USE OF SOCIAL MEDIA IN DISASTER MANAGEMENT

Research-in-Progress

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Abstract

This research in progress paper investigates the potential of Social Media in Australian natural disasters. In social context, the functional needs of disaster management agencies and communities are segregated into three dimensions including agency to agency interaction, agency to community interaction and community to community interaction. A framework proposed in this paper explores (a) the nature of interaction and (b) the ability of Social Media in facilitating the functional needs of interaction involving disaster management agencies and communities before, during and after a disaster. On the next stage of this research, multiple case studies with disaster management agencies and focus groups with communities will be conducted to validate the proposed framework.

Keywords: Social media, disaster management, conceptual framework

Introduction

Over the last few years, the world has witnessed some of the greatest natural disasters (this paper uses the term "disaster" interchangeably with "emergency") of all times. Bushfires in Victoria (Australia) in 2009, floods in Pakistan in 2010, floods in Queensland (Australia) in 2011, earthquake in Japan in 2011 and Tornado in Tuscaloosa (USA) in 2011 are just few examples. Collectively, hundreds of human lives were lost and millions of infrastructure's damage was resulted by such disasters. Consequently, these types of disastrous situations have set new challenges for disaster managers and disaster management agencies. Developing standard emergency plans (Alexander 2005), effective decision making under time constraint (Mendonca and Fiedrich 2006) and enhancing the performance of disaster respondents by using advanced technologies (Bowman et al. 2007) are some of the key challenges currently faced by disaster management agencies. This has led to increased interest of researchers and practitioners to deal with such challenges by various means. Proposing new disaster management models, adopting new technologies and utilizing computerized systems are few ways to meet such challenges.

This paper attempts to underline the potential of Social Media applications such as FaceBook, Twitter, Flicker and YouTube in disaster management process. At present, there are some studies available that report the use of some Social Media applications in a particular phase of disaster management such as before, during or after a disaster. In general, these studies cover the trend toward the use of Social Media in countries like USA, UK and Israel (Paton and Johnston 2001; Rodriguez 1997; Seydlith et al. 1990). However, there is dearth of any significant research that explores the use of Social Media throughout emergency management life cycle in a country like Australia. Since the use of Social Media is influenced by its users' demographics and local trends (Lenhart et al. 2010), it is anticipated that the studies conducted in different regional and demographic settings may not fit well with the Australian settings. To fill this gap, this paper focuses on the role and the significance of Social Media in Australian natural disasters. Considering disaster management agencies and the communities are two main actors in disaster management, this paper proposes a conceptual framework that explores (a) the nature of interaction involving disaster management agencies and communities, and (b) the ability of Social Media in facilitating the interaction involving two main actors of disaster management process.

Disaster Management

Disaster can be defined as a source of danger, and its consequences can adversely affect humans in terms of life, property and environment when the level of danger, and the consequences, exceed the ability of the affected society to cope using its own resources (Alexander 1997). Comprising the source of danger in common, disasters could vary in terms of types and their impacts on human societies (Eshghi and Larson 2008; Kimberly 2003a; Perry and Mushkatel 1984; Quarantelli 1989; Shaluf 2007; Turner 1976). Generally, disasters can be categorized into three main categories including (a) natural (such as earthquake, extreme heat or cold, fire, flood, hurricane, landslide, thunderstorm, tornado, Tsunami and volcanic eruption), (b) man-made (such as biological, chemical, nuclear and radiation threat) and (c) hybrid (for instance, extensive clearing of jungles cause soil erosion and subsequently heavy rain causes landslides; the location of residential areas, factories etc at the foot of an active volcano or in an avalanche area; and floodplain disasters).

Although, it is not possible to prevent a disaster from happening, the risk of a disaster can be minimized by controlling hazard and vulnerability, and enhancing the capacity of individuals and communities. Before further discussion on the relationship between hazard, vulnerability and capacity, it is important to understand the meaning of these terms. Asian Disaster Preparedness Centre (2000) defines these terms as follows:

Hazard: Hazard is an event, happening or human activity that has the chance of causing risk and danger to life or damage to properties and the environment.

Vulnerability: The term vulnerability refers to the inability of individuals, households and the community to prepare for and respond to hazards. The disaster may be far too big and as a result individuals are unable to take action or make proper decisions to address the problems they experience.

Capacity: Capacity is knowledge, skills, resources, abilities and strength, present in individuals, households and the communities that enable them to prevent, prepare for, stand against, survive and recover from a disaster.

Furthermore, the relationship between hazard, vulnerability and capacity is commonly represented as follows:

$$Disaster = \frac{Hazard \times Vulnerability}{Capacity}$$

The above equation clearly shows that the risk of a disaster to a community becomes increased by high likelihood of a disaster (hazard) and its incapability to deal with the disaster. However, the use of right knowledge, skills and resources for preparing and responding to disasters can counteract the overall risk of a disaster.

