivated such reaction. However, it is observed by the researcher that all response activities

conducted by Lyttelton fit into the cognitive, physical and social EM function domains, an observation subject to further evaluation. For instance, the Lyttelton response suggests that these EM functions might have been possible because response activities were coordinated by the TB coordinator who was also the Lyttelton Civil Defence coordinator. The EM expertise of the coordinator indicates the role that EM knowledge and awareness play in EM response, although the ability of the community to self-organise and respond to disruptive events in Lyttelton cannot be ignored.

The TB was used as the safety net of relationships and skills already embedded into the community (Jefferies 2012). This type of EM response is explained by Waugh and Streib (2006) as 'essential roles of networks' that can be tapped into to draw on a wide range of essential community economic, social, psychological and political resources from within and around community networks (p. 133). The ability to coordinate and collaborate these networks indicates the potential to operate in the cognitive, information, social and physical EM function domains. However, the specific domains in which TB functioned are explored through the semi-structured interviews and results presented in the next chapter.

According to Waugh and Streib (2006), modern EM is a paradox in that EM response should be meticulously organised and planned, whereas in fact its immediate provision of support and relief is driven by spontaneous actions based on needs (p. 132). The EM response in Lyttleton was enhanced by the cluster of community organisations/groups which had linked directly to the TB prior to the earthquake sequence (Ozanne and Ozanne 2013). This cluster of groups can be classified as communication, education, social and economic and health organisations (Fig. 3.1). Thus, communication and information sharing was possible through existing networks, even though the earthquake had disrupted physical infrastructures. So, while the TB is not technically designed to be an EM function, the networks that had been developed were adopted for response purpose.

By contrast, the EM response within Christchurch City was characterised by confusion at the initial 'emergency' phase, because the EM response arrangements were undergoing restructuring as a result of the September 2010 earthquake (McLean et al. 2012). According to McLean et al (2012) the standard procedures for response, which is usually provided by the police and emergency services, were insufficient to deal with the situation. In addition to this, the lack of situation awareness led to inability to promptly implement the necessary actions for response (McLean et al. 2012 p.159-160). There were also multiple debriefings which further complicated response arrangements because of limited information on the situation (McLean et al. 2012 p.162). This situation relates to peculiar problems with C2 information and cognitive domains which were identified in section 2.4. As seen in Figure 2.4, activities in the information and cognitive domains have tendencies to further influence the operations in the physical and social domains, which are domains that control resource allocation, personnel and materials.

Despite the problems identified by McLean et al (2012), the SVA ability to mobilise young people in September 2010 served as a motivating factor to carry out EM activities that relates to the physical and social function domains. For instance, the SVA teamed up with the UC student association team, Te Waipounamu foundation, White Elephant Trust and three other student clubs to mobilise about 13,000 students to volunteer weekly to help with clean-up of liquefaction debris and delivery of water and food in the worst affected areas of Christchurch using chartered buses (SVA 2014). In the aftermath of the 2011 earthquake, the SVA worked in partnership with the Civil Defence and Christchurch City Council (CCC) to respond to individual assistance requests they received via social media, the SVA website and texting (SVA 2014).

Responses to requests (resource allocation; material and people) for individual assistance across the city continued for as long as SVA and its partners had capacity to do so. No problems were identified with the assistance provided by SVA and its partners, showing that existing community functions are able to operate effectively within the physical and social domains. The ability to function within these two domains also indicates capacity to interact by using social domains to identify available resources which can be allocated to people in need within the community. The operational abilities demonstrated within the two case study communities suggest their potentials to operate within EM function domains, especially those often characterised by problems and confusion in the C2 structure. The potentials identified through this case study analysis provide further motivation for the integrated framework developed in this research for improving EM response.

3.3.3 Interviews and Focus Group Discussions

The successes of the TB and SVA as community functions used for response to the February 2011 earthquake have informed the choice of participants for this research. The FGD and semi-structured interviews with participants also helped to identify and examine challenges experienced using these community functions. It is important to identify these challenges in order to identify factors which can hinder sustainability of community functions or their usage for EM response. Thus, the target population for this research consists of individuals who perform EM response roles or functions within the two communities. Purposeful participant selection was based on experience in EM to identify participants who are able to provide the required information to help answer the research questions and objectives (Saunders et al 2009). The following categories of participants were identified:

1) Community organisations/groups with strong networks and links to other organisations
2) The Civil Defence Emergency Management (CDEM) organisations in Lyttleton, Christchurch and Wellington
3) Local government representatives/officers within these communities

These categories determine the research participants which are listed in Table 3.4.

	Participant description	Data collection	Aspect of research questions focused on
A	1) Community groups/organisations 2) Timebank coordinators [FGD2 –A1]	- FGD2 - Semi-structured interview	• Functions of their group/organization • EM roles played in the community in 2011 and after • Challenges experienced (if any) during response in 2011 and after • Benefits of community functions for EM • Whether other community functions exist which can perform EM roles
B	1) Civil Defence Emergency Management (CDEM) for Lyttelton [CDEM A] 2) Civil Defence Emergency Management (CDEM) for Christchurch [CDEM B] 3) Regional CDEM in Wellington [CDEM C]	- Semi- structured Interview - FGD 1 (CDEM Coordinators/managers for community resilience & EM response)	• Are there potentially useful community functions which can perform EM roles especially EM response? • Possible challenges of using those community functions • Benefits of community functions for EM
C	1) Community groups/organisations in Riccarton 2) Student Volunteer Army [FGD2 –B1]	- Semi- structured Interview - FGD 2	• Functions of their group/organization • EM roles played in the community in 2011 and after • Challenges experienced (if any) during response in 2011 and after • Benefits of community functions for EM • If other community functions exist which can perform EM roles
D	1) CCC Strengthening Community Advisers for Lyttelton [FGD2 –A2] 2) CCC Strengthening Community Advisers for Riccarton [FGD2 –B2]	Focus group discussion/Semi-structured interview	• To provide further explanations of community organisations, groups and profiles of Lyttelton and Riccarton communities • To identify if other community functions exist which can perform EM roles • To find out if & how community functions are supported by government

Table 3.4. Research participants and data collection techniques

Table 3.4 provides details of research participants who are community groups/organisations in Lyttelton and Riccarton, the Civil Defence and Emergency Management (CDEM) representative in Lyttelton, CDEM in Christchurch and the community resilience unit in Wellington CDEM. Other participants are Christchurch City Council Strengthening Community Advisers for Lyttelton and Riccarton.

Strengthening Community Advisers are officers who work in the community development and Community Engagement Departments of the CCC. These two departments were combined in 2010 because the Council aimed to build strong communities and believed this can be better done by combining both departments. The Strengthening Community Advisers have offices within the community they support as well as living in the vicinity of the community. For example, the Lyttelton Strengthening Community Advisers live and work in Lyttelton and thus consider themselves as part of the community. Due to their non-work, related presence in the community, they are also viewed as part of the community despite being government workers.

The participants are grouped into categories A, B, C and D. However, when data collection started, category A only had one participant for the FGD because the active community organisations or/groups in Lyttelton are all part of the TB. To avoid duplication of data, only the TB was engaged in FGD, reducing the participants for category A to one since the TB is a fusion of several community organisations. In addition, the categories which have many actors and who were likely to repeat information, were engaged in focus groups instead of individual interviews. Participants in strategic leadership or coordinating roles within the community and involved in EM response were engaged in semi-structured interviews instead of FGD since this category has just one or two participants.

Category B has three participants including a participant from CDEM Wellington - from outside the case study communities. The decision to conduct an interview with this person was based on the involvement of the national CDEM during response to the 2011 earthquake. The earthquake response need overwhelmed local resources, which led to the declaration of a national emergency and a request for support from international responders (McLean et al. 2012). Secondly, an interview was conducted with CDEM Wellington because they have a community resilience unit which has received an international award for excellence in community engagement for EM.

Other participants were selected based on the strategic roles played in EM response in 2011 and their knowledge, involvement and professional experience in EM and EM response in Lyttelton, Riccarton and across Christchurch. As outlined in table 3.2 the data collection methods used were semi-structured interviews and focus groups, while the case studies provided context for research themes. While this flexible process is consistent with the characteristics of qualitative research, multiple methods are selected to ensure that detailed, descriptive, but conceptual information are collected which can be triangulated to increase validity and reliability of data and findings.

3.3.4 Procedure and Ethical Consideration

The data collection procedures were similar for the focus group discussion and semi-structure interview sessions. The research participants were approached and the data collection process began when the research ethics had been approved by the university. Ethics consideration is a process which reviews research processes and provides guidance to anticipate and mitigate any risks pertaining to the study

which can result in harm to the researcher or/and the participants (Flick 2008). Ethical procedures for this research also helped to manage the issues of confidentiality and informed consent and to ensure the interests of participants are well understood and respected (Flick 2008).

Letters of invitation were sent by email to inform participants about the research aim, objectives and questions and to ascertain their willingness to participate in the research (*a copy of the letter of invitation can be found in appendix A*). Once a participant replied to the researcher agreeing to participate, a convenient date, time and location were mutually agreed on. The researcher ensured that the time was during office hours in order to avoid lone-working and to mitigate any potential risks. For community groups, the focus group discussion was conducted during one of their regular forums.

Participants were fully informed about the research before commencing the session. An informed consent form was signed after each session and both the participant and research retained a copy each (*a copy of the consent form can be found in appendix B*). This procedure was used for both interview and focus group sessions. The semi-structured interviews were conducted by asking the participants a series of questions, the responses to which were recorded and later transcribed by the researcher. This method allowed the researcher to listen with close attention to the participants. This encouraged the participants to express themselves freely without needing to wait for the researcher to write down points before carrying on with the discussion (Krueger and Casey 2009). This process was also repeated for the FGD which was useful as the FGD sessions varied in size from two participants to twelve participants or organisations represented. *The questions asked during the interviews and FGD can be found in appendix C.*

3.4 Data Analysis

Data analysis has followed the process specific to qualitative research. Content analysis, which focuses on the characteristics of contextual meaning of text (Weber 1990), has been used. Text data from the literature review and primary data were analysed as explained by Krippendorff (2004). This method of data analysis helps to establish language intensities which represent similar meanings, but has a goal to "provide knowledge and understanding of the phenomenon under study" (Downe-Wamboldt 1992 p. 314). Qualitative content analysis can be described as a "research method for the subjective interpretation of text data gathered through a process of systematic classification of coding and identifying of themes or patterns" (Hsieh and Shannon 2005 p. 1278). Text which can be analysed using content analysis includes open-ended survey questions, interviews, focus groups, observations, or print media such as articles, books or manuals (Kondracki and Wellman 2002). However, the text data which were analysed during this research were verbal text from the interviews and FGD, printed text from literature, electronic forms of reports about the earthquake sequence and narrative responses from reports on CDEM response. The data analysis procedure is explained in the next subsection.

3.4.1 Content Analysis and Procedure

The data analysis followed the procedure for content analysis. Certain words have been identified during the literature review which are relevant to EM response. These words were derived to form the boundaries for data collected and analysed in the next chapter. Words like coordination, communication mechanism, decision making, collaboration and capabilities were chosen as the main themes for this research. In addition to these main themes, the research also derived some subordinate themes from the research objectives and questions. This resulted in the set of themes outlined in table 3.5.

Main themes linked to EM functions	**Subordinate themes that relates to research questions**
Coordination	Emergency Management (EM)
• Communication (mechanism) • Decision Making	• EM response • Community functions
Collaboration	Benefits of community functions
Capabilities	Barriers to integrating community functions

Table 3.5 Themes for data analysis

These themes are classified as main and subordinate themes only for convenience and reference and not because of their level of importance. The themes help the researcher focus on any phrase or words that relate in meaning to them when interpreting and analysing data (Flick 2008). A theme as mentioned in this table is a word or words which provide guidelines for the researcher to identify, interpret and analyse the implications of the words for the research. According to Braun and Clarke (2006), "a theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set" (p. 82). As required in procedures for content analysis, data which are analysed are coherent, consistent and distinctive themes, not just descriptive.

Themes are also considered as concepts which are coded so they can be quantified and their presence tallied for emphasis and analysis (Bryman and Bell 2011). Using the explanations of themes from Braun and Clarke (2006) and Bryman and Bell (2011), the data relating to each question were presented under the objective and research questions they aimed to answer. After this, the theme(s) which relate to each objective were discussed and analysed based on the epistemology and ontology in EM standards and theories in the literature review. While the focus during data analysis is on the main and subordinate themes, certain words continue to recur and were classified as new themes. However, such classification was done only when the word(s) related to community functions which can be useful for EM response; can benefit the concept of integrated response; or act as barrier to integration. Thus, words that fit more into community development or other areas outside the scope of public safety are discarded. With this established rule for managing themes, themes were analysed based on their existence, usage to

emphasise EM response and their frequency of use by the participants in relation to past EM response to emphasise their importance.

The data analysis for each objective drew meaning from the theoretical bases of EM response and EM in the literature review chapter. In addition, implications were also discussed using existing knowledge and concepts in EM response that exists in literature. This helped to ensure that both conceptual and rational analyses of themes were related to the research scope, generated relevant outcomes and increased the validity and reliability of the research results and discussion (Saunders et al. 2009). Through this process, the major limitation of content analysis, which is the difficulty in locating unobtrusive comments and their relevance to research questions, was managed. Classifying the themes into main and subordinate themes also proved useful in determining which concept to analyse. For example, resilience was mentioned by a couple of respondents as one of the reasons they were able to respond effectively to incidents in 2011 and afterwards.

Although resilience is not one of the classified themes in this research, this theme is considered and interpreted as one of the characteristics of community functions which enhanced the effectiveness of response carried out by the community. In addition to this, the discussion of analysed themes was based on the ability to explain the relationship between themes and patterns of responses generated by the themes from the research findings. The implications of the pattern created by the themes derived from the literature review were also discussed based on theories in EM and practice in EM response. This process has served as a monitoring criterion for ensuring that the primary data collected using interview, focus group and secondary data from case study and literature review are well triangulated (Krueger and Casey 2009).

3.4.2 Validity, Reliability and Field Issues

Like all research, the present study has paid attention to the issue of validity and reliability in order to minimise the possibility of collecting incorrect or irrelevant responses or information (Saunders et al. 2009). Validity is the degree to which a research finding accurately represents what the actual situation, concept or phenomena is (Collis and Hussey 2009). Reliability on the other hand is the stability, repeatability and consistency of data or information (Collis and Hussey 2009). According to Golafshani (2003), validity and reliability are conceptualised in the qualitative data collected (p. 604).

This understanding has helped to ensure that this research followed a rigorous process of repeating information, and of relating the research questions and objectives with each other throughout the interview, FGD and literature review processes. This develops confidence that the validity of results has been increased and consistency created through data triangulation. This process has also been repeated for each type of data collection method and subjected to the verifiable process of linking information with concepts of EM, EM response and related theories in this field of study.

In this way, the threats to reliability such as subject error and subject bias have been minimised and consistently managed throughout the research process. In order to increase the reliability of data collected and the validity of results, the researcher has ensured that participants interviewed and those recruited for the FGD understood meanings of concepts and themes and their relevance to EM and practice. Lastly the research philosophy has also helped to improve the ability to manage the research process, data collection, validity and reliability of findings. The issues of reliability, validity and adhering to content analysis process have been a guiding factor when conducting the fieldwork and data analysis.

Despite this, the researcher faced problems relating to a continuous snowball effect (which is multiple and continuous referral to different people) of the research area. This problem was managed by continuously assessing the relevance of data to research questions and objectives. Also, continued monitoring by the researcher's team of supervisors was strategic in maintaining the focus of the research. Recognising these difficulties highlights potential problems peculiar to using qualitative data collection methods to explore research areas (Given 2008). It is also important for researchers who want to explore areas such as EM to be aware of the possibility of multiple and continuous referral, which often leads to data saturation.

3.5 Summary of Chapter

This chapter has discussed the selection of research design for this study, and provided information on sources of data, research participants, plans and methods for data collection and analysis. The methods were chosen after reviewing several methods available. Due to limited space, this chapter has narrowed the comparison to qualitative and quantitative research approaches of which the qualitative research design was found more applicable to this study area. The research philosophy provided better understanding of the need to make distinction between justified belief and opinion from data collected and their relevance to the research area. The implication of this led to preference of the inductive to the deductive approach.

Qualitative research and inductive processes led to selection of data collection instruments and sources which were triangulated to increase validity and reliability of results. Being able to use multiple qualitative data collection instruments also allowed the triangulation required for content analysis, which is the method of data analysis selected as appropriate for this research. Above all, the role of the research objectives and questions in determining and selecting the research design and methods has been emphasised all through this chapter. While each method has limitations, the consistency and combined methods of data collection helped to minimise these limitations making qualitative research a more suitable design for this study area. With this clarification, the next chapter presents research results which were gathered using the methods explained in this chapter.

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Chapter 4 – Research Results and Analysis

4.1 Introduction

This chapter presents the results from interview sessions and focus group discussions conducted in Lyttelton and Riccarton. It presents the responses from research participants using codes to represent each category of participant(s) and classifying responses under the research objectives they aimed to achieve. Section 4.2 defines the codes and provides an overview of participants, while sections 4.3, 4.4 and 4.5 present the results in a systematic manner so that themes that emerge from the results for each objective can be identified, interpreted, analysed and subsequently discussed in the next chapter. Section 4.6 summarises the results.

4.2 Overview of Research Participants

The description of the research participants and the organisations they represent are provided in Table 4.1 and coded accordingly for distinction and to avoid confusion in this chapter, and in the discussion chapter.

	Category	**Description**	**Code**
1	Lyttelton Community Organisation(s) & Government	TimeBank (TB)	**A1**
		Lyttelton Civil Defence Rep	**A2**
		Lyttelton Strengthening Community Advisers	**A3**
2	Riccarton Community Organisation(s) & Government	Student Volunteer Army	**B1**
		Civil Defence Emergency Management (CDEM) CCC	**B2**
		Riccarton Strengthening Community Adviser	**B3**
		Community Groups & Organisations (12 different groups/organisations)	**B4**
3	Others	Wellington Civil Defence, Community Resilience Department	**C1**

Table 4.1 Description of interview and focus group participants

There were more participants in the Riccarton area than the Lyttelton are, because Riccarton had a wider range of community groups and people willing to participate, while Lyttelton had fewer community groups. Most community groups in Lyttelton are linked to the TB, while SVA is linked to several groups and organisations in Riccarton and Christchurch as a whole. The contributions of groups were identified

during the interviews and focus group sessions. The research focused on examining the characteristics and nature of functions that existed in the two communities, and on groups that performed EM functions during the onset of disruptive events. The next section presents the results from discussion and interviews with all participants from the two communities.

4.3 Results

Four types of functions were identified to be relevant to EM:

1) Community Specific (CS) functions – activities carried out by groups and organisations in a community to support the community in meeting local needs. CS functions are organised and mobilised by community leaders and individuals assigned by the community to coordinate activities.

2) Impromptu functions – activities or tasks performed by skilled groups or organisations whose inherent expertise and presence in the affected community positioned them to render EM response activities and support.

3) Collaborative functions – activities carried out by community organisations, groups and networks of services supported by or in partnership with emergency services and governmental departments, such as community engagement units, welfare service providers, etc.

4) Structured functions – activities performed by specified groups and/or organisations recognised by emergency services or government, that are cooperating in a highly organised manner for the purpose of achieving a mutually agreed goal for the benefit of a community.

The results provide information about functions that were utilised during the 2010 - 2011 earthquake sequence, as well as ones which have been subsequently used for responding to incidents such as flooding, crime and anti-social behaviours, and pollution. The results also show the challenges experienced while trying to perform EM functions as well as the challenges of sustaining functions in the post-disaster period.

4.3.1 Community Specific (CS) Functions

CS functions operate as either organised systems, or activities spontaneously coordinated by people to support the community without help from governmental agencies. This was derived from the answers provided by respondents in Lyttleton and Riccarton. Key words that supported response activities in the communities during the response phase are emphasised in bold in the following excerpts:

According to participant **A1**;

"*There is the TimeBank (TB), we all had to work together to respond during major emergencies like, September 2010, February 2011, June 2011, September 2011 and in 2014. The coordinators and*

leadership of the TB are trying to create a hybrid civil defence model, so we're learning and experimenting. During last major emergency, which is the 2014 floods. We had our ***emergency response*** *at 3 sites; the first site was the* ***information centre*** *– this was where the community rang in to find out what was happening during the emergency. This was also the place where we sent information out. This was also the place where if people needed accommodation, they rang in here, and we found locals for them to stay with. We had people who were flooded in their house and we mobilised gears from here to help get them out of their house.*

Then the second site was the ***council service centre****: they acted as the official go-between the community and the council. They provided situation reports to the council, and they were the place where all the evacuated people went to. The third site was* ***Community House****: they cooked and provided food for people. They've got kitchen and cooked everyday… this place has been flooded etc. can you cook for them? We don't want to have 1 welfare centre like the CD model suggest[s] that we need, we think our community is adequately served by all these smaller places. And places where people will naturally go, so if they go there, they will find what they need during an emergency. It is much easier to operate in an emergency if you know your equipment, it is much easier to set something out in places where it is easy for community"*

Explanations of activities that fit into CS functions provided by participant A1 and A2 emphasised the ability of the community to cooperate based on the nature of TB activities since the TB's inception in 2005. Due to existing networks and relationships, the Lyttelton community through the TB was able to perform EM related activities, all of which can be classified into the information, social and physical function domains. The actual activities performed by the TB network during the quake sequence included the following:

1. *Warning messages and systems with evacuation arrangements*
2. *Emergency communications*
3. *Public information,*
4. *Refuge shelters (temporary accommodation/residence for victims of disasters),*
5. *Activate coordination centres to support people,*
6. *Mobilise resources required during emergency*

These function domains correspond to specific functions and activities as shown in that table below (Table 2.4 from Chapter Two).

EM Function Domains in C2	Function	Description	Code
Cognitive, Information & Social	Coordination, collaboration, communication	Response, plan implementation, emergency declaration, activation of emergency centre	F1
Information & Social	Communication, decision making, coordination	Issuing warning messages, public disseminating information, informing higher authority	F2
Social & Physical	Collaboration	Logistics and resources related functions such as evacuation, mobilising relief resources, providing immediate relief	F3
Cognitive	Capabilities	Technical capacity related functions such as registration and tracing, activating coordination centres, damage assessment, search and rescue, providing medical support, instituting public safety measures	F4
Social, information & physical	Communication, decision making, coordination, collaboration	Combined functions such as working with other agencies to implement F2 and F3	F5

(*Description and summary of functions*)

As participant **A1** stated; "*all [functions were] performed during the quake sequence, while other functions mentioned were developed after the earthquake sequence and because we recognised the need for them*".

To provide more explanation for how the TB was able to perform these functions during the quake sequence and other emergencies since 2011, participant **A2** replied;

"*We have the TB – a resource where you trade your skills. People work for hours which can be traded for service in their area of need, provided it's available in the TB. So, when it comes to an emergency, we already have the database of people linked in emergency; [the] TB is [has] 625 members of [with] these skills within the town. The TB is a fantastic tool to get resources, [to] get people to help in an emergency situation, to get people to provide emergency accommodation. It is built up from [a] trusted network of people; it's a great community network also which is all linked by a central database, which is very useful to get information out to the wider community – so if we need things or inform the people, it is very useful. Information gets sent by email (if the electricity is up), through newsletter or through*

the notice board. Lyttelton has[d] been trying to build a resilient community before the earthquake and this didn't just happen because of the earthquakes."

The following deductions were made from explanations of activities performed during the quake sequence and the manner in which the network evolved until post-quake period.

Functions/ Activities	Planned prior to quake sequence	Performed during quake	Performed during other emergencies	Planned since	Conclusion
F1	o	o	√	√	Developed after quake experience
F2	√	√	√	√	Consistent function
F3	√	√	√	√	Consistent function
F4	o	o	o	o	Yet to be planned or developed
F5	√	√	√	√	Consistent function

Table 4.2 Status of CS-TB and EM function domains

From Table 4.2, it can be noticed that F4 (capabilities) did not exist prior to the quake sequence, and was not used during the quake sequence or during other emergencies that have occurred since then. It is also yet to be planned, perhaps because **A1** and **A2** considered this function a duty or responsibility of the Civil Defence. Table 4.2 further clarifies the specific function domains that were developed post-quake sequence. Making efforts to develop an EM-related function after the quake further emphasises the interests and willingness of the community to take the necessary steps required for response.

Participant A3 also explained, *they believe community groups or organisations are able to perform these functions if provided with appropriate training, equipment and resources*. However, A1 and A2 explained that *functions such as F4 might be slightly beyond the capacity of community groups or organisations*. It can also be noticed that F1 only became active after the quake sequence, this is because A1 and A2 explained that; *we [they] learned from the quake experience the reality and consequences of our [their] isolated location as a community, so we [they] developed emergency plans and ways of informing our [their] community that there is an emergency*.

This shows the relevance of knowledge and experience of hazards and shared values within the community, as well as of the established social infrastructures and partnerships that the TB possesses, even though positive economic trends and EM resources and skills are average.

Similar questions were asked with the aim to identify and investigate the characteristics of community specific functions in Riccarton. The most prominent function is performed by the Student Volunteer Army (SVA). The following data supports the views that community specific functions exist and are being performed by the SVA.

B1 answered;

"*We are very much still an **emergency response** provider when it comes to disasters, and has been involved in various responses in different capacities. We responded to the Christchurch flooding in March 2014, which had huge effects on areas affected badly in the quakes. We mobilised students within 24 hours of the floods starting, and helped residents in the Mairehau area, St Albans, Lyttelton and the Heathcote Valley (with the help of Heathcote Valley Primary School). In this instance, SVA was a hands on responder, working with the City Council and Civil Defence, listed as one of their service providers that the public could contact for help.*

We are currently helping to fundraise and send over canned food for Cyclone Pam Disaster Relief in Vanuatu. We held a bake sale on UC campus as well as appealing to the UC community to donate food. Here SVA is one of many community groups trying to raise awareness and fundraise to help the many island communities recover". Unlike the TB, the SVA did not exist before the 2010 earthquake, but was one of the groups that spontaneously mobilised people to help the severely affected places in Christchurch. SVA confirmed that they performed the following EM activities;

1. *Mapping resource inventories (managing information of all resources used to implement emergency services/products)*
2. *Activating coordination centres to support people*
3. *Mobilising resources required during emergency*
4. *Providing immediate relief to people*

These four activities can be classified under social (F3) and physical function (F5) domains. The ability of SVA to perform these response functions without a similar network pattern like the TB shows that F3 and F5 functions may be delivered by institutions with access to human resources and platform for mobilising such resources. The SVA did not indicate any intentions to develop F5 functions/activities. The status of SVA and its EM response function capabilities are illustrated in Table 4.3.

Functions/ Activities	Planned prior to quake sequence	Performed during quake	Performed during other emergencies	Planned since	Conclusion
F1	o	o	o	o	Yet to be planned or developed
F2	o	o	o	o	Yet to be planned or developed
F3	o	√	√	√	Function that began during the quake & remain consistent
F4	o	o	o	o	Yet to be planned or developed
F5	o	√	√	√	Function that began during the quake & remain consistent

Table 4.3 Status of SVA and EM function domains

It can be noticed that the SVA has maintained the operations of F3 and F5 to respond to disruption events or response needs without developing F1, F2, and F4 post-quake sequence. It can then be inferred that perhaps F3 and F5 are the only functions SVA is able to perform. In any case, it acknowledged that the SVA has continued to operate since its inception. More discussion on CS functions and comparison can be found in Appendix 1, and in Chapter Four; sections 1 and 2, respectively.

4.3.2 Impromptu Functions

Impromptu functions were also identified during the investigation process. They are defined as unplanned contributions to EM response by certain groups/organisations whose inherent organisational expertise and presence in the affected community positioned them to perform undelegated EM activities. The organisations identified to have performed impromptu functions are:

a) The Navy
b) The Coastguards

The presence of both during the 2011 quake was significant and beneficial to Lyttelton. The naval vessel; HMNZS Canterbury (L421) was already in Lyttleton harbour as part of a joint Australian-New Zealand task force for disaster-relief operations. It was already loaded with resources such as vehicles, supplies and personnel required for response to such an event (UC CEISMIC 2013). This happenstance made impromptu function in Lyttelton which was not possible during the 2010 quake, possible during the February 2011 quake. The main activities performed in this function include:

- Setting up soup kitchens around the township
- Serving over 700 meals for the first couple of days to local residents

- ❖ Performing security patrols
- ❖ Guarding cordons around damaged buildings and conducting assessment
- ❖ Travelling to Wellington to re supply, when supplies ran out

Public acknowledgement of these activities is included in Appendix 1 (under Chapter Four, Section 3: Impromptu Functions)

A3 further confirmed;

"Lyttelton has geographically bounded communities and [a] community of interests: but [it is] strongly influenced by the geographical boundaries which meant that if anything needed to be done, people just get on and do it. Communities are quite distinct and recognise that if there is a need, they are part of the response and part of the solution to the response. This has been the main factor, a player and a drive[r] for how the community in Lyttelton works the way it does. It has been a driver in helping the council service centre in Lyttelton work the way it does, especially in ensuring better preparedness for future disaster and having plans in place. Because of the fact that they were cut off for days during the 2011 earthquakes, ***the naval forces*** *were able to assist with support and meals. If this didn't happen, it would have been down to the locals and they would have struggled to sustain the service required for days. It appears the commander had sufficient leeway to act as [he] deem[ed] fit, which allowed the function to be undertaken.*

Both **A2** and **A3** stated;

During the February earthquakes, ***the coastguards*** *were fantastic, they took troops over to Diamond Harbour, [and] made sure they were getting supplies, so while the road can be a divide thing when it closes, it can also be a linking thing for exploring and using other options. There was closure of roads, [so] the sea was used to bring in supplies. The* ***TB*** *also played an important role in February. [They] helped with food they were fantastic and supportive"*

The coastguards came every day to help during the 2011 earthquake, but [they] were not needed for the flooding because people who needed help or emergency accommodation got one [it] by booking hotels or through accommodation allocation from the TB. Even though they were badly affected, they were able to look after themselves and [the] community in Diamond Harbour. People were looking for opportunities to help people, [they were] looking at the positives, and collaborating [in] the ways they worked together, [building] relationships, which are the benefits of the incidents"

It can be noticed from this response that the TB is also mentioned as participating in activities serving impromptu functions, but only in a support capacity. The TB has been identified as serving an existing

CS function embedded in the community, and the TB's local knowledge of the community and established relationships provided the information access (within the information function domain) required for impromptu functions to operate. Though the TB might appear as a major provider of impromptu functions since it was originally designed for a non-EM response aim, its continued undertaking of EM function and being able to operate without the Coastguard and the Navy differentiates its activities from the impromptu function category. The characteristics of its purpose provided the necessary social, physical and information domains required by the Navy and the Coastguards (who had cognitive and information assets) to operate.

Participants **A2** and **A3** both identified that some of the EM roles and activities carried out during the quake were:

*"**Emergency response activities**, which were based on the plan jointly owned and understood by emergency services and community in Lyttelton. They also helped to issue **Warning messages and emergency communication** were used for evacuation arrangements which had been provided by fire, police, prior to the incident, but carried out by the coastguard, TB and community members."*

Participant **A3** further explained:

*"**Refuge shelters** providing [provided] support to ensure that temporary accommodation were [was] available for victims of the quake to be moved into, and this was done by all available support and in collaboration with the community and the TB. **Tracing people** during emergencies, **activate[ing] coordination centres** to support people and **mobilise[ing] resources** required during [the] emergency was also done as part of response arrangement[s] but as joint efforts. The coastguards [and] naval forces cooperated to **provide relief** which was led by the TB and Community House in Lyttelton.'*

The pattern of responses from all participants show that the TB is a prominent community function. However, the responses from **A2** and **A3** provided a deeper context for other groups that supported response during different emergencies in the suburb. Major themes such as collaboration, working together and relationships which have emerged from this section are similar to the themes identified in the literature review as essential for improving EM response. These themes enabled impromptu functions to be performed as EM response activities during the 2011 quake. Furthermore, the level of cooperation and support provided by government and other community groups linked to the TB might have made the function more effective.

Functions/ activities	Community organisations/ Entities (O1)	Government organisations/ Agencies (O2)	Conclusion
F1	o	√	O2 led and performed this function, but worked with the community to function
F2	√	√	Joint efforts to perform this function
F3	√	√	Joint efforts to perform this function
F4	o	√	Only O2 performed this function
F5	√	√	Joint efforts to perform this function

Table 4.4 Impromptu function activities and EM function domains

Table 4.4 shows that the EM response activities which the community organisations/entities and/or government organisations/agencies were unable to perform under the CS function were instead performed under the impromptu function. For example, F1 was a joint effort led by O2 and performed by O2. Also, F4 was solely performed by O2, thereby emphasising either the distinct role of O2 in EM response or a specific area where the community needed to develop more capacity. Participants **A1**, **A2** and **A3** confirmed that despite the short reaction period to the incident and without prior arrangements, the effective responses were "*due to their ability to partner, collaborate and plug into existing community functions within the community*." The explanation for this ability is examined in section 4.4.

However, the specific government organisations/agencies that performed impromptu functions after the 2011 quake have not been involved in response to other incidents in Lyttelton. The information in Table 4.4 shows that functions that involve networks of people and organisations can be effective during EM response without prior arrangements or planning. Furthermore, the support role played by the CS functions is significant in enhancing the effectiveness of activities performed by impromptu functions. This emphasises the ability of the community at risk to be involved in response to their own disruptive events, especially their ability to operate in the social and physical domains.

4.3.3 Collaborative Functions

Collaborative functions initially appeared to research participants as government organised functions. But with further investigation, it became clearer that collaborative functions are group or community functions which are funded, supported or facilitated by the joint efforts of local authorities, recovery authorities and CDEM and/or emergency agencies such as the fire service and police. Also, the organisations, entities or groups that were identified under this category were either inactive prior to the quake sequence or came into existence after the quake sequence. Although the governmental

organisations existed prior to the quake sequence, many of them changed their strategies or commenced initiatives to encourage involvement in EM activities following the 2010 event. The groups or organisations and their functions that fall under this classification are:

1. The TB: working with the council service centre, St. John ambulance service, fire service, police and other organisations.

2. The SVA: working in collaboration with the Christchurch City Council, Civil Defence, community leaders and other groups, churches, Project Lyttelton, BP, Mitre 10, Bunnings and Pizza Hut.

3. The Christchurch City Council (CCC): working with Civil Defence, Lyttelton TB and Civil Defence (CD)

4. Neighbourhood support teams: facilitated by the NZ police in the area, but involving collaboration between community groups, leaders, commercial organisations, universities, religious groups and other governmental agencies

5. Riccarton Project: comprising a committee that was formed using funding from Canterbury Earthquake Recovery Authority (CERA).

6. Riccarton Baptist Church: involving different groups and organisations, the strengthening community unit from CCC and other residential associations and groups from inside and outside Riccarton.

The range of organisations involved in collaborative functions indicates the willingness of organisations and groups to engage for the purpose of EM as discussed in section 2.5. Although EM response has been identified to have problems with collaboration as indicated in Table 2.2, collaboration can be seen to be possible at the community level. More discussion on this can be found in Appendix 1 (under Chapter Four, Section 4: Collaborative Functions).

Participant **A1** explained:

"*The TB is part of the community and we're trying to build the TB even more with people. We also have the Lyttelton Review through the information centre, because we don't want to force everyone to join the TB. And we have 1,500 people on that database, so we encourage everyone to sign up to that so they are getting instant broadcast. For the TB, everyone knows themselves or the people who are helping. The CD trainings seem illogical in an emergency, some of it is not common sense. But we link everyone who is interested into this network."*

Participant **B1** stated:

"*[The] SVA is committed to working with community organisations and groups, to make an emergency response as effective and efficient as possible. I am confident SVA can carry out the plans above to ensure this happens, as we all share a common goal in a time of need – to protect and care for the community.*

We are open to working with any community-oriented organisation when responding to emergencies. During the flood clean-up of 2014, many church groups and international students were among the volunteers working in Lyttelton and Heathcote Valley, which was incredible. Community and leadership groups such as Emerging Leaders has [have] also had considerable involvement in [the] SVA's previous work.

We have experienced the kind generosity of many local and nationwide companies who have donated goods to us during emergency responses, such as BP, Mitre 10, Bunnings and Pizza Hut.

We are on constant alert for any sort of disaster, and are prepared to work with other community organisations to provide help when needed. Despite there being no solid framework, or agreement between community organisations as to how best respond to disasters since the floods of 2014, [the] SVA retains close relationships with Police, the Fire Brigade, the council and Civil Defence in case of any disaster in the future. We have relationships with many people who are experienced in risk reduction, and so will ensure we retain these relationships so we are best prepared in the future."

For example, participant **B1** said:

"*We have worked alongside both the Council and Civil Defence when responding to emergencies, we communicate closely as to what needs to be done and where help is most needed. Therefore, we aren't necessarily doing work they would normally do, [the] SVA has a very unique role in emergencies: to give those a helping hand in a wide capacity who cannot do it themselves. We help with a wide range of things, but essentially we are helping a community get back on its feet after an emergency*."

According to participant **A3**:

"*What happened in 2011 has informed changes in the way government supports the community. There was a document produced that captured gross sets and [is] seen as useful in capturing the local community. The criteria for determining community groups involves people who have established systems, structure and reasons for being there as a group in the community. The community groups just carry on and were able to use these facilities for emergency response, even though Civil Defence was being used or operated from the information centre. It was a joint effort and felt very collaborative.*

Participant **B2** answered:

"*There are different functions and groups in the community, but emergency response is multi-agency. For example, the Lyttelton landslide involved the CCC, the Civil Defence, the Lyttelton CD, the TB volunteers, groups etc. [They] were all involved in responding to the emergency. Although response was local, it was supported by several agencies. Community makes up a whole bunch of different people and groups coming together*."

B2 further emphasised that "*while some communities in Christchurch are already performing some EM functions through the technical support provided by the government, others are also able to do the same if they are willing to engage and undertake EM roles or functions. But the ability of communities to perform EM functions will vary from community to community*.

This is because as explained by B2, the communities that have hazard knowledge, shared values and partnerships that can be used for mobilising resources for the community are likely to be more able to carry out EM functions especially ones within the physical and social function domains. B2 further explained and categorised the communities the Civil Defence worked closely with since the quake sequence as *networked communities, transient communities and affluent residential communities*.

"*The affluent residential communities which are geographically bounded often base their resource and skills in direct proportions to their knowledge of hazards and take personal insurance to secure themselves. Even though shared interests in terms of activities that interest affluent people exist, and there are good social infrastructures, there is little partnership to solve problems. Everyone is willing to pay to get the problem solved without being necessarily involved in the process of solving it.* **B2** claimed *this makes it challenging to plan with such communities. Transient communities have minimal knowledge of hazards, resources and skills because they live in Christchurch and work somewhere else and vice versa"*.

B3 emphasised:

"*In terms of community functions, although there is no TB operating in Riccarton, the monthly* ***neighbourhood support group*** *(neighbouring policing team), in collaboration with other agencies, is the platform that brings people together. And this has been going on for over 2 years; the [people of] Riccarton West have been bringing people together, in a way they never used to do before the earthquake. In that area, there are a lot of transient residents, long-term residents, Housing NZ [clients], social housing [residents] and different ethnicity[ies] in the area. The different groups didn't mix, and so the meetings are bringing people together and helping them to mix. And out of that have [has] come the community garden. And there is common ground café that bring[s] people together.*

There were other things such as the community garden they felt were [a] priority, and [they] felt they needed that more than [the] Time Bank, even though they agreed that [the] TB could be good. For example, a community garden was one of the strongest things they felt they would like to do. But producing vegetables and produce out of the garden was secondary to bringing people together; having them work together and using the opportunity to identify what their needs were, is equally as important as using it as an instrument to bring people together. And they have a team who work[ed] among them to ensure that they better communicate with residents in the area. So, it is more about what the community see[s] is a priority [that] they would work on − like doing things like BBQs in the park."

*Participant **B4**, being part of a group of different organisations that supported different people, but worked together when required, explained:*

"We formed the Riccarton Project Committee from some funds received from CERA. We are providing funds to get to [the] communities together. This has been a very good project and a lot of money has been put into that. We meet every month and try to make community stronger, there is also the Safe Growth (a training [programme] for empowering community delivered and funded by the council). [It] is also helping to bring people together to address their needs and the general community needs."

*While it seems that the functions performed by all groups and organisations in this category vary and are unrelated to EM functions, participants **B3** and **B4** both explained that "in the event of any emergency, even though we have not been directly affected by one, we can implement an emergency response plan if we have one: send warning messages, public information, mobilise resources and provide immediate relief.*

According to **B3** and **B4**, "*these factors are low at the moment except for resources and skills which the local and recovery authority have invested into since the quake. This is because a sense of community is just building in this area, being a combination of transient community, extended area with diversified community and relocated communities*."

B3 particularly emphasised:

"*We have communities who are able to do things for themselves now and look for ways they can do it. So, rather than going to the council to say this is what we want to do, they say this is what we want to do, and we need a little bit of help doing it. So, it might be [that they need] permission, funding, etc. to do it. But if the community isn't resilient, they will say we want you to do this for us or that for us. So, before the earthquake, there was no sense of community there. Even the community organisations tend[ed] to work as solos and never work[ed] together − no sense of community pride, ownership, no involvement or participation. But since the earthquake, there's more collaboration, and the Strengthening Community Team has been a catalyst in a way. Even the group[s] that are not in this area have played a major role in bringing people together in this area to work together. Policing*

team[s] and different organisations came together. It was a collaborative effort. For example, St. James Church, and even [other] churches are now working with other organisations in the area. Also, Riccarton Baptist Church, and many of the churches in the area, now work together to organise [a] joint youth forum. Hope Presbyterian and Oak Trust [are] now working together since the earthquakes."

This response by **B3** explains the low ranking of factors in the community, even though resources and skills are available through a range of government support measures present in Riccarton.

4.3.4 Structured Functions

This section examines existing functions outside of the case study communities in order to investigate the potential benefits of integrating existing community functions with structured EM response functions. To achieve the purpose of this section, **C1** being outside of the case study communities provided a useful perspective of community functions and the capacity of communities to perform EM response functions. Examples of community engagement for EM practice in Wellington were provided to answer the question(s) about community functions, the ability of communities to perform EM response role(s) and the nature of collaborative efforts with communities for EM purposes.

Participant **C1** explained;

"*We have communities of place and [a] community of interests – so we have tools that represent both definitions of community – for example, we have community arrangement[s] in urban area[s] and small suburbs that bring people together to plan how they will work together for the first 3 days of an emergency without any government support. This is not about the plan alone, but also about the planning process, the relationships formed based on the needs the community consider[s] critical during an emergency. It also involves how the community will make sure that the people who need to be fed are fed, [that] people are assisted in the event of evacuation, etc. It's also about how they can form relationships and keep people working together in a sustainable way.*

This is done by bringing all the community leaders together, comprising [the] owner of [the] supermarket, the vet, hospitals, doctors, elected officials in that area [and] known community drivers who meet to make things happen, etc., to understand what they value, what they love about their community. And then give a SWOC (Strength, Weakness, Opportunities & Challenges) analysis, which is a modified model of SWOT. What are the strengths, what are the physical assets we have, what [are] the opportunities to grow our community, how do we make our community better? What are the challenges for this community? These were all mapped out.

As the facilitator, we support the owner of the plan and get an MOU from the local council government saying the government recognises this plan and at the WREMO office we know these people and are aware of what they'll be doing from the EM perspective.

The role of CDEM is to support the community and not override it. So, we retain our status in the EOC with the assumption that they're implementing the plans developed using SWOC because they've worked through many things. So, the community can write up to a $5k to $10k IOU (no questions asked), to respond to emergencies in their community based on the SWOC plan facilitated by the CDEM. The community can then send the IOU (receipts included) to the council to have the IOU expenses paid. But ultimately what this does is it ensures that trust is built between the council and the community through the community leaders."

C1 explained that *"for many communities [that] the regional Civil Defence have [has] worked with in Wellington, they [the Wellington Civil Defence] have [has]found that communities can perform the following EM response functions, although some functions were at [the] organisational and structured[al] level performed by the Civil Defence. Functions such as plan implementation, disseminating warning messages, providing public information, tracing of people, inform[ing] higher authorities, evacuation, mobilising and providing resources for immediate relief and damage assessment are all functions communities are capable of performing*."

From the explanation by **C1**, collaborative structures tend to perform the following functions.

Functions/ activities	Community organisations/ Entities (O1)	Government organisations/ Agencies (O2)	Conclusion
F1	o	√	Can partly be done by O1, but mostly done by O2
F2	√	√	Collaborative
F3	√	√	Collaborative
F4	o	√	Only O2 in metropolitan cities, but possible in rural communities
F5	√	√	Collaborative

Table 4.5 EM response activities and collaboration for structured functions

Table 4.5 shows that while it is possible for communities to perform some EM response functions, it appears that all the four community functions identified in this research are yet to perform F1 and F4.

4.4 Results from identified Community Functions: Challenges

This section presents the challenges experienced and or mentioned by the interviewees. The detailed transcripts for sessions are in Appendix 1 (Chapter Four, Section 5: Challenges Managing and Maintaining Community Function). This section summarises and classifies all challenges discussed by interviewees. For instance, interviewees in Lyttleton explained that there was no major challenge or problem experienced during the quake sequence. Reports and documents have testified to the effectiveness of response arrangements carried out in Lyttelton during the quake sequence. However, many such reports fail to capture challenges experienced when responding to incidents after the 2011 quake. For example, there were problems experienced when responding to the 2014 flooding. Some of the challenges identified during response to this incident include technical problems with the communication software used for disseminating emergency information, which was meant to have been used for response during the 2014 flooding event (participants **A1** and **A3**).

Overreliance on this software during the 2014 event delayed emergency communications and hindered ability to promptly carry out functions from domains such as F1, F2, and F3. This problem made community specific functions less effective at the onset of the flooding event, a hindrance that was not experienced during response to the 2011 quake. The hub and facilitators of community specific functions found response to the flooding event more challenging than the quake sequence (**A1** and **A3**). Although a backup arrangement for data sharing and for communicating and mobilising people and resources has now been developed, this problem indicates the ripple effect and consequences of communication problems during EM response as explained by Klein (2008).

Similarly, CS functions in Riccarton during the 2011 quake experienced communication problems between affected people in the community and volunteers delegated to help them (**B1**). In addition to the lack of existing networks, facilitators and relationships to manage people in the suburb prior to the onset of the quake sequence, this communication problem made coordination even more challenging. Other problems experienced by community specific functions in Riccarton in 2011 and in Lyttelton include:

1. Lack of clarity of response strategy [B1]
2. Lack of knowledge of what to do or what help is needed [B1]
3. Difficulty managing public expectations [B1]
4. Communication problems with other organisations especially emergency organisations [B1].
5. Communication problems with affected people in community when attempting to mobilise local resources [A1 and A3]
6. Leadership friction between community members [B3 and B4]

7.	Challenges with funding to sustain community groups and networks [B4]
8.	Lack of clarity about situation and damage impact assessment (during 2014 floods) [B1 and B3]

These challenges can be linked to issues that arise from ineffective cognitive and information function domains. The problems outlined are related to descriptions identified in Table 2.2 in Chapter Two. For example, problem number 2 emphasises the potential implications of low levels of hazard knowledge and understanding of the response strategy (Comfort et al. 2004b). Although collaborative functions in Riccarton have been developing capacity to better respond to other disruptive events, problems such as leadership and funding identified in 6 and 7 above are challenges that may threaten the sustainability of SVA in the future.

Other challenges identified by interviewees were:

i. Sustaining the required level of interest in EM among participating community [A1, B2 and B3]
ii. Inability to promote interest in EM response functions and build relationships for EM as the prevalent mentality, rather than as an emergency survival mentality [C1]
iii. Difficulty nurturing the required level of cooperation for EM response regardless of the incident or hazard [A3].
iv. Lack of personnel to facilitate the type of relationships required for collaborative, and structured functions, since government resources are limited [A2, B2, B3 and C1].
v. Inability of EM personnel to teach EM principles and procedures in a way which the community can easily understand in order to be able to carry out basic EM response functions [A1 and C1].
vi. Fluctuation of people in communities or migration patterns especially in transient communities [B2 and B3].

Many of these problems are related to leadership issues which Crandall et al. (2006) explained as the difficulty in finding reliable teams of people to coordinate and maintain EM-related relationships. This in turn makes it difficult to build the required level of coordinated arrangements with community groups and organisations. According to Betts (2007) it is important to teach EM principles to communities; however, it can be challenging for professional emergency managers to widen the scope of community connectedness using a teaching approach. Ozanne and Ozanne (2013) explained that mechanisms and approaches differ for communicating emergency management principles and communities might not find the usual rigid training format user-friendly.

4.5 Barriers to Integrating Community Functions with EM response

The interviewees were also asked about the potential barriers they thought could hinder integrating community functions with EM response arrangements. Interviewees in Lyttelton identified the following barriers.

- Bureaucracy in the current EM practice [A1]
- EM practice retaining control without a distributed network [A1 and A2]
- EM practice being too rigid and inflexible [A1 and A3]
- Lack of encouragement and insufficient attempts from the Civil defence to engage or involve community in EM response [A1]
- Perceptions of community about EM roles and where responsibilities lie [A3]
- Lack of funding to make EM response roles sustainable, which also affects the availability of community for EM response when needed [A1]

A critical evaluation of these barriers indicates that they are not related to issues of C2 EM function domains (see section 2.4), but to issues relating to EM theories (see section 2.3). The difference between the two is that while the former (issues of C2 EM function domains) relate specifically to the response phase, the latter relate to human factors issues applicable to any discipline. The practice of EM as discussed in Chapter Two is based on comprehensiveness, integration, collaboration, flexibility and professional principles. For the response phase, Figure 2.4 explained the C2 structure as a process or system that is directed and one that delegates based on components of cognitive and information domains, not as a rigid and inflexible structure, yet the participants saw it as such. Interviewees in Riccarton also identified the following foreseeable potential barriers.

- Lack of emergency response plan: which affects the level of confidence and readiness for future EM response, communicating with community, determining leaders in the group, identifying partner organisations for EM response purpose and maintaining relationships with government and emergency organisations [B1].
- Low level of hazard knowledge and awareness about risks, hazards and available EM support [B3]
- Data protection or restricted sharing information with people or groups who are not colleagues in the same emergency organisation [B3 and B4]
- Frequent changes in governmental sector and departments further complicate communication for EM response and future preparedness [B2]
- Organisational arrogance of some emergency agencies or services [B2], influencing their willingness to delegate or integrate functions with community.

➢ losing momentum of EM response arrangements in “peacetime” [B2]
➢ Unwillingness or inability of community to carry out EM functions in future [B2 and B3]

Again, these can be explained or managed through the EM theories in section 2.3. For instance, the first barrier relates to the normative theory of EM and practice that influences preparedness for response; an issue that can be resolved by developing an emergency plan. Although it can influence the effectiveness of response, it is not viewed as a barrier since impromptu functions operated well in Lyttelton without a prior plan. Furthermore, it takes cooperation from all stakeholders to resolve this issue as mentioned by B2 who said; “*the CDEM is already working with networked communities to develop response plans post-quake*”. This action by CDEM also emphasises that the EM system is not rigid, neither is it one that retains control, yet it is continuously perceived as such.

These results have shown that organisations and emergency sectors in Christchurch are aware of EM issues. However, the disruptive events that have occurred in both communities examined have influenced the level of awareness about EM practice and the need to be better prepared for response to future incidents, as evidenced by frequent references to different incidents during the interview and focus group sessions.

4.6 Summary of Findings and Chapter

This chapter has presented results of data collected through primary sources; semi-structured interview and focus group discussion and analysed using content analysis techniques. As a result, potentially useful services, functions and roles of community groups and organisations have been identified which will be discussed and analysed in the next chapter. However, organisations and functions identified through case study analysis also contributed to the results presented in this chapter along with new organisations which emerged after the quake sequence. Section 4.4 presented results on existing functions with a focus on EM response-related activities performed after 2011, their wider community engagement, challenges experienced and continuity of operations. In summary, the lessons and issues identified in this chapter that are developed in subsequent chapters are:

- Communities possess functions that can be utilised for EM response
- Four relevant, but distinct functions were identified from Lyttelton and Riccarton i.e. CS, impromptu, collaborative and structured functions
- These four functions were able to implement response activities that fit into the social, cognitive, information and physical domains of C2 structure
- Community functions were able to operate in the most problematic function domains for traditional EM practice i.e. the cognitive and information function domains

- Challenges with operating functions are more or less generic issues that can be explained through theoretical bases for EM practice rather than as issues specific to EM response arrangements.
- Most barriers to integration identified by interviewees are not problems specific to EM response, but can be resolved through theoretical bases for EM as well as application of EM principles

These lessons and summary of the research outcomes are used in discussing the findings within the context of the literature review in the next two chapters.

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Chapter 5 – Discussion I: Implications for EM Response

5.1 Introduction

The purpose of this chapter is to present, discuss and analyse the implications of the research results. To achieve this purpose, it is divided into sections that discuss the results on community functions within the context of EM response examined in the literature review chapter. Other sections discuss the management of challenges and barriers identified by the interviewees, drawing clues from theoretical and practice bases of EM response. This chapter places the results within the context of the literature review in order to answer all research questions and identify essential components for designing the Integrated Response (IR) Framework which is the research aim.

5.2 Functions and EM Response

The literature review chapter has helped to explain how EM response works. Section 2.4 specifically focused on C2 and, its conceptual process that involves command, control, sensemaking, and execution using situation information to deal with the effects of a disruptive event (Alberts and Hayes, 2006). This section also identified key dimensions of C2 approach that explained the patterns of interaction, relationships and collaboration required for function domains that help the decision-making process and distribution of resources and information for response needs (McEntire, 2007; Alberts and Hayes, 2006). Through the interviews and focus group sessions, it was found that functions may operate in a standardised and organised manner, having supply bases of manpower, resources and high knowledge of hazards and the risks they present. Others operated in a spontaneous manner or on a "when needed" basis. Discussion on identified functions (i.e. background, components, and mode of operations) are provided in Appendix 1 (under Chapter Five; Section 1 – 4). The next section discusses the EM response function domains each of the functions listed above fit into.

5.2.1 Community Functions in EM Response Domains

CS functions were identified in both communities that possessed different modes of operation. For example, CS functions in Lyttelton utilised benefits of having existing networks and relationships within the community to perform functions classified under F2, F3 and F5 domains (Table 2.4). CS functions in Riccarton operated in a spontaneous manner to perform functions classified under F3 and F5 domains (Table 2.4). While Figures. 4.1 and 4.2, and Tables 4.1 and 4.2 provided explanations for these variations, the main lesson to draw is that CS functions were able to cooperate with social, economic, religious and educational groups or organisations to perform functions classified under F2, F3 and F5 domains which are activities that fit into the social, information and physical EM function

domains. It has been observed that CS functions were used during response to disruptive events so it can be inferred that CS may be utilised for EM response. CS functions, regardless of being spontaneous or adopting benefits of existing networks in the community, are able to operate within social, information and physical C2 function domains.

Impromptu functions were also identified in one of the communities examined. This function conducted operations that can be classified under F1 and F4 (for some activities), and F2, F3 and F5 without prior response arrangements. The specific activities carried out by impromptu functions were resource allocation, awareness of intent, roles and responsibilities. Other activities also involved resource allocation; using information assets of the Navy and Coastguards to share response information through information access provided by the affected community (see section 4.3.2). All these activities fit into the C2 function domains such as social, cognitive, information and physical. Such a wide range of performance demonstrates the ability of impromptu functions (that comprise cooperation between specialised organisations such as the Navy and coastguards and community networks) to conduct EM response duties during emergency without prior rehearsal of arrangements. However, it should be noted that the training naval and coastguard officers had undergone must have played a significant role in facilitating the response activities that were carried out. Impromptu functions equally represent the ability of community functions (which are not first response agencies) to operate in EM response function domains.

Unlike CS and impromptu functions, collaborative functions evolved in the post-quake period across Christchurch City especially in communities at risk. Community groups, local authorities, emergency services and businesses began to collaborate in an attempt to deal with disruptive events of all types. Section 4.3.3 explained the various partnerships, relationships and contributions of stakeholders in the case study communities. Appendix 1 (Chapter Five, Section 3: Discussions on Collaborative Functions) provides detailed discussion on the nature of relationships, but a critical assessment of collaborative functions indicated that activities within the social, physical, information and cognitive function domains were being performed.

While some activities were identified as possible, activities that fit into the cognitive domain were said to require technical capabilities or the development of technical capabilities (**B2**). This perhaps explained why F4 domain functions were either not possible by CS functions or were performed by specialised organisations (i.e., the Navy and the Coastguard) as impromptu functions. Regardless of this potential limitation, this research emphasises the importance of integration and of not utilising one function for all response domains. This emphasises that the limitations of one function can be enhanced by the strengths of another function or through the concept of EM response examined in section 2.4.1. It also emphasises that collaborative functions are more likely to be possible or effective in networked communities, rather than in transient or affluent residential communities (**B2**). While the interviewees

mentioned this, the experiences in Lyttelton and Riccarton, being networked communities, testifies to this statement.

Structured functions were identified in another region with the purpose of determining the possibility of integrating community functions with EM response arrangements. It was found that in communities at risk in other regions in New Zealand, there are different arrangements to develop and increase capacity for response. Detailed discussion on structured functions is available in Appendix 1 (under Chapter Five, Section 4: Collaborative Functions). It was discovered through the semi-structured interviews that activities from EM function domains F1, F2, F3, F4 and F5 were being performed through the mutually agreed response arrangements between stakeholders in communities at risk. Stakeholders in this sense refers to the context of the coordinated EM principles explained in Appendix 1 (under Chapter Two, Section 1: Definitions and Explanations of EM Principles).

Table 4.4 showed that some of the activities for F1 and F4 function domains were performed by emergency agencies or by local government. Again, this confirms that certain activities and function domains will need to be either shared responsibilities or sole responsibilities of the emergency organisations or government. However, it is important to emphasise that the inception and continuation of EM activities performed by structured functions in the Wellington region are based on officially recognised arrangements through a signed Memorandum of Understanding (MoU) (**C1**). The implication of this for a city like Christchurch is that having formal recognition of response arrangements between communities and the local Civil Defence or government may be key to more effective response. While the capacity of communities and the Civil Defence to operate effectively within the C2 function domains vary as discussed in this section, community functions are nonetheless important and may be suitable for EM response arrangements.

5.3 Challenges and Barriers

This section examines challenges with maintaining community functions identified in section 4.4 and barriers to integrating community functions with EM response arrangements identified in section 4.5. The difference between the two is that while challenges are issues that threaten sustainability of community functions identified during this research, barriers are factors that interviewees consider as a hindrance to integrating community functions with EM response arrangement. Understanding the difference establishes the contribution of this section to the research objective and IR Framework in the next chapter. Challenges indicate that community functions also have demerits which need to be examined in order to avoid compounding problems with EM response. While the merits provide strong justification for their usefulness, challenges like those identified in section 4.4 help to identify gaps in and limitations of the functions.

However, it is noticeable that the challenges identified relate to low knowledge levels, cooperation with other organisations, leaders, funding and other issues. It is also noticeable that challenges that relate to sustaining relationships and collaboration with other organisations were mentioned by interviewees involved in collaborative and structured community functions. These probably show that the functions have not been operating long enough in the community to develop strong networks like CS functions. For example, the factors embedded in CS functions provide strong justification that networks of several groups and organisations can operate together based on a unified goal. In fact, the numbers of organisations involved in the community hub (the TB) in Lyttleton post-quake sequence have increased rather than decreased as shown in Figure 5.1.

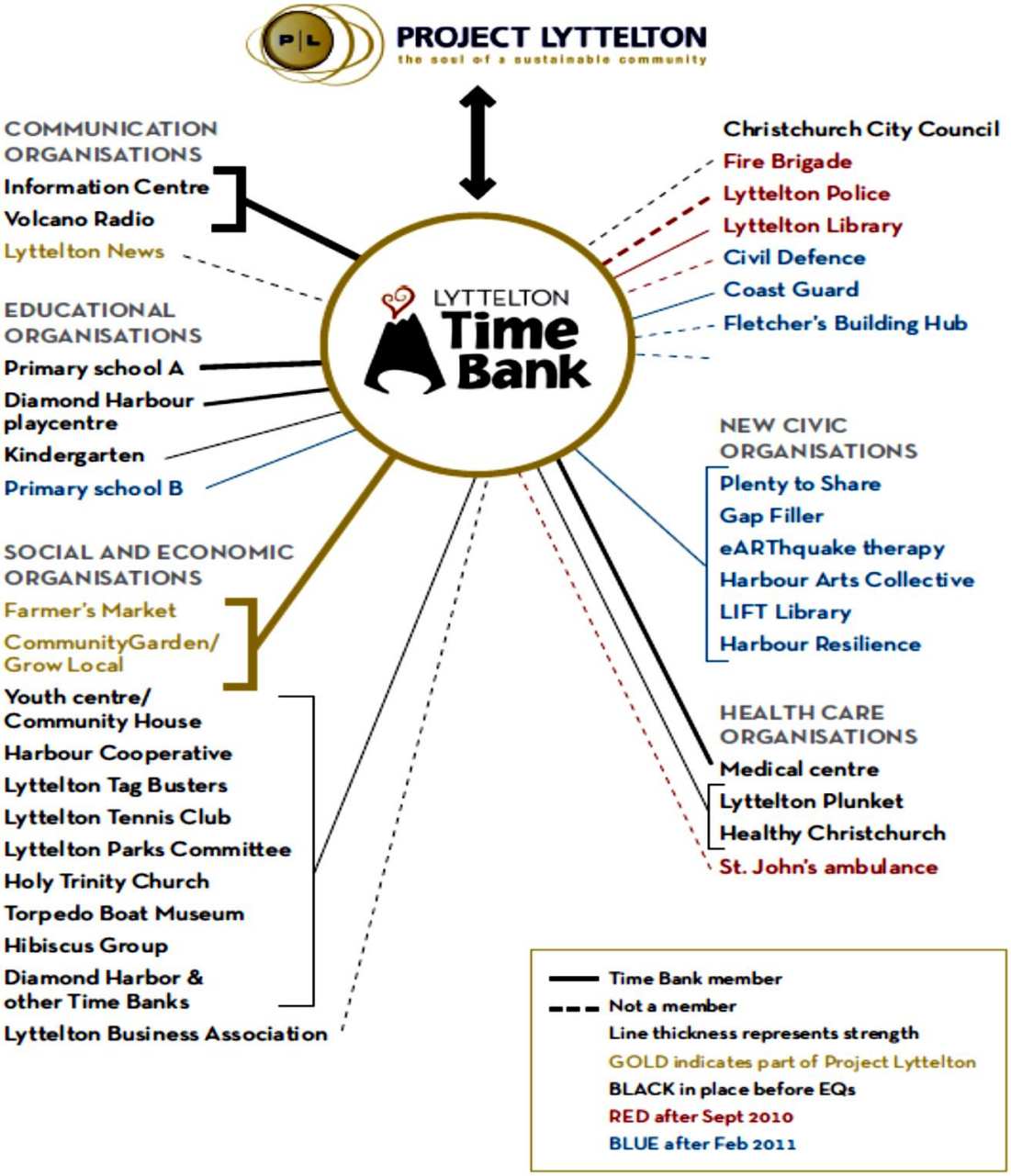

Figure 5.1. Time Bank (TB) Network after quake sequence (Ozanne and Ozanne 2013 p 34)

As seen, while some organisations are not TB members, they support the activities of the community. However, it can be seen that the Coastguard, which was part of the response activities performed by impromptu functions, is now a member of the community network that make up CS functions. It is worth emphasising that in the case of Lyttelton, the TB only operates as a hub that coordinates connections, relationships and the nature of the activities that take place between organisations and groups in Lyttelton. Although the capacities, duties and descriptions of each organisation or group that is part of the hub vary, the TB is able to draw from available and relevant skills present within its network for the purposes of EM response. Demonstrating such a level of coordination and communication makes the features of this community specific function a strong contribution to improving EM response. The ability to coordinate, collaborate and communicate effectively in "peacetime" proved useful during response to every incident that has occurred in Lyttleton. Such a level of community knowledge, interaction and understanding of community is often lacking in the formal EM systems, making response more challenging during the onset of major incidents (Betts 2007).

However, it can also be argued that the commitment of CS functions to effective response as seen in this case is informed by their understanding of the possible implications of lack of coordinated response as a direct threat to their survival (Betts 2007). Having a good understanding of coordinated response relates to response strategies evaluated in section 2.4 where the potential effect of an incident on the environment determines the situation information and reactions (Alberts and Hayes 2006). Situation information of the incident then influences sensemaking of the situation and execution of activities required to manage the effects the incident has on the environment (Alberts and Hayes 2006). Although the C2 model explained by Alberts and Hayes (2006) is often seen as a rigid one, the activities performed by CS functions have indicated that integration is possible for EM response.

Another justification for integration is found in theoretical EM principles. The comprehensiveness principle mandates emergency managers and organisations to take into account all hazards, all phases, all stakeholders and all impacts relevant to any emergency (IAEM 2007). In order to do this, the collaborative principle mandates the creation and sustenance of broad and sincere relationships among individuals and organisations for EM purposes (FEMA-EMI 2011). Such EM purposes provide a unified objective for integration of functions and for EM professionals to maintain relationships with communities at risk. This shows that collaboration has a background in EM principles, but the challenges associated with lack of collaboration or inability to collaborate can be explained or managed through the theories examined in section 2.3 in the literature review and listed again below.

- Normative theories can increase understanding of EM principles and ensure effective EM (Drabek 2004).

- Micro theories and broad perspectives can enhance understanding of human behaviours (Drabek 2004) and systems theories to predict and study human behaviours in disruptive events (Davies 2015).

- Embryonic theory uses case studies of disruptive events to learn lessons and formulate frameworks from past response scenarios that can improve future ones (Drabek 2004), as intended by this research.

- Decision and management theories are vital in understanding the stressful phase of response and how resources, information and situation can be better managed and coordinated (Klein 2008; Yu et al. 2014).

These theories provide suggestions for solutions and help in answering 'how' the challenges identified by interviewees can be managed or solved. They also further justify the need for research of this nature that focuses on developing a framework for solutions to problems of EM response and strategies for improving them. Similar measures can be applied to dealing with barriers to integration. The barriers identified in section 4.5 are also related to human factors or organisational problems. While the coordinators of the Lyttelton hub perceived insufficient attempts of or lack of encouragement from the Civil Defence, interview data from Riccarton indicated otherwise. The SVA, for example, had been formally recognised by the Civil Defence as a community organisation capable of EM response (**B1**). Thus, these barriers can be explained and resolved using broad perspectives and micro theories that draw inspiration from social sciences and reflect on substantive theory formulated to predict human interaction and behaviour during disruptive events (Stallings 1995; Jenkins 2003; Drabek 2004).

While these barriers can be fundamental problems in practice, and require further investigation, they are not problems that are inherent or integral to the system. Barriers such as these can be considered as subjective, relating to human interpretation and the practice approaches taken by a selected few when implementing EM in a specific community and for a specific problem relating to EM response arrangements or C2. However, many of these barriers may be managed by understanding the strengths and contributions of each organisation or community group and the nature of the EM characteristics they directly enhance. Figure 5.2 illustrates the categories of networks, relationships and organisations that can improve patterns of interactions for EM response purposes.

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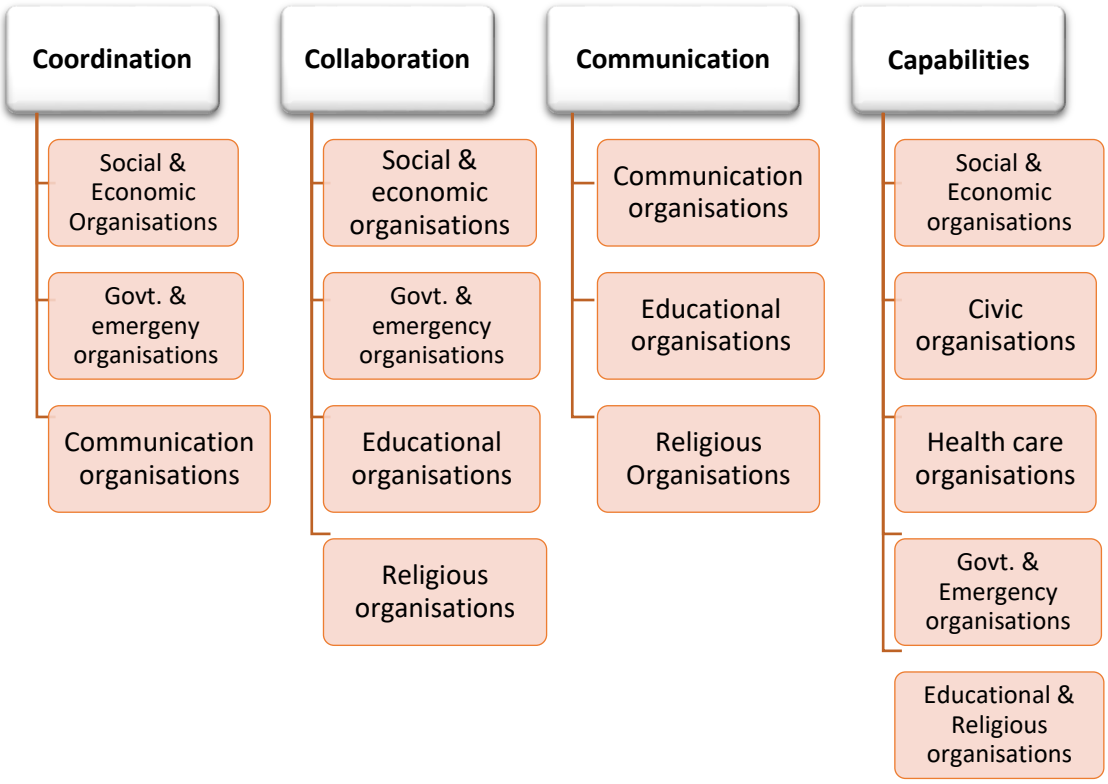

Figure 5.2 Categories of Organisations and community groups that enhance EM response relationships and interactions

These categories of organisations and community groups enabled CS, impromptu, collaborative and structured functions to perform EM-related activities when responding to disruptive events. It can then be inferred from the discussion in this section that while barriers were identified by interviewees, the characteristics of community functions (especially CS functions) provide possible means for dealing with these barriers. Challenges identified were also not EM response-specific, but related to perceptions which may be solved through the application of EM theories and principles. Thus, this section has focused on answering the second research question: What are the barriers and/or challenges which can hinder integration of community functions with EM response?"

5.4 Benefits of Integration

The interpretation of results in Chapter Four, and the discussion in this chapter, have all pointed to the potential benefits of the community functions identified during this research. It also means that the positive impacts of community functions can be transferred to EM arrangements through integration. For instance, the challenges associated with navigating unusual environments during crisis periods which emergency organisations experience can be managed by working in partnership with affected communities through community functions. As seen in the case of impromptu functions, the Navy (which had expertise that is useful for response) was able to cooperate with community functions to

carry out EM response activities that fitted into all the C2 function domains. Other benefits of integrating community functions with EM functions can be summarised as follows:

1) Integration is strategic to addressing the problem of the inadequate capacity of the emergency sector for dealing with large-scale disruptive incidents. The response activities carried out by impromptu functions in Lyttelton testify to this statement. Regardless of the scale of the incident, the capacity of the Navy and the Coastguard in collaboration with community functions, was sufficient in ensuring effective response in the community despite circumstances that initially limited the overall response.
2) Integration is important if confusion is to be minimised during response. The integration of community functions with EM response provides opportunities for emergency managers and agencies to better understand the community prior to the onset of any disruptive event, and vice versa. Integration encourages the nurturing of relationships that facilitate EM response activities especially those that fit into the response function domains.
3) Integration enhances the process for resource allocation and distribution as seen in the case studies. Even when resources from the emergency sector were limited, community functions were able to identify other sources of resources within the community that could be mobilised for response needs. This was possible in both Lyttelton and Riccarton through CS functions, impromptu functions (Lyttelton only), and collaborative functions performed during and after the quake sequence for dealing with different disruptive events.

Therefore, the immediate benefits of integrating community functions identified in this research with EM systems are key in solving the problems experienced during EM response. While community functions are not flawless, the immediate benefits of integrating functions still ensure that response is effective. For example, some of the newly formed networks that operate from Riccarton Baptist Church (now a community centre) have been aiding response strategies to incidents relating to crime, anti-social behaviours, etc. [**B3** and **B4**]. While such incidents are different from disruptive events caused by natural hazards, collaborative functions are being utilised for enhancing safety in the community. Figure 5.3 shows the decline in burglary crime in the area since collaboration between the police, the Christchurch City Council, the Fire Service, housing agencies, local private businesses, the University of Canterbury and the community at risk started in December 2012 (Neighbourhood Policing Team 2014).

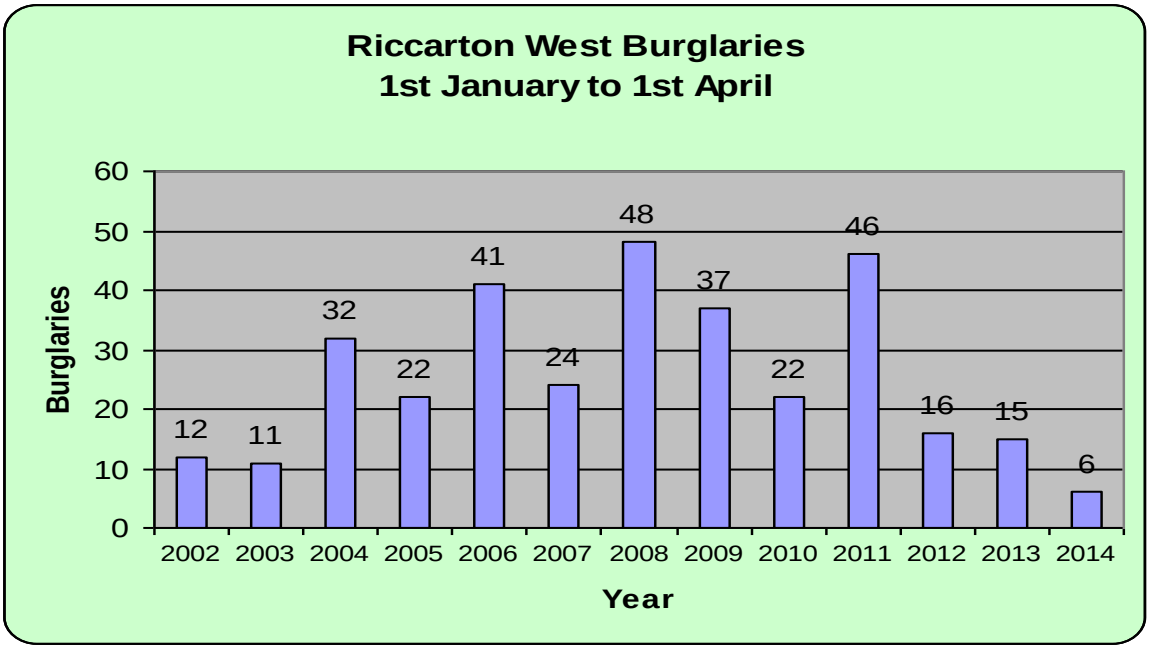

Figure 5.3 Riccarton West Burglaries declining since 2012 (Chart Courtesy NZ police- Neighbourhood Policing Team; 2014)

Although this response is being facilitated by the police, many of the strategies for crime reduction were suggested by the community at risk. Such positive outcomes support the effectiveness and benefits of integrating community functions with EM response arrangements. This also presents the concept of integrated response as an approach for dealing with different types of disruptive events. More detailed discussion on short-term benefits can be found in Appendix 1 (under, Chapter Five, Section 6: Discussion on Benefits of Integration).

The medium to long-term benefits of integration are also feasible from the characteristics of the community functions identified. For instance, impromptu functions emphasised the possibility and benefits of information sharing and communication between all organisations, groups as well as community and emergency organisations as seen in Lyttleton during the 2011 quake emergency and beyond. Prior to now, the emergency phase has often been characterised by confusion and communication breakdown as identified in some of the case studies of disruptive incidents mentioned in Chapter One. Impromptu functions clearly show that it is possible for emergency and first response organisations and local authorities to cooperate and work with affected communities during an incident. Communication is one of the challenging themes that is often difficult to solve during response (Klein 2008), but it was possible through impromptu functions.

Collaborative functions, on the other hand show the benefit of delegation and decision making, which is influenced by having a good understanding of the type of community function that can perform EM

functions. Through this function, it was realised that networked communities are empowered to perform EM response functions, and EM roles and responsibilities can be delegated to them. The high capability displayed by networked communities is beneficial to EM response (Van De Ven and Walker 1984). This benefit is crucial to solving problems associated with traditional multi-agency EM response that often struggles to develop and sustain the type of relationship required for collaboration, coordination, and communication in EM response (Kapucu 2006b; Patton and Swope 2005).

The benefits of structured functions complement all other functions by emphasising the long-term benefits of integrating functions. Beyond the ability to utilise and mobilise all community stakeholders for EM response, structured functions indicate the importance of having formal acknowledgement of all roles, planning processes and arrangements. Such formal acknowledgements by the local authorities, emergency organisations and community ensure that confusion is minimised and EM functions are understood, clarified and defined based on all stakeholder capabilities.

In addition to this, structured functions also provide substantial benefits in terms of helping to identify future challenges and threats to integrating community functions with EM systems. Being able to identify challenges that can occur in the future with the IR Framework is also a significant benefit of structured functions to this research. By identifying structured functions from another region, it becomes possible to anticipate the future and ensure that resources and necessary networks are priorities for adequate readiness and response to all hazards. This major benefit draws from the progressive and risk-driven principles of EM which were explained in section 2.2 and are also explained in Appendix 1 (under Chapter Two, Section 1: Definitions and Explanations of EM Principles). The next section summarises the lessons learned from this chapter and the research results.

5.5 Lessons Learned

Community functions have been discussed within the context of EM response concepts examined in Chapter Two. This has shown that while challenges exist in developing and maintaining community functions, there are no major barriers to integrating them with EM response function domains. Although barriers were identified by the interviewees, a critical evaluation of both challenges and barriers indicates that they are issues that relate more to generic aspects of EM or human factors rather than issues that relate to or that can threaten EM response domains. This research acknowledges that some of the challenges mentioned by the interviewees have also been identified by WREMO. According to Doyle et al. (2015) communication, capacity and resources; transparency and trust; priorities and political agendas; community context and vulnerabilities and their relevance as well as partner equity are the challenges to collaboration between stakeholders. These challenges may hinder integration if and when measures are not taken to improve collaboration for the purpose of integration.

For example, adopting a community-driven approach that enhances understanding of the context of the community, defining scope and process of the project and adopting a creative approach to capacity building and resourcing with good facilitation are all key to solving problems relating to collaboration (Doyle et al. 2015). This research illustrates 'how' capacity and resourcing can be developed and enhanced for EM response. As in the case of WREMO, advisors work with community leaders to enhance their preparedness, create a s sense of community participation and scope of their actions (WREMO, 2012) According to Dallenbach et al. (2015) community response planning is a process that involves both emergency practitioners and community groups. During the planning phase, WREMO advisors help communities to connect with one another and establish ties and relationships that are needed for response (Dallenbach et al. 2015, p.5). Advisors also help to develop action plans that focuses on developing specific activities for response (Dallenbach et al. 2015).

However, it is not about the plan, but ensuring that the process is flexible and progresses in a manner that knowledge about actions necessary for response is transferred (Doyle et al. 2015). This indicates that integration is a process that requires collaborative planning at the readiness phase until the response phase. The literature of Doyle et al. (2005) Dallenbach et al. (2015) WREMO (2012) and others examined in Chapter Two has testified to the role of community in planning and the collaborative approach taken by both communities and practitioners in WREMO to plan for response suggesting interoperability. This research illustrates how integration during response can be achieved, beyond interoperability especially during readiness phase. It also indicates how a unified framework that incorporates the inputs and actions of communities and EM practitioners and emergency services can be combined and utilise for response, and not one over the other.

Therefore, the lessons from discussing the results for all research questions and triangulating existing knowledge, research and lessons in this field is that integration needs to be inclusive in principle and in the operational sense of response. To achieve this, the results are summarised in Table 5.1, a table which embeds community functions with the EM response framework.

Community Functions	Codes identified in results	Functions by community	Functions by govt.	Community Function Domains
Community Specific	F1, F2, F3 & F5	F1, F2, F3, F5	None	Social, part of Cognitive, information & physical domains
Impromptu	F1, F2, F3, F4 & F5	F2, F3, F5	F1 & F4	Social, physical & information domains
Collaborative	F1, F2, F3, F4 & F5	F2, F3, F5	F1 & F4	Social, physical & information domains
Structured	F1, F2, F3, F4 & F5	F2, F3, F5	F1 & F4	Social, physical & information domains

Table 5.1 Capacity for community functions and function domains

Table 5.1 shows that only CS functions were able to perform limited parts of activities in the cognitive domain. As recalled from the results presented in Chapter Four, Table 4.1, CS functions in Lyttelton that were developed as part of F1 activities, post-quake, guided response to other disruptive events such as flooding, landslides and pollution. According to (**A1**), the specific F1 activity developed post-quake was the emergency plan, because after the quake sequence in 2011, the TB saw a need to have one in order to help them assign response roles and responsibilities more effectively. However, it was noted that CS functions in Riccarton did not develop any F1 function capacity post-quake or until now, which shows either that F1 function capacity can be developed based on community acknowledgement of its need, or it is location specific. While this information is worth noting, it is a variable characteristic of CS functions, not a fixed characteristic like other activities common to the two functions.

Drawing from the information in the table, we can focus on the initial motivation of this research to identify existing functions within communities at risk. The focus is to prioritise the domains in which community functions have:

- demonstrated interests in performing,
- performed activities,
- operated in and for an actual incident response, and
- displayed common and constant characteristics within each type of function.

Although selection of domains for community function is made based on these listed priorities, this research does not infer that community functions are unable to operate within cognitive domains. It has been considered preferable to select domains based on the indications from the results which show that the cognitive domain was the only one in which community functions did not fully operate without the

support of emergency or government response organisations. It can then be inferred that community functions are likely to be less effective in operating in the cognitive function domain. Therefore, the summary of the results is that all four community functions are capable of operating, and have operated, within the social, information and physical function domains. This conclusion is relevant to the objective to identify community functions with adequate capability to improve EM response, and not ones with insufficient capacity that needs to be further developed before they can function effectively within any of the C2 response domains.

5.6 Chapter Summary

The sections in this chapter have been arranged to answer the research questions. While the literature review chapter was crucial in answering the first research question, "how does EM response work," it also helped to provide context for the community functions that can perform EM response. The content in this chapter and supporting discussion in Appendix 1 (under Chapter Five) have all contributed to answering the second and third research question. Section 5.4 emphasised the immediate, medium and long-term benefits of integrating community functions identified in this research with EM response, but the fourth research question is still pending. Therefore, the next chapter is devoted to answering research question four: "How can emergency management (in NZ and generally) be modified to use community functions to improve response?" The discussion and clarification made in this chapter is crucial in developing the Integrated Response (IR) Framework that aims to incorporate community functions with EM response arrangement. Answering the first, second and third research questions provide context for the next chapter detailing the IR Framework.

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Chapter 6 – Discussion II - Integrated Response Framework

6.1 Introduction

The purpose of this chapter is to achieve the fourth objective by answering the fourth research question: "How can emergency management (in NZ and generally) be modified to use community functions to improve response?" This chapter is divided into three main sections and a summary section. Section 6.2 provides context for the transferable framework (Integrated Response Framework) which is the research aim, and section 6.3 explains the components of the framework and its management and impacts on EM response. This section also explains the implications of all components in the framework. Recommendations for application and areas that require further research as a result of developing the IR Framework and conducting this research are discussed in section 6.4. Section 6.5 summarises the chapter and states the relationship between this chapter and the next one.

6.2 Context for Transferable Framework

The literature review provided understanding for EM response by answering the research question on how EM response works. The research investigation has drawn clues from the theoretical and practice contexts of EM response examined in the literature review, especially information in sections 2.3, 2.4 and 2.5. Figure 2.4 is important because it illustrates the relationship between four distinct function domains and the activities linked to each domain. Examining the function domains also revealed the problems associated with them.

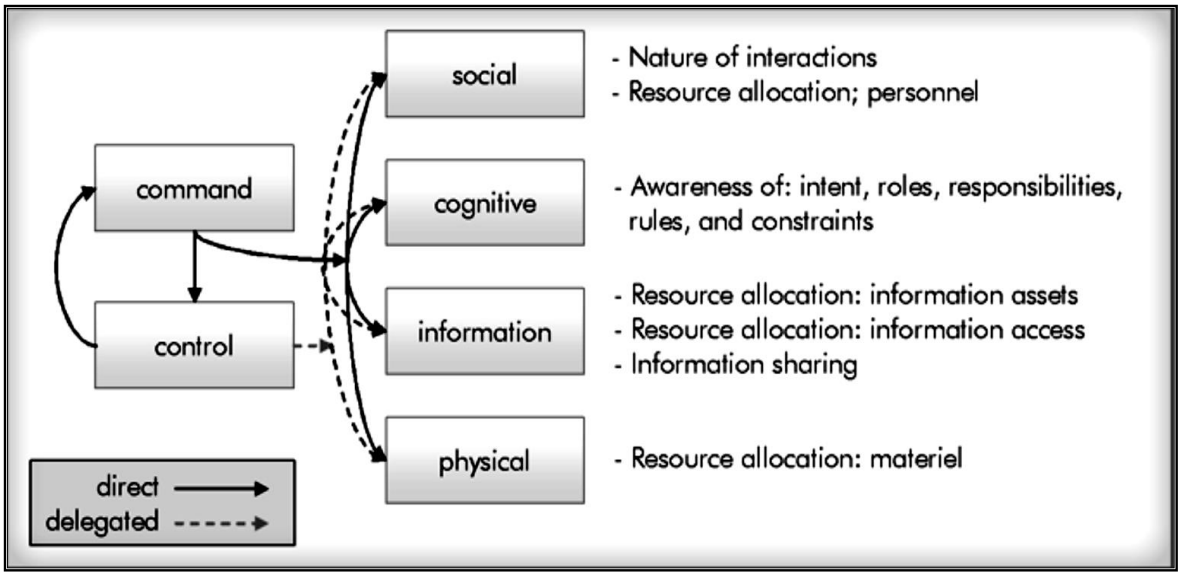

Figure 2.4 Command and Control as a function of domain (Alberts and Hayes 2006 p.60)

The problems in C2 which continue to limit response arrangements to disruptive events informed the researcher and the need to modify C2 function domain to use community functions. As a result of explanations provided in section 2.4 and research results in section 5.5, the essential components of the Integrated Response (IR) Framework are outlined in Table 6.1.

EM response function domains (C2)	**Community functions**	**Community response domains**
Social	CS function	Social, information, physical
Cognitive	Impromptu	Social, information, physical
Information	Collaborative	Social, information, physical
Physical	Structured	Social, information, physical

Table 6.1 Components of IR Framework

Themes outlined in Table 6.1 are incorporated to develop the IR framework in Figure 6.1 illustrating how EM response can be modified to use community functions.

6.2.1 Explanation of IR Framework

The IR framework in Figure 6.1 is a modification of the C2 structure which shows command and control as a process that is either directed by command or delegated by control (Alberts and Hayes 2006). While the new framework retains all the aspects of C2 illustrated by Alberts and Hayes (2006), it is modified and includes the addition of interaction lines between the domains (shown in the EM response C2 functions of the framework). The IR Framework also shows that rather than command directing the cognitive and information domains from Figure 2.4, it now jointly facilitates response activities in all domains. This modification enables decision makers to have better situational awareness and to use such information for resource and personnel allocation. Another improvement is that the IR Framework includes a major link to incorporate community functions. This offers the opportunity for EM response to be influenced by and benefitted from communication, collaboration, coordination and capabilities developed through relationships that exists in community groups and organisations. The justification for this is based on the research outcomes (case study of Lyttelton response) which indicated that response arrangements that interacted and cooperated to delegate and direct functions were more effective and beneficial to affected communities than those that did not.

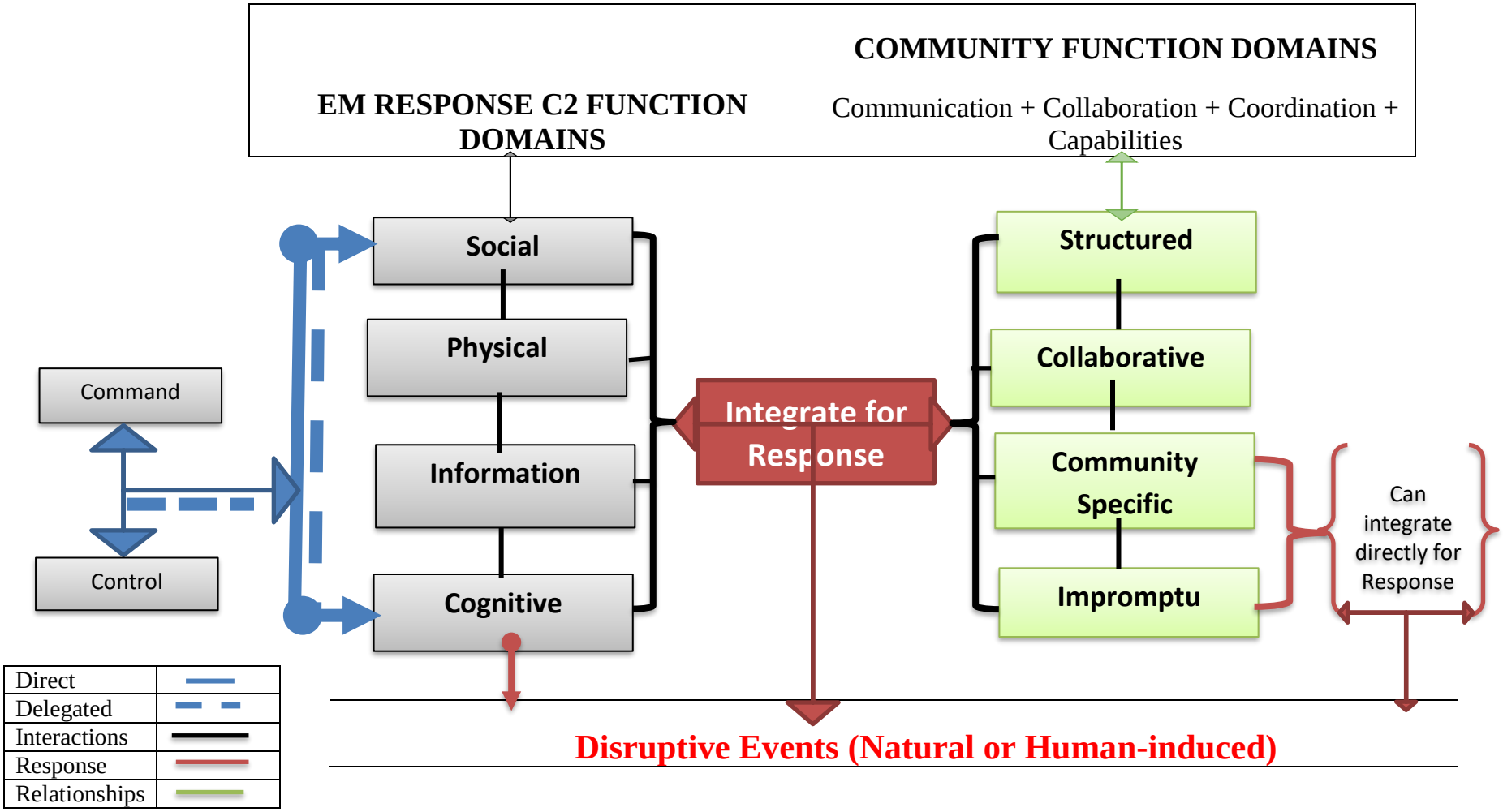

Figure 6.1 Integrated Response Framework for improving EM response

The modification of C2 function domains in Figure 6.1 ensures that the 'direct' and 'delegated' arrows interact for joint decision-making processes, reducing problems that result from lack of collaboration and communication. The modification also enables EM organisations to identify resources and capabilities available within both EM organisations and community functions that can be mobilised for response, thus reducing problems associated with lack of capabilities. The process for identifying and mobilising resources requires good coordination, which is made possible through integration with community functions and joint 'direct' and 'delegated' decision-making processes.

The red arrows refer to arrangements for response deployment. In Figure 6.1, response may still be mobilised using the EM response C2 function domains. However, such a response arrangement might be limited during a large-scale incident because of the absence of community groups and organisations that possess relationships that lead to better communication, collaboration, coordination and capabilities (Mendonca and Wallace 2007; Ozanne and Ozanne 2013). While communication, collaboration, coordination and capabilities have been recurring problems in C2 function domains, relationships that improve them have been identified herein to be present within the community functions.

EM response arrangements can utilise the benefits of these relationships from existing community functions if there is awareness and understanding of their presence within the community prior to the onset of any disruptive event and a mechanism for incorporating them. Figure 6.1 shows that all community functions can be integrated for EM response to any disruptive event. It also indicates that impromptu and CS functions can integrate directly for response. However, for response to be effective during disruptive events, organisations with technical skills and expertise as well as understanding of safety and potential risks peculiar to the cognitive domain must be involved. While this condition may seem restrictive, technical tasks were acknowledged by the communities studied herein as responsibilities of EM organisations.

Furthermore, explanations of community functions in previous chapters indicated that impromptu, collaborative and structured functions also include the participation of EM organisations. This emphasises that both community and EM organisations have the specific skills and resources required for EM response to be effective, hence the importance and value of the IR framework that allows these skills to be utilised. The IR framework is illustrated as an improvement on the traditional EM C2 function domains in that it has the potential to enhance and improve EM response if utilised as a coordinated framework based on mutual understanding of the roles and responsibilities of all stakeholders. Understanding the context of this framework is also important in order to avoid duplication of duties and resource wasting.

6.2.2 Application and Justification for IR Framework

Using the case study of disruptive events in Christchurch has helped to demonstrate the relevance and potential of the IR Framework for improving EM response. However, it is also important to demonstrate the wider applicability of this framework, especially for countries with similar EM standards and arrangements. In Chapter One of this thesis, disruptive events in the US and the UK were used as examples to emphasise the need for improved EM response arrangement. For example, Hurricane Katrina illustrates an ineffective response to a large-scale disruptive event. Some of the problems identified in the aftermath of Hurricane Katrina were lack of coordination, inability to coordinate a network of responders and organisations, slow decision making, confusion, inability to mobilise resources and poor decisions (Cooper and Block 2006). These problems are similar to those addressed herein, thus indicating that they could have been prevented through the use of the IR Framework.

For instance, the response to Hurricane Katrina involved an inter-governmental (federal, state, and local) and cross-sector (public, private and non-profit) network of stakeholders (Moynihan 2009). The National Response Plan which was introduced in 2004 sought to formalise the role and responsibilities of at least some of the central stakeholders when responding to incidents. The Plan identified a series of emergency support functions which different federal agencies can provide to support FEMA. Within this arrangement, FEMA's traditional role for large-scale disasters is to act as a coordinator, arranging the capacities of the federal government, while working with state responders (Senate Report 2006). However, this arrangement was ineffective during Hurricane Katrina, because being a large-scale event, more responders and stakeholders were required to manage the increased range of tasks and variety of capabilities (Moynihan 2008).

The response network for Katrina was so large that FEMA and different federal agencies found it challenging to comprehend the skills offered by stakeholders and how to mobilise their capabilities and resources (House Report 2006). This resulted in further communication, coordination, collaboration and capability problems, which are all problems the IR Framework has been designed to resolve. If used, the IR Framework would have allowed a more flexible and community-focused response tailored to addressing the immediate needs of the affected community. The response failures of government, FEMA and emergency services during the response phase exposed the limitation of the EM C2 function domains for large-scale disruptive events (Brunkard et al. 2008). For example, Walmart's response was so significant in the wake of Katrina that it can be used as an example of the role of CS functions in responding to the immediate needs of the community (Guion et al. 2007). While Walmart's response is a positive example of CS functions, it also indicates the limitation of CS functions operating without being integrated with EM response functions.

Responses provided by Walmart and other cross-sector organisations were limited to evacuation and delivering materials such as food, water and medicine (Guion et al. 2007). While providing these resources and functions (F2, F3 and F5) was helpful, it was insufficient because many people still died from the direct impact of the incident due to ineffective search and rescue operations, inability to promptly restore public safety, communication and power, and bad management of evacuation centres (Sobel and Leeson 2006). Any large-scale event can be overwhelming, which means that it will also be overwhelming for either EM organisations or community functions, hence the need for integrated functions to better cope with response needs and requirements.

However, assuming the IR Framework had been in place prior to Katrina, certain functions (F2, F3 and F5) could have been implemented by community and inter-sector networks of stakeholders, which have been identified herein as entities capable of performing CS functions. Acknowledging and understanding these capabilities in communities at risk, EM organisations and FEMA could then have focused on more technical and complex functions (F1 and F4), and more could have been done. Furthermore, the clarity of tasks, responsibilities and capacities could have informed better coordination and communication, thus leading to improved response to Hurricane Katrina. Similar response processes can be replicated in the UK, Australia and countries that have adopted C2 response arrangements. The IR Framework can be adapted to improve response to different disruptive events. The problems identified in EM systems and response arrangements at the beginning of this research and in the literature review further justify the need for modification. For instance, the role of the IR Framework in solving or mitigating the impacts of problems identified and discussed in Chapter One can be outlined as follows:

Inadequate capacity for response – this problem was identified as a common issue during large-scale incidents such as the quake sequence in Christchurch in 2010-2011, Hurricane Katrina in US (2005) and the summer floods in UK (2007). As exemplified in Lyttelton, capacity for response can be enhanced by integrating community functions with EM functions. The IR framework illustrates how EM functions and community functions can collaborate in order to increase capacity and capability for response especially for large-scale incidents.

Communication and collaboration problems – the areas in C2 system that allow communication problems to occur during response to many disruptive events have been identified herein. Including an interaction and relationship process between function domains in the C2 structure in the IR framework is vital in solving these problems. This modification enables better communication between all stakeholders which indirectly motivates better collaboration as demonstrated in the case studies. Therefore, the IR framework is an improvement on the C2 structure that mandates better communication and interactions between all stakeholders as demonstrated by impromptu function.

Global need for holistic approach – the IR framework does more than provide a holistic approach for increasing capability and capacity for EM response. It is a process of fostering communities, agencies, and contributes to disaster resilience in the long term. At the same time reduction and readiness can be constantly co-evolving systems like the ones combined in the IR framework which can also help to better cope with disruptive events across temporal and spatial scales (Adger et al. 2005).

Since the extent of these problems may vary from community to community and country to country, it is needful to conduct an initial assessment in any emergency lead organisation before applying the IR framework. The initial assessment is to help identify the C2 function that pose a challenge during response in order to determine the community functions that may enhance the overall response process. To facilitate application, a manual that guides implementation of response arrangements from response planning by community and emergency practitioners and the clarity of roles and responsibilities defined along IR framework will be written. Through the principles of inclusiveness and purposeful outcomes (Doyle et al. 2015), the manual will define and divide roles and responsibilities, and aim for sustained community engagement and integration of community functions with ICS response framework.

6.3 Implications and Impacts of IR Framework

Through the application and explanation of the IR framework, it is evident that while the categories of organisations and groups identified to constitute CS functions play significant roles during ‘peacetime’, they become even more important during response to disruptive events. Because very few people are educated or informed about the mode of operations in the emergency sector, however, drawing benefits from community functions for response is problematic. Problems can result from attempting to develop collaborations between organisations and groups that possess different objectives, cultures and missions. It can also be challenging to convince community groups and emergency organisations to become committed to IR framework arrangements.

The likelihood of these problems emphasises the importance of the EM theories examined in chapter two, especially the systems and management theories. Conceiving the IR arrangement as system thinking is a good starting point for ensuring good synergy between stakeholders. For instance, Aronson (2011) argued that systems thinking has been valuable in encouraging numerous individual actors to ‘see the big picture’ and not remaining an isolated part of issues they consider as complex problems. Systems thinking has also been used to address and solve recurring problems that have been made worse by past attempts to rectify them without the systems framework (Alberts and Hayes 2007).

Although other problems may arise in future which are not identified herein, Skyttner (2005) states that systems theory has been adopted to study and understand problems whose solutions were not obvious. Thus, while it is important to adopt the IR framework as a holistic approach that helps stakeholders to

understand and solve problems associated with EM response, it is also important to adopt the framework as a system that requires continuous evaluation and adaptation based on events occurring in the world. The importance of systems and management theories cannot be overlooked in any integrated arrangement. For instance, the interactions between collaborative and structured community functions provide good examples for understanding collaboration between different organisations and groups. However, such interactions and relationships for EM require management and continued nurturing since disruptive events are not a 'one time' thing in a community prone to risks – they will recur.

The interactions between impromptu and CS functions are a typical model of what is possible during the stressful period of response when coordination and communication is effective. Above all, integrating all functions for the purpose of improved EM response is a goal of all in preserving lives of people and the environment. As seen in Figure 6.1, all components in the framework interact with each other which enhances communication, collaboration, coordination and capabilities. These interactions are important in resisting or recovering from the impacts of any external perturbations such as disruptive events. Therefore, adopting the IR framework can also help to promote relationships and connectedness required for enhancing coping capacities for dealing with future disruptive events of all types. The discussion in this section has emphasize the potential impacts and implications of the IR framework as a modified model for improving EM response. If unused, the worst-case scenario is for the current problems experienced during response phase to persist, resulting in large scale destruction during disruptive events.

6.4 Recommendations

Improved response arrangements have always been a priority in EM, a goal that EM organisations aim to renew in the aftermath of any large-scale disruptive event across the world. Yet, this priority and goal continues to be a mere desire especially when actions and policy formulation after disruptive events do not generate solutions to pending issues in EM response. In reaction to this disconnection, this section offers recommendations that can inform and motivate both the academic and practice fields of emergency and disaster management to further promulgate and test the IR Framework.

Recommendations for Practice

In order for EM practice to be more effective, certain measures need to be incorporated into the current arrangements. It is conventional for novel approaches and strategies to be developed into policy in order to be adopted for use. While a number of policies govern the emergency sector, many are not well understood and few focus on improving activities at both operational and tactical levels. Therefore, the following recommendations are made:

- It is important that policy is developed that encourages the use of the IR Framework because it simultaneously supports the improvement and implementation of tactical and operational tasks.
- Community engagement for capability identification and assessment should be required by EM organisations. This provides opportunity for emergency professionals and organisations to interact with community functions in low-stress circumstances prior to an incident occurring. As well as identifying local community functions, their limitations, challenges and areas of improvement, the limitations of EM response arrangements should also be made known to communities at risk.

Assessing the capabilities within any community helps in understanding the needs and dynamics of the community as well as in identifying what can be integrated for EM response, in addition to the community functions identified in this research. This leads to further recommendations for practice as stated below.

- For all this to be possible, it is important to conduct a series of seminars, training and workshops with emergency professionals to explore the concept and context of the IR Framework. It is also important to conduct training that includes both emergency organisations and community representatives in order to provide orientation on IR arrangements. This will further enable all stakeholders to be acquainted with one another as well as to understand that the common goal of a safer community requires joint efforts.

An examples of a response arrangement which was made possible through joint training with community representatives and emergency practitioners is the Community Action for Disaster Response (CADRE) used in Bangladesh. CADRE is a basic training programme which aims to enable local residents to become 'first responders' to unexpected incidents relating to health emergencies through technical and practical exercises (Noeske et al. 2014). The training, which equips communities with skills essential for emergency response, clarifies techniques required for response and provides guidelines for communities in Dhaka in the event of a health emergency (Noeske et al. 2014). CADRE is led by community leaders and volunteers (called the Narinda Community Volunteers). The training focuses on building or enhancing the capacity of community volunteers to put in place logistics, planning and pre-established systems. It also enables them to put in place a local incident command centre which is maintained and managed by the community volunteers themselves. Such enhanced capacity and knowledge of clear protocol, coordination and response efforts encouraged the Narinda Community Volunteers to lead response to the Savar building collapse in the Savar area near Dhaka on 24 April 2013 (Noeske et al. 2014). The community-led team demonstrated an ability to support the army by securing the scene, guided people to safety and developed a tagging system for all injured people, which was all learned from the CADRE training. The community leader then collated

information and tags and reported findings and the situation to the incident commander from the army (Noeske et al. 2014). As explained by the community leader in Dhaka, “adequate training in overall response process, including key stages in emergency response, is a must for effective response” (Noeske et al. 2014 p. 20).

Recommendation for Future Academic Research

Achieving the research aim and objectives has been the focus herein. Nevertheless, other areas that can motivate future research include the following activities.

- Critically investigate how CS functions can be standardised to operate within cognitive function domains in order to respond to any scale of disruptive event.
- Examine the role and relevance of organisational structure and culture in emergency organisations involved in response, and how this impacts on communication, collaboration, coordination and capability development as well as on the sustainability of relationships that facilitate response.
- Identify and prioritise information-sharing mechanisms and platforms for communicating emergency response matters between communities and EM organisations.
- Examine leadership structures in emergency organisations and the role of leadership structure in emergency response and decision-making processes.
- Evaluate the different levels from which integration can be driven and actualised within the emergency sector.

These areas of future research focus more on concepts of emergency management. This is because the present research rationale was motivated by factors that limited EM response. However, more studies are also required in the emergency management sector to investigate issues and explore explanations and solutions through normative theories in the field.

6.5 Chapter Summary

This chapter has helped to answer the last research question. It discussed the essential components of the proposed IR Framework as one possible way of modifying EM response (in NZ and generally) to use community functions to improve response. Section 6.2 illustrated how EM response arrangements can be integrated with community functions identified in this research through the framework. While it is acknowledged that adopting the framework would not be without its challenges, other sections in this chapter explained and justified the global application of the IR Framework, once it has been extensively and rigorously tested and perhaps modified. Section 6.4 discussed recommendation for practice and

areas of further research that are important for serious consideration of the impacts of the research outcomes.

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Chapter 7 – Conclusion

7.1 Introduction

This chapter recapitulates the research objectives and briefly explains how they were achieved in his research. It also states the outcome of each objective and its relevance to the IR framework designed for enhancing EM response. Section 7.3 discusses the research limitations, while section 7.4 outlines the research contributions.

7.2 Summary of Research

Four objectives which were derived from the research aim to ensure that the purpose for conducting this research is achieved. Each objective has helped to achieve an outcome that contributed in one way or the other to the IR framework. The next few paragraphs explains how.

Objective One – "To critically examine the theoretical bases and practice systems for emergency management and EM response". This objective was achieved through an extended literature review of existing information on EM theories and practice. Theories examined as a result of this objective were useful in understanding community functions identified and in explaining solutions to challenges and barriers identified as potential problems with integrating community functions with EM response arrangements. In addition, response strategy and management helped to better understand how EM response works and the theoretical bases and practice system for EM and EM response. Gaps identified from the literature review informed the questions asked in the field, which subsequently helped in identifying the community functions which can be useful for EM response. Major literature that contributed to achieving this objective and informed others included; Drabek (2003; 2004), McEntire (2004; 2007), Mendonca and Wallace (2004; 2007), Kapucu (2006), Klein et al. (1993), Klein (2008) and Alberts and Hayes (2006; 2007).

The outcome of this objective indicates that there is a major gap between the theoretical bases and practice systems for EM response in particular. While the theoretical bases stress the relevance of EM principles to all phases, all hazards and all stakeholders, the practice systems seem to be far from adopting EM principles. Similarly, EM theories examined also provided a range of ways to implement EM procedures and understand strategies for dealing with challenges relating to EM practice systems. However, the research results show that most problems are ones that are peculiar to general practice of EM that get transferred to the response phase and other phases of emergency management. The outcome shows that EM response systems operate through the C2 model which has four function domains i.e. social, cognitive, information and physical.

Objective Two – "To identify and evaluate functions within communities which can be utilised for emergency response (using Lyttelton and Riccarton as case study)". This objective was achieved using multiple data collection techniques. First the literature review provided context for determining the characteristics of community functions that will be appropriate for EM response. Secondly, case study analysis was used to cross-examine the nature of response activities in the two communities during the last disruptive events experienced. Lastly, data collection techniques such as semi-structured interviews and focus group sessions were used to collect data that were triangulated to identify community functions that are potentially useful for EM response.

The outcome of this objective indicates that there are four community functions potentially useful for EM response. It also shows that two of the functions performed major response roles during the earthquake sequence, while two other community functions were noted to have developed because the need for them became apparent. Community functions were identified and selected on the basis of their characteristics and capabilities to operate within the four function domains in the C2 model. However, it was noted that only one of the community function (the CS function) involved community organisations and groups at the time of response to the earthquake sequence in 2011. But the CS function - especially the one in Lyttleton - now benefits from the support of emergency and government agencies such as the police, fire, coastguard and Christchurch City Council. Above all, community functions continue in their respective communities, while other community functions have been initiated based on response needs.

Objective Three – "To assess the barriers to and benefits of integrating community functions with EM response". This objective was achieved through analysis of the primary data collected from communities. Several barriers were identified (discussed in chapter four and five), but their solutions were also available from the literature review. Achieving objective one was also useful in assessing the barriers to integrating community functions with EM response. Immediate, medium and long-term benefits were also identified which were discussed in chapter five. Discussion of the benefits of integrating community functions with response was helpful in identifying essential components of the IR framework. Discussion on community functions (second objective) and practice systems for EM response (first objective) also contributed to components of the IR framework proposed in chapter six.

Objective Four – "to develop an integrated response framework for enhancing EM response". This objective was achieved in chapter Six, using information from chapters two, four and five to ensure that essential components that can improve EM response were combined to develop the IR framework. Chapter Six also explained the possibilities implications and impacts of the framework, while outlining the recommendations for practice and future research.

While all the objectives were achieved, the research process was not without its challenges. The next section outlines some of the challenges experienced during this research and its limitations.

7.3 Limitations of Research

The data collection techniques (semi-structured interviews and focus group) and sample size, which are often cited as limitations in qualitative research, are not considered as limitations in this study. This research identified functions within communities and did so by studying processes of interactions between organisations, groups and stakeholders of EM. Such processes are not normally generalizable across any population, but peculiar to communities who are prone to the impact of disruptive events or communities who had suffered one. Since the purpose of this research is to identify functions within communities which can be used for EM functions, the use of interview and focus group to collect data from group leaders, EM professionals, government community workers and students did not limit the validity of data.

What is considered knowledge in this field of study is verified in regard to validity and scope of EM theories and practice which helped to make the distinction between justified concepts of EM and opinion that is unverified. The use of case studies at a local level in Christchurch rather than on a national or international level allowed further assessment of the EM dimensions of the community functions identified. However, the main limitation of this study is the reliance on the C2 model only to determine the nature and characteristics of community functions and sample size. Primary data collection was predominantly obtained from available and interested community leaders who were informed on the subject area. While the scope and sample size are justified by the research aim, this limits the sample size to two communities and findings to operational issues in the response phase. The recommendations for future academic research outlined in the previous chapter is important for addressing these limitations.

7.4 Research Contribution

This research has:

- Developed a new framework (IR) for improving EM response
- Successfully improved the existing C2 response model by integrating community functions such as CS, impromptu, collaborative and structured
- Challenged the rigid perception and understanding of EM response
- Added progressively to the understanding of EM response dynamics and complexity of operations in the confusing and tensed phase of EM response.

- Identified and assessed the capabilities and abilities of communities to function in EM response domains and clarified the domains in which community functions can be utilised
- Contributed to existing knowledge in community engagement in EM by providing new insights on the role of communities in the response phase, as against the more commonly - researched reduction, readiness and recovery phases.

7.5 Conclusion

Disruptive events have become a frequent feature in human existence across the world. While some are naturally occurring, others are triggered by the activities of people or even made worse by people. This research not only provides solutions to some of the challenges experienced while responding to many of these disruptive events, but is also a call for action that focuses on better collaborative activities, that are coordinated based on understanding of capabilities in communities. The research has emphasised the possibilities and ways of improving EM response through integrated arrangements between EM organisations and community functions. By so doing, organisations, groups and people, regardless of their orientation and status in the community, can be more efficient and effective in dealing with disruptive events. In this way, future responses to disruptive events can become more effective than the current EM response arrangements.

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Appendices

Appendix 1 – Detailed Information Relevant to Chapters

Chapter Two

Section 1. Definitions and Explanations of EM Principles – Reference from Section 2.2

Comprehensiveness – emphasises that emergency managers must take into account all hazards, all phases, all stakeholders and all impacts relevant to any disaster or emergency. The concept of 'all hazards' is usually interpreted to infer that hazards within a jurisdiction must be treated using hazard-specific planning through risk assessment processes (IAEM 2007). While most hazards have similar impacts in terms of disruptions to livelihood (Haddow et al. 2011), 'all phases' stresses that planning and response arrangements must be developed by using a comprehensive emergency management model based on the four phases of EM so that disruption can be reduced as much as possible (IAEM 2007). 'All stakeholders' entails that effective EM must facilitate close working relationships between all levels of government, private sector, and the general public in order to ensure the implementation of effective EM. Waugh (2000) argued that the relationships between all stakeholders are important for coping with the impacts of any disruptive event, which usually require efforts and restoration that that exceed the capabilities of emergency organisations or governments. The term 'all impacts' then stresses that emergencies and disasters should be analysed in terms of predictable or possible consequences on human services, social services, infrastructure and economy in order to determine the most suitable processes and resources for dealing with them.

Progressiveness – this principle provides direction for emergency managers in the context of their responsibility to anticipate future disasters so that preventive (reduction) and preparatory (readiness) measures can be taken to build disaster-resilient communities (IAEM 2007). Research in the natural and social sciences suggests that disasters are becoming more frequent, dynamic, complex and intense (Kapucu 2006). The increase in frequency has been attributed to factors such as population growth and climate change impact, (Haddow et al. 2011), while increasing disaster complexity is often attributed to the impact of human activities, urbanisation and other volatile development ventures such as nuclear energy plants (McEntire 2007). Given these factors, it is expedient that progressive and strategic readiness and response activities are undertaken to mitigate the impact of future emergencies and disasters (Kapucu 2006b). According to Edwards and Goodrich (2007), the level of vulnerability varies from community to community and it is important to understand and plan with communities to understand and evaluate their level of vulnerability based on the risk they are most prone to. This forms the rationale for the next principle.

Risk-driven this factor emphasises that emergency managers should use sound risk management principles when assigning priorities and resources for readiness and response to emergencies or

disasters (FEMA-EMI 2007). Although views differ on the most effective methods for analysing risks, "risk-driven" as emphasised in this principle refers to the combination and use of risk management policies, procedures and practices as emphasised by EMA (1998). Some of these include hazard identification, hazard assessment, risk assessment, risk analysis, risk acceptance, risk communication, risk control, risk impact analysis, risk criteria, risk evaluation, and risk treatment. This places risk management as crucial to effective mitigation, preparedness and response to the potential impacts of events which might exceed routine emergency response procedures (Lindell and Perry 2004).

The **Integration** principle of EM stresses that emergency managers should ensure unification of effort among all levels of government and among all elements of a community that is prone to the potential impact of disruptive events (FEMA-EMI 2007). This principle is influenced by the "integrated emergency management" framework proposed by McLoughlin (1985), which was adopted as a system called "Integrated Emergency Management Systems" (IEMS) for emergency managers. IEMS is designed to ensure and monitor the direction, control and coordination for dealing with all types of hazard events regardless of their location, complexity or size (IAEM 2007). The concept of IEMS involves collaboration between all stakeholders in the community in decision-making processes, while creating a culture of that ensures unity of efforts between government and all stakeholders (IAEM 2007). The present research topic draws part of its rationale and concept from this principle as one of the critical means for improving EM response.

Collaboration – this means that emergency managers must create and sustain broad and sincere relationships among individuals and organisations to develop and maintain trust, advocate a team atmosphere, build consensus and facilitate communication (IAEM 2007). Within the context of EM, collaboration should not be confused with coordination. While collaboration is considered as an organisational culture that characterises the extent of communication, unity and cooperation that exists within a community (IAEM 2007), coordination refers to the process designed to ensure that functions roles and responsibilities are identified and tasks assigned for the purpose of EM especially response are accomplished (IAEM 2007). **Coordinated** as a principle then mandates emergency managers to synchronise the activities of all relevant stakeholders to achieve the common purpose of EM. This is often not simple due to the diverse and varied responsibilities even with the management tools embedded in operating procedures available to emergency managers (FEMA-EMI 2007), hence the relevance of the flexible principle of EM.

Flexibility – emergency managers should use adaptive, creative and innovative approaches in solving challenges peculiar to disaster or emergency management (FEMA-EMI 2007). IAEM (2007) states that in the event of complex emergencies or large scale disasters, codes of ethics for organisations and stakeholders vary, emphasising the need for prior agreement on the required professionalism for EM. For instance, the eighth EM principle which is; **Professional** states that emergency managers must value

a combination of scientific and knowledge-based approach to EM based on education, training, experience, ethical practice, public stewardship and continuous improvement (FEMA-EMI 2011). This infers that the commitment to EM as a profession has certain characteristics some of which are reflected by codes of ethics, standards and best practices, and specialised bodies of knowledge, to mention a few. For instance, a specialised body of knowledge as mentioned here consists of three principles.

1. The study of historical disasters especially the ones pertaining to the community the emergency manager is responsible for (IAEM 2007).

2. Having working familiarity with social and natural science literatures pertaining to disaster issues (IAEM 2007).

3. Emergency managers must be well versed in EM practices, standards and guidelines informed by theories, concept and best practices of EM (IAEM 2007).

These principles suggest what needs to be done in practice.

Section 2. Summary of Research Findings from Literature Review –Reference from Section 2.7

The findings from the literature review also provide a basis for other chapters in the research. The main findings that particularly informed the investigation process are summarised as follows:

- EM operates as a process that applies different measures and strategies in order to mitigate the impact of a disruptive event on people and community (Drabek 1991)

- EM uses principles such as comprehensiveness, progressive, risk-driven, integrated, collaboration, coordination, flexibility and professional to ensure that all measures and strategies work well together to achieve the aim of EM (FEMA-EMI 2007; IAEM 2007).

- However, EM, especially the response phase experience limited synergy of activities and actions (Lewis 1988). This disconnection often results in problems during the response phase that emphasis the need for improved coordination of EM activities and actions especially in the phase that deals with the onset of a disruptive event.

- The response phase is also notorious for confusion, limited capacity to respond to overwhelming demands of response logistics and insufficient coordination of resources and efforts at the onset of disruptive events (McCreight 2011; Kapucu and Comfort 2006).

- For example, communications between EM agencies are problematic during response (Comfort and Kapucu 2006) and communication between EM agencies and affected community are almost impossible or non-existent or chaotic (Drabek and McEntire 2002). This makes communication, including communication medium and mechanisms, as well as coordination,

any form of collaboration and ability to mobilise resources important components of EM response and major themes for this research.

- Challenges experienced during the response phase have emphasised the importance of community involvement in order to improve response (Becker et al. 2011). Continued problems with response overtly suggest the need for approaches that can improve EM response.

- Barriers abound in involving communities in EM practice especially in the response phase (Drabek 2004), which stresses the need for better understanding of how EM works drawing from different academic theories.

- Theories such as; normative, broad perspectives, micro, embryonic, chaos theories (Drabek 2004), systems and management theories (McEntire 2004) and decision theory (Klein et al. 1993) are some of the theories examined to establish and understand the theoretical bases and practice system of EM systems and EM response.

- These theories helped to identify and explain typologies which were essential in EM response, but which are also some of the root causes of problems experienced in EM response. The challenging typologies are communication, coordination, collaboration and capabilities (Klein 2008; Comfort et al 2004; Webb 2004; McEntire 2007; Bharosa et al. 2010)

- Community functions related to and potentially useful for EM response have different unique features and network that influence their activities and sustainability, but make them reliable for improving EM response (Betts 2003; 2007; Ozanne and Ozanne 2013; Jefferies 2012).

The gaps, limitations and challenges identified from critically evaluating the C2 structure, EM response strategies and theories and community engagement for EM response justified the importance of this research. They also indicated that social, cognitive, information and physical domains of C2 are likely to be areas where community functions may be integrated with EM response arrangements.

Chapter Three

Section 1. Explanations for Research design

A research paradigm or philosophy according to Bryman (2008), is "a cluster of beliefs which dictates what should be studied, how research should be done and how the results should be interpreted" (p.696). Research philosophy reflects the perception the researcher has adopted for the development of knowledge, which inevitably influences the way in which the research is undertaken and interpreted (Saunders et al. 2009). The more prominent philosophies are scientific (objective) i.e. positivist, and constructivism (subjective) i.e. phenomenology (Creswell 2009; Saunders et al. 2012). Although Saunders et al. (2009) explained that, there are realism, pragmatism, functionalism and subjectivism to mention a few (p. 102), Creswell (2009) argued that these other paradigms can be classified as either objective or subjective philosophy. According to Easterby-Smith et al. (2004) the positivist philosophy is considered as knowledge in science which can be gained from direct experiment and observation. They went further to explain that the social world exists externally and independent of human properties and as such should be measured through objective methods such as experiments rather than subjective reflection or interpretation (p.28). While this might be true for researches focused on scientific properties, it might be difficult to use the positivist philosophy to understand the socially constructed aspects of the world given that people have feelings, share experiences and use these dynamic characteristics to influence the world (Bryman 2008). The present research tends more towards the socially constructed activities in the world i.e. how response is coordinated for managing emergencies or disasters and the involvement of communities in response processes. To explain the differences in positivist and constructivism philosophy better, Figure A1 is used to summarise the difference and comparison.

	Positivism	**Constructionism (Phenomenology)**
Human interests	Should be irrelevant in result and independent of result	Are the main drivers of science and search for knowledge, results
Explanations	Must demonstrate causality	Aim to increase general understanding of the situation
Research progress through	Hypotheses and deduction	Gathering rich data from which ideas are induced
Generalisation through	Statistical probability	Theoretical abstraction and generating theories
Sampling requires	Large numbers selected randomly	Small numbers of cases/people chosen for specific reason
Others	Tends to produce quantitative data with high reliability	Tends to be qualitative data with high validity

Figure A1. Contrasting elements of positivism and phenomenology
(Adapted from Collis and Hussey 2003 p. 55; Easterby-Smith et al. (2004 p. 30)

Figure A3 shows that positivism and constructivism differ in explanations, research progress, sampling requirements and components. These differences are better understood by examining the epistemologies, ontologies and axiologies that govern them.

Epistemology is "concerned with the study of knowledge and what can be accepted as being valid knowledge" (Collis and Hussey 2003 p.48). Bryman (2008) emphasised that "an epistemological issue concerns itself with questions of what is (or should be) regarded as acceptable knowledge in a discipline" (p.13). Hence, epistemology lends itself to asking what knowledge is true or false in the search for knowledge, while trying to answer questions to ascertain if a given body of knowledge is adequate or inadequate. For instance, positivism affirms that only phenomena which are measurable and observable are valid knowledge (Saunders et al. 2009).

This paradigm maintains an objective and independent stance. Contrary to this, constructivism acknowledges that knowledge can be based on perceptions of individuals or groups (Cooper and Schindler 2006). While this paradigm is subjective, it attempts to minimise the distance between the researcher and what is being studied. Therefore, epistemology (what is, or should be acceptable knowledge) in this research with respect to data collection, analysis and discussion is influenced by the perceptions of participants in relation to the concepts and principles of EM and EM response.

Ontology is considered as the nature of reality. According to Saunders et al. (2009), "ontology is concerned with the nature of reality, the assumptions researchers have about the way the world operates and the commitment held to a particular view" (p. 110). Within this branch of philosophy, reality can be thought of as knowledge of a phenomenon. Ontology is a description of the concepts and relationships that can exist (Bryman, and Bell 2011). For example, it helps to determine if description is external to or within the mind of the individual or researcher. Therefore, the ontology (reality of knowledge) in this research is based on, and analysed using, theoretical and practice concepts of EM which have been critically examined in the literature review.

Axiology is based on assumption and perception of value (Patten 2004). Within this branch of philosophy, positivists believe that science and the process is free of what the researcher values (Gilbert 2008) this means that researcher's personal values are independent from the content being researched and regards the phenomenon as an object or experiment (Patten 2004). Axiology in constructivism philosophy considers the researcher as someone with values which can either mar or enhance the phenomena being researched (Cooper and Schindler 2006). Hence, axiology in constructivism is vital in helping the researcher (if the researcher has background understanding of what is being researched) to determine what is valued fact and what is the interpretation of such fact (Cooper and Schindler 2006). Therefore, the axiology of data collected in this research is considered as facts if verifiable and can be

justified based on existing concepts of EM, social existence and/or evolving trends in the field or disciplines related to EM.

The essence of understanding and using philosophy lies in its role in helping to determine the type, quality and depth of data. For example, an objective (positivist) way to collect data about a house will present a result which states that the house is big or small, wood or brick build. However, a subjective (constructive or phenomenology) process will present results derived from perception i.e. the house is unmaintained, poor quality, owned by low income earners etc. Therefore, the understanding of positivism and phenomenology based on epistemology, axiology and ontology has strongly influenced the choice of research design to select constructivism or phenomenology, which helps to gather subjective data which can help to explore possible means of managing problems with EM response.

EM response problems, for which this research seek to provide possible solution focus more in meaning rather than measurement, thus tending more towards a phenomenological philosophy. It is a study area which requires in-depth exploration and seeks existing community functions which can be integrated with EM response arrangement in order to optimise response to emergencies and disasters. This takes this research away from the laboratory or experimental process advocated by positivism and more towards social reality within a natural human setting. Furthermore, exploratory research study is conducted when the causes of a problem is unclear or how to manage a problem is unclear and there is a need to get deeper understanding and possible solution to the issue (Saunders et al. 2012).

Section 3. Research Approach

The justification for constructivism is also crucial for deciding the research approach. The philosophical process further explains this research as using inductive logic rather than deductive logic. Trochim (2006) explained inductive reasoning as a "bottom-up" approach which starts with observation of a problem subjected to in-depth investigation which leads to development of theory or explanation for the phenomena being investigated. Deductive approaches called "top-down" processes (p.19) which aim to test a theory which can lead to rejection or confirmation of the theory (Trochim 2006). The inductive process is peculiar to phenomenology, constructivism or interpretive paradigm and helps to formulate theory from relationships based on themes created by qualitative data. The inductive bottom-up process is also known to help manage the issue of validity and reliability (Creswell 2009) peculiar to qualitative data. The inquiry process of both deductive and inductive approaches is illustrated in fig. A2.

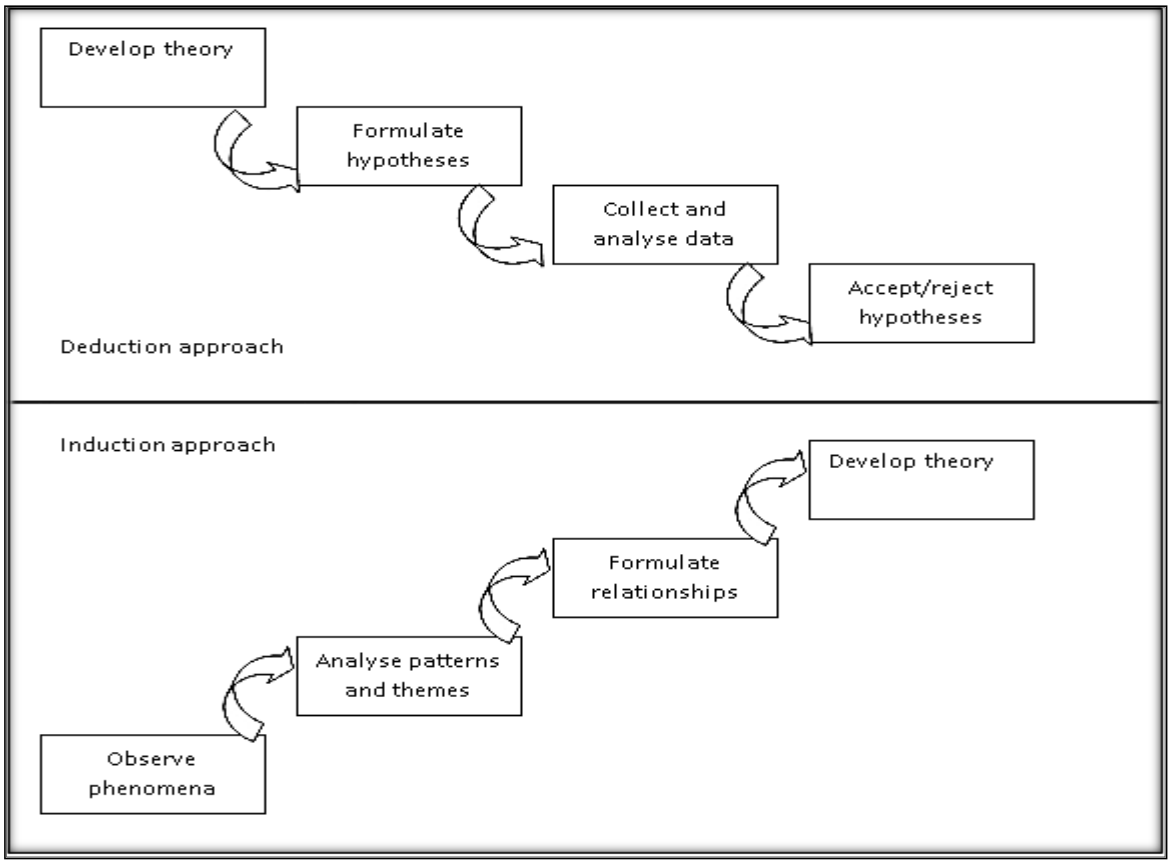

Figure A2. Deductive & Inductive approach to data collection, analysis, reliability and results (Adapted from Cavana et al. 2001 p.36)

Figure A4. infers that in the deductive approach a theory (or theories) is tested in order to confirm or reject a theory, hence the researcher's bias is independent of the process as seen in statistical data or procedures (Cavana et al. 2001; Creswell 2009). Data collection and analysis in inductive approaches build from particular to general themes from which the researcher interprets the meaning of the data (Creswell 2009). Therefore, the present holistic and open research (qualitative) cannot be undertaken using controlled measurements (quantitative). Hence,

- Quantitative = Positivism = deductive
- Qualitative = Phenomenology = inductive

However, this is not a strict rule, but more a summary of this section and how it relates to subsequent sections of this chapter. As outlined in table 3.1 the method of data collection in qualitative research design includes but is not limited to observation, survey, interview, documents, focus group, and critical incidents, and the use of combined methods to achieve triangulation. Triangulation is a broad strategy of data collection and analysis within which a range and variety of techniques can be utilized (Krueger and Casey 2009). The process that led to triangulation of data is illustrated in Figure A3 illustrates how consistency and focus were maintain throughout the research process.

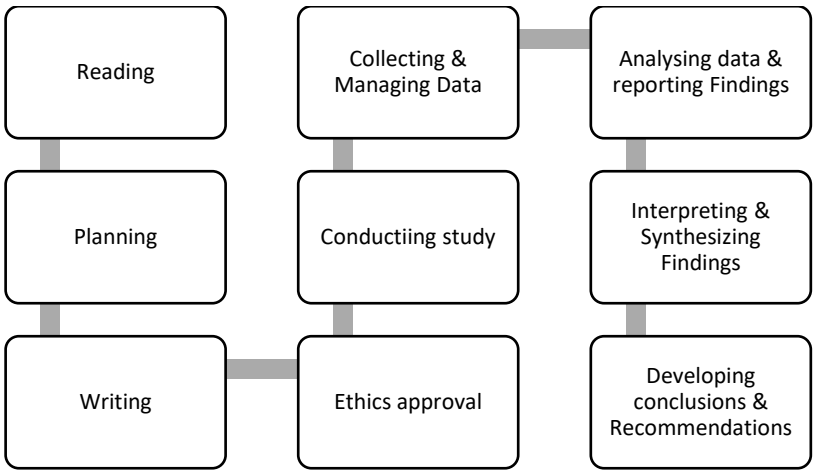

Figure A3 Research and thesis process (Adapted from Bloomberg and Volpe 2008 p. 1)

Figure A3 influenced the result and discussion chapters. This process was also vital in ensuring that the research adheres to the University ethics regulations for conducting research.

Chapter Four

Section 1. Community Specific (CS) Functions

Outline of EM activities performed by CS which participant **A1** claimed TimeBank (TB) performed during the quake sequence and is capable of performing.

1. *Emergency response plans*
2. *Warning messages and systems with evacuation arrangements*
3. *Emergency communications*
4. *Public education*
5. *Public information*
6. *Resource inventories (managing information of all resources used to implement emergency services/products)*
7. *Training programs*
8. *Refuge shelters (temporary accommodation/residence for victims of disasters)*
9. *Registration and tracing people during emergencies*
10. *Inform local and higher authority about emergency situation*
11. *Activate coordination centres to support people*
12. *Mobilise resources required during emergency*
13. *Provide relief*

While numbers 2, 3, 5, 8, 11 and 12 were performed during the quake sequences, others are activities respondents claim they are able to perform if given the opportunity. While these might be true, it is also possible that respondents said so without having adequate information on what each activity (besides those performed already) entails.

Unlike the TB, the Student Volunteer Army (SVA) did not exist before the 2010 earthquake, but was one of the groups that spontaneously mobilised people to help the severely affected places in Christchurch. However, SVA confirmed their capacity to perform the following EM readiness and response functions;

1. *Emergency communications*
2. *Mutual aid agreement (lending assistance across Christchurch) – SVA has an unspoken agreement with the city and Civil Defence to assist during emergencies and considered as one of the organisations which can help.*
3. *Public information*
4. *Resource inventories (managing information of all resources used to implement emergency services/products)*
5. *Training programs*
6. *Registration and tracing people during emergencies*

7. *Inform higher authority about emergency situation*
8. *Activate coordination centres to support people*
9. *Mobilise resources required during emergency*
10. *Provide immediate relief to people*

While **B1** claim, they are able to perform all these functions it is important to note the actual functions performed during the quake sequence and after in Table 4.2. It is also important to compare the information in Table 4.2 with factors that contribute to CS functions for SVA in Figure 4.2. This comparison shows that while factors that support the ability to develop EM functions exist in the area, they are yet to be utilised by SVA to develop further EM function domains as seen in Lyttelton.

Section 2. Comparison of existing community functions

Regardless of the influencing factors identified in each community, it was also noticed that, the classification of networks, groups and organisations that are linked to community hubs also influence the level of response activities that can be performed by CS functions in Lyttelton and Riccarton. The comparison and differences are outlined in Figure A4.

Lyttelton	Riccarton
Communication organisations	None mentioned
Educational organisations	Educational organisations
None mentioned	Religious organisations
Social and economic organisations	Business organisations such as housing, local businesses
Civic Organisations	None mentioned
Health care organisations	None mentioned
Government and emergency organisations	CERA, Government and emergency organisations

Table A4. Category of organisations, groups & networks linked to CS functions

A4 shows that Lyttelton possesses more defined category of organisations and groups that enhance its capacity to operate with more EM function domains. Unlike Lyttelton, Riccarton is yet to build such a level of defined network that enhances EM capability. Although the longevity of community specific function in Lyttelton can be said to be responsible for the level of defined roles, networks and relationships, it is important for this research to note the category of networks, organisations, groups and projects that directly increases capacity to perform EM response. These categories of existing network, groups, and organisations in communities supports the hypothesis of solving response problems through integrated functions.

Section 3. Impromptu Functions

The fortunate happenstance of having the Royal New Zealand Navy in Lyttelton Harbour with their ship increased capacity to perform F5; a function domain that requires technical expertise. The coastguard are designated to be in the harbour and perform their primary role of search and rescue for the coastal waterway and major lakes. Other roles of the coastguard include response to major maritime incidents if called upon by the Rescue Coordination Centre New Zealand (RCCNZ). This clarification shows that in-land and on-ground rescue and incident response is not the responsibility of the coastguards. This indicates that they would not have been involved in the response process without the involvement or presence of the Navy. However, during the 2011 quake, the presence of the Navy in the Lyttelton harbour motivated their involvement in disaster relief response. This is why the coastguards are classified as serendipitous in this case since there was no record of their involvement in 2010 quake response, but only 2011 quake which was motivated by the presence of the naval ship and the NZ Navy in the harbour prior to the onset of the 2011 quake.

Figure A5. Impromptu functions provided by naval force in Lyttelton (Navy Today 2011)

It is worth noting that there was no emergency plan that outlined the duties of each party for response during the 2011 quake. Response was in reaction to needs and requirements of the affected community. Through cooperation, serendipitous function became possible by partnering with existing resources and skills of the Navy and the Coastguards [A1 and A2]. But the partnership with the community hub and other existing projects in Lyttleton also contributed to the ability of serendipitous function to operate within unfamiliar territory. While it can be inferred that serendipity, functions were only possible through happenstance, it also important to state that the implementation of their EM function was by collaborating with affected community to gain local knowledge. Such positive outcomes further

emphasise the importance and role of community involvement in EM response as well as in ensuring that emergency services are able to effectively implement their response arrangements. The role of existing community hub and community specific function was also stressed during this process.

Section 4. **Collaborative Functions**

B2 identified functions which they have been supporting communities to undertake or perform and those they believe communities are able to perform.

Supported & collaborative EM functions	a. Mutual aid agreement (lending assistance across Christchurch) – SVA has an unspoken agreement with the city and Civil Defence to assist during emergencies and is considered as one of the organisations which can help. b. Mobilise resources required during emergency c. Refuge shelters (temporary accommodation/residence for victims of emergencies) d. Public Education and information **e.** Provide immediate relief to people
Possible functions	1. Emergency response plans 2. Warning messages and systems with evacuation arrangements 3. Emergency communications 4. Training programs 5. Test exercises 6. Plan implementation 7. Registration and tracing people during emergencies 8. Inform higher authority about emergency situation 9. Damage assessment 10. Resource inventories
Functions that require technical capabilities	1. Search and rescue 2. Provide medical support & Institute public health measures 3. Activate coordination centres to support people

Figure A6. Range of EM response activities possible through Collaborative functions

Section 5. Challenges managing and maintaining community functions

A1 explained using the experience of response to incidents using the TB;

"*For the flooding, the software for the TB comes from the US and the TB is getting more popular around the world, so the website was not responding during the flooding incident so I couldn't get information*

out to people as quickly enough, there was time delay like 2 hrs. As a result of that problem, the TB software have been modified now, so the problem won't occur again. But if the power goes out, we can't get information out fast enough as we'll like to the people, so it will just be notice board out in the front.

As a result of the last problem, we realised our information wasn't getting out fast enough, because real time information needs to get out. So, we use mail chip – its electronic email system, pull out the email addresses from the database, and load them into the software so now we don't have to worry about the US server, going slow. There was an incident (oil fuel) which we used existing contact to get information from the manager of an oil refinery who stays in Lyttelton. Now we have direct link with Mobil. Each emergency highlights different things, but you learn from it and put other things in place to improve the arrangements. And people in Lyttelton prepare the TB because they know them and have a proven time record. The service centre for CCC also worked well, but they are local people and they live here.

We also have a good resilience network, - getting young kids to learn how to grow food in schools. We have a paid coordinator who goes into the schools to teach children. Funding comes from Project Lyttelton which is the umbrella for the TB, we get grants and sponsors to do that through organisations. We also have the garage sale as we encourage the community to recycle everything, so many times, the clothing, blankets etc. for support for community comes from the garage sale.

The earthquake and flooding were both challenging, but the flood really emphasised that we really need unique vegetation. And with all the runoffs from the hills into the harbour, sedimentation, what's happening to the fish and everything, being smudged by the mud. So we're working with the council parks and reserve people, environment Canterbury"

B1 explained that;

"During 2011 response; *a challenge, as with any emergency response, was trying to co-ordinate where the help was needed, and supplying volunteers to help, and communicating this to both parties. It all had to happen so quickly, people didn't know what to do and some panicked. It was SVA's job to rationally assess the situation and act swiftly, and appropriately for such an emotionally distressing time. Following the September 2010 earthquake, expectations of SVA were high, the public expected the students to respond again – which they did, with force. Over 11,000 students helped shovel silt, help people remove items from their houses, helped people move house, provide them with food and water and even provide an ear to listen to people's stories, or a shoulder to cry on.*

Challenges helping in the March 2014 flooding were similar to that of the 2011 earthquake. We were first of all unsure if we would be needed, we didn't know how destructive the flooding would be, so we

were very much ready to jump into action from the news breaking that bad weather was scheduled for the area. The SVA executive had never had any hands-on emergency response experience, so we found it challenging to know what to do when people first started asking us for help. We ended up being in contact with the Council and Civil Defence who listed us on their available services list, so people knew they could ask us for help. It was hard to decide where in Christchurch we would help, as we couldn't help everyone, although we wanted to. So, we chose the hardest hit places, and sent out Facebook and email calls to our members, contacted the media, to get volunteers involved in helping the clean-up."

Section 6. Potential Barriers to integrating Community functions

This section presents results from all participants interviewed and engaged in focus group discussion. It presents results on potential barriers and/challenges foreseen in attempting to integrate services and functions provided by community with EM arrangements.

A1 and **A2** agreed that the barriers to integrating community functions are

"*Bureaucracy, retaining control without distributed network. I find EM structure too rigid, too inflexible.*" While **A1** acknowledged that; "*We actually work pretty well during disasters here, all that because we know ourselves well and we know the skills of the people that live here, all these can benefit EM response in general*". **A3** said "*the council have been supporting to make sure that we have safer community, community engagement and build stronger communities who are able to deal with future emergencies better, these are good things which can benefit EM and community. We're already doing it, but not with a focus on emergency management, so I don't see any barrier if CDEM wants to, we are not CDEM and we don't have authority to do EM roles*"

B1 explained that; "*there are no barriers at the moment, because more people are now aware of the collaboration between community and the council, even the CDEM. Many people contact us requesting for help and then groups contact us wanting to help, so they provide groups of additional volunteers who work with other SVA volunteers. It's an organic collaboration with likeminded organisations that enables us to have large groups of volunteers in emergency situations*".

Although these are not barriers or challenges, challenges abound for future response activities because **B1** said; "*in both 2011 and 2014, SVA did really well with the time they had to respond, but there are things that could improve. For the current SVA exec, we do not have a formal emergency response plan in place, therefore, to be as ready as possible for any future disasters, we would need to introduce this, which would help improve upon our past responses. We would be more particular and organised in planning the way in which we communicate with each other within the exec, and with our volunteers, others we collaborate with and the general public, to ensure everyone is aware of what is happening and how it will happen*."

B2 identified; "*Data protection and organisation arrogance*" as potential barriers, while challenges mentioned were "*possibility of community losing momentum of the arrangement*." However, because the reality is that "*government is under-resourced, there will be need for government to start looking into cross-functioning of units and departments to work on projects relating to emergency response and future preparedness*".

B3, explained that "*the benefits are in the roles community functions provide and the crucial roles government also provide. Integration is important as some of the churches in Riccarton area are supported with funds by the council, because they provide social services for the council for the people in the area. Due to this, those churches have now become a major support for the community, running counsel centres, after school programmes, youth support, community hub, providing for the community lunches for the community etc. so in this region, 80% of funding from strengthening community team is provided to support faith-based organisations who are providing different range of service which strengthens the community.*

Some of these services are not limited to churches alone, but other faith-based organisations, although many of them don't provide religious service with these funding, they help with community development and use their network to bring people together. The barrier will be ***unwillingness or inability of community to provide these services of functions in future*** *or* ***lack of funding committed to community to make sure their role in EM response is sustainable***"

B4 also affirmed that; "*because funding is dispensed once a year, which is good, but challenges abound in terms of* ***sustainability, availability of personnel, and increasing capability*** *in what we offer. These are the main challenges I foresee which will also be barriers to integrating community services or functions with formal EM practice. Although the benefits will always be connection and friendship the community organisations provide to people*." In another forum, B4 also explained that "*there are challenges in having transitional community in Riccarton,* ***people fluctuating*** *- student community, trying to get the students to work with community, and every community in a transitional community without geographical boundaries to work together and continue to work together in the way required for emergency response*".

C1 further listed a range of challenges which can also serve as barriers to integrating community organisations, functions and services based on their experience working in collaboration with communities in Wellington region. Some of the challenges and/or barriers identified are;

- *"Creating a space for community resilience within EM, especially the response phase can be challenging*
- *Building capacities for disaster-related issues in emergency management to be more resilient. While community development organisations have capacity building as their core focus,*

emergency management does not have this space and it's been challenging at times changing this paradigm in emergency management.

- *Social capital and building relationships. Relationships are the biggest rival for successful response and recovery. This is because the survival mentality is still highly promoted above building relationships and working together to solve common challenges, building "working together obsession" amidst this mentality might be challenging.*
- *Increasing connectedness is about building strong communities, but this is the role, space and responsibilities of traditional community development organisations. But we've tried to support anyone doing this (building strong communities without an EM focus), since it isn't the space or primary responsibilities of emergency management.*
- *Fostering cooperation – we support activities which bring people together to build social capital for emergency management purpose – building capacities, increasing connectedness and fostering cooperation are the sum of our objectives.*
- *There might be challenges around apathy*
- *Teaching emergency management and community development skills – which was a challenge for my team also, especially people with response background*."

Few barriers were identified by the community groups and organisations, but more benefits were identified. However, the existing community organisations who played prominent roles during the quake sequence are confident and committed to continue to function in EM response capacity. A1 and B1 mentioned the series of emergencies in which they worked with other people, including assisting emergency services to respond to since the 2011 earthquake. While knowledge of hazards and other EM factors influence their continued commitment to performing EM functions, other factors which can be explained through broad theoretical perspectives are also responsible.

Chapter Five

Section 1 – Discussion on Community Specific Functions

The research results show that EM response activities can be overwhelming for one group to implement which is consistent with evaluation of EM strategies in the literature review that explains EM response as multi-agency or collaborative operations (Kapucu 2006). The result can also be validated through the EM principle that states that the essential quality for EM functions is to be flexible and adaptive to the needs of EM response (IAEM 2007; Haddow et al. 2008). Regardless of the level of resources and structure of any group or organisation, EM response requires the support and cooperation of other organisations or groups during a major incident such as that experienced in Christchurch.

Prior understanding of their capacity and ability to identify the required resources required is necessary to ensure safety of people and the support for their community. This feature of community-specific functions indicates that there is need to identify and know capacity, limitations and roles of partners in a community. This emphasises that pre-planned engagement with a community is required to determine capacities and capabilities (Mendoca and Wallace 2004). Such initial assessment and knowledge of a community are important in order to identify areas where support will be needed during any major incident (Betts 2007).

Analyses such as this emphasise the importance and relevance of the normative theories, system and management theory, embryonic theory and decision making theory examined in the literature chapter. Boin et al. (2005) explained that the critical period and the dynamic situation of the response phase makes immediate needs assessment, collaboration and communication stressful. This means that that such decisions are significant ahead of any disruptive event (Klein 2008). According to Alexander (2005), planning or readiness activities are determined in anticipation of imminent or possible events so that plans are documented with careful consideration of resources, and needs. It is the implementation of such plans that ensure that resources are well coordinated during response (Alexander 2002), thus ensuring that the impacts of disruptive events are mitigated or the event is prevented from escalating (Boin et al. 2005; Haddow et al. 2008).

However, for this to be possible, community specific functions demonstrated an inadvertent ability to coordinate multiple factors and variables of EM response (Drabek 2004). This important ability was mentioned by the interviewees when they outlined the several EM related functions their community groups and organisations performed during the quake sequence and other incident responses.

It is also noticed from this comparison that while activities for F1 in Lyttleton were not planned for prior to the quake sequence, they have since been developed as seen in Table 4.1. However, this is not the case with the community specific function in Riccarton. The evaluation of this function revealed

that F1 and F2 were unplanned for prior to the quake sequence and are yet to be planned or developed. This result indicates one or all the following:

1. community specific functions such as F1 in hazard prone communities can be promptly developed based on lessons learned [A1 and A2]

2. Geographically constrained areas are compelled to develop coping capacities for dealing with impacts of disruptive events [A1, A2, & A3].

3. Some locations with overlapping boundaries can be challenging to coordinate for EM related activities (Comfort and Haase 2006; Bharosa et al. 2010)

4. Some suburbs based on their location have access to government or emergency agencies or options of organisations who are responsible for and able to perform functions such as F1 and F2 [B1]

5. Communities are not equipped, trained and resourced to perform certain EM functions [A1, A2, A3 and C1].

For example, the first and second points listed above are reflected in the structure of community specific function in Lyttleton. There is a major difference between the structure, level of capacity and engagement available prior to the quake and after the quake sequence. Figure 3. 2 in Chapter Three shows the limited level of capacity and engagement level in Lyttleton prior to the quake. For example, there were only a couple of communication and health care organisations, educational organisations were limited to three, social and economic organisations were also a few and the Christchurch City Council was the only governmental arm linked to the community hub in Lyttelton (Ozanne and Ozanne 2013 p.9).

Mode of operations for Community Functions

The TB as the hub that facilitates or coordinates community specific function in Lyttelton mirrors the ideal logistical arrangement for EM response called multi-agency or interagency working (Kapucu 2006). It is notable that this community function is able to learn lessons and apply the lessons learned from past incidents into improving planning for future ones, making this community specific function able to be utilised for responding to different types of hazard. For example, the colour variation in Figure 5.1 indicate the organisations, groups and agencies that joined the hub after every major incident experienced in Lyttelton community. While further investigation could identify reasons and mechanisms for their ability to learn, adopt and apply lessons, this would be beyond the scope of this research. However, ability of community specific function such as TB to build relationships with

different categories of organisations and groups that can perform F1, F2, F3 and F5 activities emphasises the capability of community specific functions to perform EM response activities.

Furthermore, it is worth noting that the TB is one of the projects connected (linked) to Project Lyttelton (PL) as shown in Figure 5.1. PL is a parent hub for a total of eleven major projects in the community showing the level and extent of networks, relationships and interactions that exist at different levels in the community. As seen in this research, such multi-level relationship and interactions are beneficial to EM and to ensuring effective EM response unfortunately, however such multi-level relationship do not exist in EM system, practice or organisation. This is because EM organisations or agencies are operations-specific and hierarchically linked to their defined organisational duties and legislated obligations for ensuring security and safety when there is a threat to public safety (Klein 2008; Curnin and Owen 2012).

For example, community projects such as TB, Festival of Lights, Lyttelyon Farmers Market, Grow Harbour Kids, and Waste Matters to mention a few [A1, A2 and A3] all enhance community connectedness, collaboration, relationships and communication useful for EM response. All these projects have been integral in strengthening the community, and ensuring that Lyttelton becomes resilient and self-sustainable during any disruptive events. Thus, it is pertinent to understand that the effectiveness of any community specific function can be influenced by factors such as community knowledge which can be forced by proximity to hazards, knowledge of hazards that threaten them as a community, and geographical location as seen in Lyttelton [A1, A2 and A3].

Also, the nature of the interaction in the hub in Lyttelton is inward looking into the TB, which in turn draws from available skills and resources in different categories. By contrast, the nature of the community hub (SVA) in Riccarton is somewhat outward driven, such that resources from the SVA are mobilised to support needs in the community without much interaction between the categories of organisations identified in chapter Four. Although resources and skills are often mobilised from within other organisations linked to the SVA [B1], such mobilisation is done during “peacetime” not during response to an incident.

From the results derived from analysing data collected from interviewees in Lyttelton, it can be inferred that the motivation of community groups and organisations to participate in EM response activities is influenced by their knowledge of hazard. The ability to utilise lessons learned from response to past incidents has also been integral in improving the interactions between the community hub and various organisations. It can also be inferred that having existing projects such as PL and TB operating prior to the quake sequence are major influencing factors for building EM-aligned capabilities.

All these reasons contribute to the distinct EM response in Lyttleton as against Riccarton who only just sprung into EM function during the quake sequence. Thus, the influencing factors in Lyttelton can be explained using normative (relating to decision-making concept of EM), broad perspectives (perception of reality and threat to livelihood) and micro theories; societal behaviour that motivates society to be self-sustaining (Drabek 2004). Regardless of the limited response functions performed in Riccarton, the community specific function in this suburb have been utilised for response to other incidents such as flooding, and recovery efforts in Christchurch City. The community specific functions in Riccarton have used their capacity in a reactive manner rather than proactive way to respond to incidents. Such consistency of operation makes it worthwhile to consider this function and to evaluate their contribution to EM response.

Based on the data from the Riccarton community, the influencing factors that govern the nature of activities and their effectiveness can also be justified through EM principles such as flexibility; using creative and innovative approaches to solve challenges peculiar to EM (IAEM 2007). Collaboration and coordination principles are also evident in the two communities, which imply the ability to create and sustain broad and sincere relationships among individuals and organisations to encourage trust and facilitate communication (IAEM 2007). Other EM principles evident from analysing community specific functions especially in Lyttelton are risk-driven, progressive, comprehensive and integrated (IAEM 2007), all of which indicate the competence and relevance of community specific functions to EM response and EM system in general.

Section 2 – Discussion on Impromptu Function

The nature of impromptu function is quite different from community specific functions as identified from the primary data. This function became operational due to unplanned or unscheduled availability of competent agencies and emergency organisations. It was also possible for serendipity function to support a community during a major emergency because of their presence at the onset of the incident and their accessibility to the affected community; Lyttelton.

Thus, the location of a community such as Lyttelton seems to have advantages which positions them to benefit from support such as being connected and interdependent on one and another. Through the joint efforts of the navy, and coastguards and their ability to access Lyttleton via the waterways, serendipitous functions were made possible for EM response activities. In addition to this, improvisation was possible as the search and rescue coordination skills of the coastguards were utilised for in-land EM response, since they were available and possessed better knowledge of the community than the navy.

However, it is worth noting that all functions and EM response activities performed were led by the Navy or through joint efforts in collaboration with community specific functions and the coastguards

[A2]. Table 4.3 illustrates the level of cooperation for response activities and who performed what. It is however important to further emphasise that a high level of cooperation was possible between all involved parties despite not having established documented arrangement for response.

Therefore, it can be inferred that community specific functions operate better with collaboration with serendipity functions as seen in Table 4.3. This is because F4 was not implemented by community specific function, but was possible based on partnership with emergency organisations such as the Navy. Evidently, it seems some EM response activities are likely to be performed by emergency agencies and organisations based on the results and evaluation of community specific functions and impromptu functions. Lastly, the possibility of such partnerships without rehearsal and documented arrangements confirms the importance and possibility of community coordination at two different, but interrelated stages as explained in chapter two (Section 2.4.1), without confusion.

Having existing ability and capacity to carry out communication and coordination between agencies within the community, and with emergency organisations during the onset of the 2011 quake, helped to facilitate response arrangements that took place [A1, A2 and A3]. Such a level of capacity for communication was explained by Comfort and Kapucu (2006) as necessary for building and sustaining the type of relationship required for multi-agency response. While serendipitous functions occurred by happenstance, the manner of activities and processes for carrying out such activities model a multi-agency response arrangement required for any major incident.

Serendipitous function also shows that a two-way coordination i.e. coordination between emergency organisations, and coordination between emergency organisations and community (Drabek and McEntire 2002) is possible during a major incident. Accordingly, communication and coordination between networks of agencies and the affected community is necessary for good coordination which in turn eventually leads to effective EM response (Comfort and Kapucu 2006). On one hand, this result emphasises the benefits of collaborative working, and the potential outcomes of integrated response which are the focus of this research. This result also draws attention to the need to build capacities, and create opportunities and platforms that will facilitate the required level of coordination, communication and information sharing during EM response (Handmer and Dovers 2007).

Information sharing between organisations is considered one of the factors that result in communication problems in multi-agency working (Comfort and Kapucu 2006). But the performance of serendipitous functions has confirmed the possibility of good communication stemming from the willingness of both parties to share information that can support response needs. This outcome shows the contribution of serendipitous functions to EM response processes, addressing a problematic aspect of response. Furthermore, the contributions of serendipitous functions during the 2011 earthquake justify the need

for recommendations that guide information sharing between organisations/groups when cooperation for EM response is required and possible.

However, the possibility of the level of cooperation that leads to good communication is directly based on the types and characteristics of organisations, agencies and groups that are partnering to perform serendipity functions. For instance, the fusion of the Navy and Coastguard who are trained for responses of different nature, and disaster relief operations, encouraged the community to cooperate with them. Since they are already familiar with the presence of the Navy and Coastguard in the harbour from time to time during "peace time", the community's ability to cooperate with them for response was not far-fetched. This again stresses the importance of developing some form of relationship that can benefit EM process (Meadows 2008).

The joint activities of the naval, coastguard and community as seen in Table 4.3 were collaborative and complementary, which ensured that the gaps were bridged, and F4 (which was impossible in community specific functions) was actualised through serendipitous functions. The level of collaboration displayed during this response process negates the argument that EM response is confusing or chaotic when several groups and agencies are involved (Kapucu 2006; Patton and Swope 2005). However, it also emphasises that having existing community functions and certain levels of relationship, or community knowledge can be beneficial to EM response, especially the multi-agency response required during major incidents.

Section 3 – Discussion on Collaborative Functions

Collaborative functions appear to be similar in principle to serendipitous function. But unlike serendipitous, collaborative functions are not products of happenstance, they exist in a community prior to the onset of incidents. Collaborative functions are EM response activities carried out by community organisations, groups and network of services supported by or in partnership with emergency services and governmental agencies (Fakuade 2015). Although serendipitous function was happenstance and a one-off response to the 2011 quake, collaborative functions continued post-quake in different capacities in the two communities.

Organisations that joined the TB hub had been motivated by needs and the result was the collaborative response witnessed during the response to the quake sequence. The possibility of serendipitous function and the reality of impact of incidents motivated collaboration for different community development and EM activities [A2]. Even though both the Navy and Coastguard were part of the response in Lyttelton in 2011, the coastguard became part of the Lyttelton hub afterwards. The rationale for the coastguard decision to be part of the Lyttleton hub was not established during the scope of this research but it is

one which can perhaps inform further research into factors that motivate inception and sustainability of EM relationships for collaborative function.

Collaborative functions were also identified in Riccarton. For example, religions institutions were identified as collaborating with emergency services, residential associations and CCC to jointly perform functions that contributed to EM response. While in some cases, the CCC acted as the facilitator of some projects, in others it was the church that served as the hub and coordinating arm. While most of these works were directed at strengthening communities, some were attempts to prevent and reduce crimes [B3 and B4]. As identified during the primary data collection process, the focus of collaborative function in Riccarton was on human-induced hazards and incidents.

While all discussions prior to this stage have been based on naturally occurring hazards and incidents such as earthquake, flooding, landslide etc., the ability to coordinate networks of resources, capabilities and people to prevent and reduce crime shows the all-hazard potential of the collaborative functions. Similarly, collaborative functions were put to use during response to a fuel spill and pollution in 2014 in Lyttelton. This incident was an event with cascading or complex effect (Perrow 2011). A landslide hit the two Mobil storage tanks in Lyttelton during a storm in March 2014, rupturing a tank with 1.2 million litres of jet fuel, and dented a 91-octane petrol tank [A1 and A2].

In response to this complex incident, and as part of an attempt to prevent the incident from escalating, about 19 homes were evacuated (Robinson 2014). While this preventive evacuation shows the application of the risk-driven principle of EM, the continued ability of Lyttleton as a community to respond to different types of hazards is explicable through management theory as explained in chapter 2. According to Hamra et al (2012), management skills and theory in EM response are exhibited more in environments where interrelationships and improvisation of arrangements of resources, people and equipment occur. The ability to coordinate resources and improvise as seen in this case study in Lyttelton is also linked to and explicable through systems theory (McEntire 2004) as examined in chapter 2.

Consequent on this result, collaborative functions can be utilised for multi-hazard response. It is also worth noting that even though collaborative function was non-existent in full capacity in the communities prior to the quake sequence, the quake sequence awakened community and stakeholder to EM related responsibilities geared towards EM response. However, the response activities collaborative functions have been able to perform are F1, F2, F3, F4 and F5, showing that F4 which were impossible in community specific functions were made possible through collaborative functions.

Even though collaborative functions identified in Lyttelton and Riccarton sprang into existence post after the quake sequence, they have been used for response to flooding, landslide, crime reduction and

prevention, fuel spill and other incidents. While some of these incidents were life threatening, complex and could have escalated, the role of collaborative functions was quite distinct in responding to their occurrence. This manner of response can be understood using Figure 2.4 which shows the interaction of functions within the command and control system, with the command aspect directly focused on the cognitive and information aspects of functions in EM response.

Figure 2.4 also shows that social, cognitive, information and physical interactions and allocations can be delegated to organisations or groups with capabilities (Alberts and Hayes 2006). It appears this actually played out in both case study communities through collaborative functions. The understanding and clarity of delegation for EM functions shows how awareness of the situation, rules and constraints, and roles and responsibilities of all stakeholders can minimise confusion. Furthermore, clarity of the function domain demonstrates (as seen in collaborative function) that the efforts of stakeholders can translate into effective results if and when functions are delegated.

However, the decision to identify and delegate in collaborative functions is also influenced by a good understanding of the type of community. As identified during the data collection process, communities in Christchurch such as Lyttelton are defined as networked, transient and affluent residential communities [B2]. A comparison of Table 4.3, 4.4 and 4.5 shows that networked communities have higher EM-related components and activities which can be utilised effectively for EM response. Such high capacity and relevance to EM can enhance response strategy and decision making processes during the onset of any incident, stressing the relevance of the decision and system theories evaluated in chapter 2.

For instance, in networked communities, there are different hubs, projects or platforms that bring people together for various reasons [B3]. Being able to increase hazard knowledge in such communities as well as to sensitize people to EM responsibilities have been made possible through existing activities and projects. Such platforms are lacking in transient and affluent residential communities [B2 and B3]. As mentioned by some of the interviewees, this factor makes it more challenging for organisations, emergency agencies or other stakeholders to work with or partner with transient and affluent residential communities despite the proneness of some of these communities to different hazard [B2].

Regardless of these challenges, the approaches for engaging communities for EM examined in chapter 2 show that building relationships and partnerships for EM can be improved by providing well-aligned EM messages to communities (Betts 2007). McEntire (2007) also confirmed the difficulties that abound in maintaining EM relevant relationships with communities. However, Betts (2007) argued that more positive outcomes have been achieved in some challenging communities through appropriate EM activities, diplomacy in disseminating EM messages to communities and by encouraging communities to be more responsible for their safety and preparedness.

Given that networked, transient and affluent residential communities identified during this research all have similar levels of shared values (Table 4.3, 4.4 and 4.5), it is possible that through the platforms outlined in section 2.5, some of the challenges of engaging transient and affluent residential communities can be overcome. As identified in section 2.5, the characteristics of activities that lead to sustainable relationships in communities tend to be activities or projects that reflect culture, context, rules, and division of labour, values and ones that minimise tensions (Gilad and Kanfer 2006). Explanations such as this drawn from existing literature and the outcomes of this research, justify the validity and reliability of data collected and results of this research. The present research also provides direction and scope for providing recommendations for improving EM response arrangement especially for building relationships for EM.

Section 4 – Discussion on Structured Functions

Structured function is an example of an existing community function that has been identified as beneficial for EM activities, and which has been integrated with structured EM response arrangements (Fakuade 2015). An example of structured and integrated function was identified in another community outside of the researched area. This was done in order to identify possible challenges for integrating functions and the relevance of this research area to a wider community. By so doing, it seems other communities in New Zealand, especially ones around the capital city, have been benefiting more from the proximity of the Ministry of Civil Defence and Emergency Management (MCDEM), well-resourced regional civil defence organisations and availability of resources. As identified through the interview process, communities prone to the impacts of hazards have been identified and supported by the regional CDEM to develop their response capabilities [C1].

The regional CDEM facilitates EM-related activities which including designing a community EM plan that outlines the roles and responsibilities of community organisations and emergency services. This EM plan is supported by a Memorandum of Understanding (MOU). The MOU states that the local government recognises the integrated response plan and that all parties are competent to identify response needs and mobilise required resources for response to hazards stated within the integrated response plan. Formal documentation that acknowledges the existence of integrated response arrangements ensures that confusion during response is eliminated or kept to the minimum.

One of the benefits of having such arrangement with communities is the level of confidence it gives a community to perform EM response functions they have volunteered for [C1]. Such confidence to respond and the manner of partnership defined in this process are based on a good level of understanding between all parties. It is also based on the recognition and acceptance that certain functions are and should be performed by the Civil Defence and another emergency organisations [C1]. For example, functions such as emergency declarations, activation of coordination centres, search and rescue,

providing medical support, and instituting public health measures are legislated roles of emergency organisations and government [C1]. As seen in Table 4.7, communities engaged and empowered by CDEM for EM response have high levels of components, qualities and commitment relating to EM.

Based on the level of shared interest between CDEM and communities in EM, all stakeholders have been able to perform some level of EM functions observed in serendipitous and collaborative functions in Christchurch. This outcome achieved in this region is also attributed to a high level of hazard knowledge, risk perception and understanding that passiveness towards EM activities can be detrimental in many ways [C1]. While the ability to conduct, and implement such level of coordination and outcomes can be explained using decision theory such as NDM and RPD models, the integrated response structure practiced in the Wellington region seems to have limited categories of organisations and relationships.

The limitation of this function became evident in the process of analysing and discussing the research results. In comparison with earlier discussion in this chapter, it is evident that there are fewer networks, relationships and organisations involved in the arrangement in the Wellington region. While the CDEM facilitates the response arrangement, there was no mention of other emergency organisations or services involved in the arrangement. Furthermore, the description of organisations and groups involved at community levels seems to be a conglomerate of community leaders interested in EM, and not community groups. In terms of organisations, business or economic organisations were identified as was the involvement of elected officials [C1].

Unlike community specific, serendipitous and collaborative functions in Christchurch, the lack of educational, health, and communication organisations/institutions as well as the vast range of governmental agencies and civic organisations were evident. While this is not to undermine the roles of community leaders in leading the community, as identified through several disaster case studies, occurrence of a major incident can be overwhelming for an individual or individuals to effectively spearhead activities for F1, F2, F3, F4 and F5.

However, it is understandable that the level of EM activities in this region is based on their level of experience with incidents. Since an incident like that of Christchurch is yet to be experience in the Wellington region to test their capacity to utilise the current arrangements, it can only be assumed that such arrangements will be sufficient when any incident occurs. Since the integrated arrangement is yet to be assessed, the challenging typologies of EM response are also yet to be tested to determine their capability for response.

Nevertheless, there are key issues identified in the implementation of this function, which is the formal acknowledgement and understanding of response arrangements. A formal acknowledgement that

recognises the availability and mobilisation of resources, as well as roles and responsibilities of all parties involved in the deployment of EM response at the onset of any incident, is pertinent. Arrangements of this nature focus on the planning process, and ensure that the relationships formed are based on the critical needs of the community should a major incident occur [A1 and C1].

Section 5 – Discussion on Challenges and Barriers

While Lyttelton seem to be able to utilise its strong network of relationships and links with different groups and organisations in the community to learn lessons and improve partnerships for response to different types of incidents, the reverse is the case in Riccarton. Perhaps this difference is due to the characteristics of Riccarton suburb; being a community with a fusion of diverse ethnic composition (CCC 2014), with varying perceptions of risk and hazards. Hence the most active networks and relationships in Riccarton are only service-providing in nature, proffered by a limited transient group of people from religious or educational institutions.

The low hazard knowledge and peculiarity of this community makes the high level of shared values, established social infrastructures, positive social and economic trends, partnerships and resources and skills underutilised for EM response. Even though the levels of all these factors are higher in Riccarton than Lyttelton (See Figure 4.1 and 4.2), this does not translate into effective EM response arrangements. This indicates that, it is not just the number of links, relationships, networks and partnerships present in a community that is important but the ability to translate such resource to response functions and utilise them for effective implementation of EM response. The extent to which available resources and partnerships are coordinated based on hazard knowledge for the purpose of mitigating the impact of hazards and preventing an incident from escalating is very important (Lindell et al. 2007). Such levels of coordination based on hazard knowledge have also been explained as strong disaster resilience tendencies in communities prone to hazard (Paton and Johnston 2006).

It can be inferred that a high level of hazard knowledge is a significant factor in ensuring adequate development and implementation of community specific functions in any type of community. For instance, the proximity of community specific functions in Riccarton to the local authority, CDEM, and several emergency services did make a difference, especially in dealing with types of problems listed in 1, 2, 3, 4 and 6. However, all the problems listed above show evidence of lack of stage one communication and coordination (Comfort and Kapucu 2006; Drabek and McEntire 2002). Understanding the nature and level of relationships between agencies and communities is very important for communication and coordination in the event of any incident (Salmon et al. 2011).

These challenges are also influenced by a major problem of insufficient funding to support communities and EM organisations to a sustainable level where all stakeholders are confident to mobilise for

response. Although sustaining relationships for EM purposes is already being practised in Lyttleton, the issue of funding is becoming a major threat to the sustainability of the hub and the set of people who coordinate relationships and networks [A1 and A3].

Section 6 – Discussion on Benefits of Integration

Integrating community functions identified in this research is important for several reasons. Although challenges and barriers to integrating functions were identified during the research investigation, the barriers identified are ones that can be solved through the theoretical and practice bases for EM and response. For example, an emergency plan which contains clarity of scenarios, risks, roles and responsibilities of stakeholders, resource requirements and allocations etc. can be used to improve knowledge of response (Alexander 2002). Alexander (2005) further clarified the minimum requirements and sections in a standard plan as stating and incorporating issues of:

1. Legislative and organisational context
2. Clarity of plan objectives and scope
3. Hazard, vulnerability and risk analysis
4. Logistics – activation of roles and responsibilities and mobilisation of resources as well as nature of cooperation with all partners, agencies, community etc.
5. Recovery and stand-down procedures
6. Arrangements for plan maintenance, review, training needs etc. (Alexander 2005 pg. 161 – 165).

Therefore, developing a standard plan based on the recommendations of Alexander (2005), in line with normative theories in EM practice will potentially ensure that the first, second, third and fourth barriers are resolved, eliminated and their impacts prevented. Whereas the fifth, sixth and seventh barriers are subjective issues which can be addressed through broad perspectives, micro theories, systems and management theory. The generic factors identified as barriers in this community indicate that creating a paradigm that will cause an overlap between the community capabilities and EM system capabilities will be challenging. Thus, integrating functions identified in this research with EM systems will need to be organic or justified by its benefits as means of improving EM response. Therefore, the next section explains the benefits of integrating functions with EM system as an effective way of improving EM response.

Appendix 2 – Interview Questions

Section 1 – Questions for Community organisations & groups

1. Have you (your organisation/group) been involved in responding, helping and supporting the community during any incident or disaster before? If Yes
2. Can you say what the incident/disaster was and what role you (your organisation/group) played during this period?
3. What were the challenges (if any) experienced in performing this role? What challenges? How do you think things can work better in the future?
4. How did the community react to you (your organisation/group) performing this role instead of the Civil defence or local council?
5. Did you receive any support from any other group or community organisation in carrying out this role and supporting your community? What sort of support? How did that work?
6. Since the last disaster/incident, have you and the community you support been deliberating and planning how best you can prepare for future disasters or anything that can cause disruption to the community?
7. Are you confident your organisation/group will be able to carry-out this plan in partnership with the community or other group/organisation?
8. Further comments……

If No to question 1, then the session will follow this line of questions:

1. What function/service/role does your organisation/group play in the community?
2. Do you think your organisation provide education/information about possible harm, disaster or incidents which can disrupt the community to the people you support? If Yes
3. How will you provide this education?
4. Do you work in partnership with any organisation or group in the community to deliver your service?
5. Are you able to work in collaboration with the civil defence and the council to provide public information and/or training programs to help community better prepared for future disasters?
6. In the event of a major disaster, what services or support are you able to provide to your community?
7. How will you mobilise resources and how will you communicate availability of these resources to your community?

8. If you're able to do this, how many people do you think you can effectively support with your existing resources?

9. Further comments…….

Section 2 - Questions for Civil Defence Representative in Lyttelton

1. What are the current challenges experienced in effectively planning and responding to disasters in communities in Christchurch?

2. Does Lyttelton community prove challenging to plan for and respond to in the event of any major emergency?

3. Do you think people in Lyttelton are able to do more during the onset of disaster events to support and cater for each other?

4. Can you provide reasons for your answer to question 3?

5. Do you think community groups/organisations can support the Civil defence in carrying some of the readiness and response activities?

6. If Yes, which Readiness or response activities?

7. If No, why?

8. What are the future challenges you foresee with integrating the community in readiness and response activities undertaken by the Civil defence?

Further comments……..

Section 3 – Questions for focus group sessions with Civil Defence in Christchurch

1. What are the current challenges experienced in effectively planning and responding to disasters in communities in Christchurch (Wellington)?

2. Does any particular community prove challenging to plan for and respond to in the event of any major emergency?

3. Do you think communities are able to do more during the onset of disaster events to support and cater for each other?

4. Can you provide reasons for your answer to question 3?

5. Do you think community groups/organisations can support the Civil defence in carrying some of the readiness and response activities?

6. If Yes, which Readiness or response activities?

7. If No, why?

8. What are the future challenges you foresee with integrating the community in readiness and response activities undertaking by the Civil defence?

9. Further comments……..

Section 4 – **Questions for Semi-structured interview with WREMO emergency planning, response and resilience manager/coordinator/unit/team**

1. What are the current challenges experienced in effectively planning and responding to disasters in communities in Christchurch?

2. Why do you think these challenges exist?

3. Why do you think it's challenging to plan for or response to incidents/emergencies in some communities as compared with others?

4. Do you think communities are able to do more during the onset of disaster events to support and cater for each other?

5. If Yes, has anything been done to confirm or test community capability to support response to disasters/emergencies

6. Do you think community groups/organisations can collaborate to support the Civil defence and other emergency responding agencies in carrying any of the readiness and response activities?

7. If Yes, which Readiness or response activities?

8. If No, why?

9. What are the future challenges you foresee with integrating community functions/supports/resources with readiness and response activities carried out by the Civil defence and other emergency responding agencies?

10. Any further comments……

Section 5 - Questions for Focus group session with CCC Strengthening Community Advisers in Lyttelton and Semi-Structured Interview in Christchurch

1. What service or role does your organisation play within the community?

2. How long have you been providing such role and did anything changed before, during and after the quake sequence and why?

3. Do you work in partnership with any community organisations or groups in the community to deliver your service?

4. Are you able to work in collaboration with the civil defence and the council to provide public information and/or training programs to help community better prepared for future disruptive events?

5. In the event of a major disaster, what services or support are you able to continue to provide in your community?

6. How will you mobilise resources and how will you communicate availability of these resources to your community?

7. What are the challenges you've noticed within the community you support? What do you think are the causes of the challenges?

8. Do you think these services can collaborate with other community/groups who support other people? If not, what barriers do you foresee?

9. Further comments…….

Appendix 3 – Research Ethics documents

Research Clarification and Covering letter

Department of Geological sciences

University of Canterbury

27th May, 2014

The Secretary,
Ethics Committees,
Okeover House,
University of Canterbury

Dear Ethics Committee,

Re: HEC Application 2014/34

I'm writing in response and to provide more clarification to the questions raised in your email dated Wednesday 21st of May. The questions asked have enable me review the content in the initial ethics application form sent and have since reflected on the contents of the form and have consulted my supervisor on the same. Thus, I have reviewed the research ethics form, edited the research information and consent leaflet and included an additional appendix which serves as a letter of invitation for participants. In addition to the reviewed form and documents, please find below my direct response to the issues raised to further support my application:

- While this form was exemplary in many respects, the committee had some difficulty with the lack of detail on recruitment and confidentiality.

  - Supporting document and ethics form have been revised to address the issue of confidentiality and recruitment, please check question 9 (b) for reviewed answer about recruitment and supporting document in Appendix D. To explain the issue of confidentiality, please refer to 17 (a) and (e) for revised answer to confidentiality which will complement strict adherence to following the outlined procedures for undertaking this research according to University ethics guidelines.

- With regard to recruitment, there seems to be no initial advertisement or letter of approach. How are people to be contacted in the first instance? (Please also be aware that snowball recruitment must be based on professional contact details; obtaining private contact data would be a privacy breach).

  - Please refer to reviewed answer to question 9(b) and supporting document in Appendix D. While Question 9 (a) outlines the participants of this research, the participants of this research are the civil defence, community strengthening/Support unit of the CCC and the community organisations and groups directly linked to the Community strengthening/Support unit. And the participants will be invited by the researcher through existing professional relationship and work in the emergency sector. This is because potential participants are already aware of this research and have signalled strong interests and willingness to participate. Above all, the researcher will give her contact details to participants of the focus group to distribute to new community groups or potential secondary participants who might be interested in participating.

- You will most likely need permission from the various organisations to talk to their employees – please discuss how you will obtain these permissions.

- There is a community forum held regularly and hosted by the Community strengthening unit of the CCC which is for community organisations and groups. This forum which will be used to engage different community organisations and groups in focus group discussion. While it is possible that there are new community organisation who are unaware of this research, the research information leaflet, informed consent and invitation letter will be sent through the CCC community strengthening unit to all community organisations and groups to invite their participation in the research, even though many of them are already aware of this research. The information leaflet and invitation letter will be sent along with the notice of meeting for the community organisation forum held regularly by the Christchurch City Council, specifying that interested community organisation should contact the researcher to register their interests if they wish to participate in the research and are willing and able to spend additional 30 minutes during the community forum meeting on the research focus group session. The focus group for this research requires complementary data collection of different community organisations providing different support to community. Hence, the information sought is based on the nature, challenges and limitation of service provided to the community which does not require them to provide personal details of any of individual or confidential information about their clients.

- Please clarify who the groups are from which participants are sought, eg are youth considered possible participants and if so, will there be need for parental consents?

  - Question 9(a) outlines the classification of the participants and Question 12 states that all participants will be adults. But in description, the groups or participants of this research are community organisations in Lyttelton and Greater Riccarton area who are formally recognised by the Christchurch local Council as community organisations/groups. The second classification of participants is the Community strengthening/support unit of Christchurch City Council and lastly the Canterbury Civil defence; community resilience unit.

- Confidentiality is offered but it would seem difficult at first glance to sustain given the nature of the conversations and how they will be reported in the research; please comment.

  - Most of the data that will be provided by the participants of this research are information which might be published eventually in the annual community profile report. This research will be providing academic explanations to some of the dynamics recently observed by the Christchurch City Council while utilising this information to further strengthen the community in view of future disasters. However, it is possible that some data which will be provided might not be within the regular content for annual publication. The information will be coded when presenting them in the research (only if they are relevant to the research objectives) and anonymity of organisation or agency will be maintained at the writing stage of this research to retain the confidentiality of the data. Thus these are information published to inform policy makers and improve procedures disaster management framework in New Zealand as implemented by the Civil Defence and Christchurch City Council, hence the strong interests in the research.

- Question 5 – what is meant by functions?

  - Question 5(c) have been edited to explain what functions means in this research.

- Question 6 – please provide more details about procedures for focus groups.

- Question 6 have been edited to provide a more lucid procedure of this research especially as it concerns the focus group or interview sessions. And appendix C of the supporting document provides types of topics which will be discussed and the relationship of these discussion to the research questions and objectives.

- Question 17e – indefinite data retention, while becoming less unusual, still requires more discussion than offered in the application and, more importantly, the information sheet and consent form; please revise.

  - Data will in principle be stored for a period of five years on University of Canterbury secure computers and folders. This time frame is informed by the national census cycle in New Zealand for which the demographic information about communities provided by the Christchurch city council (CCC) would need to be reviewed and updated. Since this research results will be contributing to enhancing disaster resilience, especially disaster preparedness framework currently being developed by the Civil defence and the CCC, there might not be need to indefinitely retain data, but the documented thesis can serve as reference for further research.

- The information sheet should make it clear that in some cases participants are being asked to join a focus group and that this will make the removal of their data difficult.

  - The information sheet have been edited to include the statement about difficulty of removing data

- Please ensure forms for participants are on UC letterhead.

  - This is noted and will be done once research ethics is approved. The department has informed that UC letterhead will only be provided following ethics committee approval.

- Has CEISMIC been considered as a possible recipient of the data?

  - CEISMIC has not been considered as potential recipient of data since data collection method will not include visual. However, this research area and focus can be discussed with CEISMIC.

In view of progress, I hope this letter helps to clarify the issues raised in your email to me. However, please do not hesitate to contact me should more information and clarification be needed.

Thanks, in advance for your response.

Sincerely Yours,

Signed

Oludolapo Taiwo Fakuade

PhD Candidate

Ethics Approval Letter

Oludolapo Fakuade
Department of Geological Sciences
UNIVERSITY OF CANTERBURY

Dear Oludolapo

The Human Ethics Committee advises that your research proposal "Disaster resilience: an integrated process for improved disaster preparedness and response in disaster-prone communities" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 28 May 2014.

Best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand. www.canterbury.ac.nz

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