In addition to the relationship among hazard, vulnerability and capacity, literally volumes haves been written on defining the disaster management process by deconstructing it into several phases such as three (Asian Disaster Preparedness Centre 2000; Atmanand 2003; Richardson 1994b), four (Kimberly 2003b; Tuscaloosa. 2003), six (Manitoba-Health-Disaster-Management 2002; Turner 1976), seven (Toft and Reynolds 1994) and eight phases (Kelly 1999; Shaluf et al. 2003). The common objective to decompose the disaster management process is to provide a basis and structure for segregating the problem into its main areas, thus contribute to its successful management. Among the most cited disaster management models, Richardson (1994a) presented the simplest classification of disaster management process. This model identifies three stages such as mitigation (before disaster), response (during disaster) and recovery (after disaster) in the entire disaster management process and is shown in Figure 1.

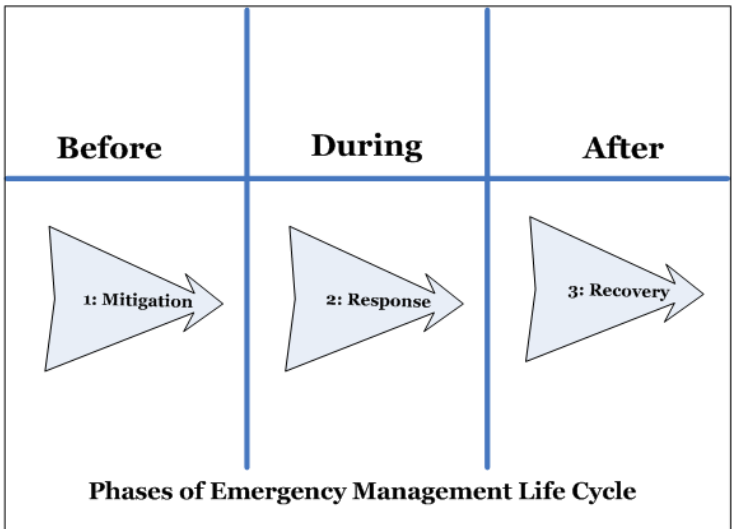

Figure 1: Emergency Management Model (adapted from Richardson (1994a))

Mitigation (Before Disaster):

A process of planning and taking long-term risk-reduction measures to eliminate hazards before the occurrence of a disaster situation (Peterson et al, 1999). Through mitigation, organizations try to intervene by preventing a destructive event from happening. According to the suggestions of Krovvidi (1999), mitigation is one of the important steps of emergency management and can be adopted without going through the costly process of risk assessment. Coburn et al. (1994) also highlights the significance of mitigation and further suggested that mitigation not only focus on saving lives, minimizing the injuries and other property losses, but should also be targeted at minimizing the consequences of emergencies for economic activities and social institutions. In a nutshell, mitigation aims to minimize the chances of an emergency occurring. Scrupulous consideration of mitigation measures helps in minimizing the consequences of an emergency, if not preventing it all together.

Response (During Disaster):

Assessment of damage, communication with all necessary parties, and the initiation of short-recovery attempts are the major activities of this phase (Richardson 1994a). According to Shaluf (2008), the goal of the responder is to save lives, minimize property damage and enhance the beginning of the recovery from the incident. According to Asghar (2006), the ultimate goal of the response phase is to address the needs of victims, and to undertake necessary steps such as (a) issuing a warning to the public, (b) safe evacuation of victims, (c) immediate supply of medical services, (d) people or victim management, and (e) actions to restore the basic structure of life and short-term plans to restore the normalcy of day-to-day life; to help people in coping up with consequences of the disaster.

Recovery (After Disaster):

The actions taken following the emergency phase are often defined as the recovery phase. It can be classified into two main categories such as short-term (restoration of basic services) and long-term (permanent rebuilding of the damaged infrastructure) recovery. This phase includes both rehabilitation and reconstruction. According to Yasemin et al. (1993), reconstruction refers to the operations such as full restoration of all services, rebuilding the local infrastructure, replacement of damaged physical structures, revival of economy and restoration of social and culture life.

Role of Communication Media in Disaster Management

The significance and the unique role of the media in natural disaster situations are unarguable. The media constantly act as a transmitter of valuable information throughout the disaster management life cycle (Perez-Lugo 2004). It is further argued that this didactic function of the media varies only in content across various phases of disaster management. Seydlith et al. (1990) suggest that during mitigation phase, the communication media provide factual information about the approaching disaster and remedies to immediately prepare for its impact. After disaster, the media focus their attention on the supposedly most affected areas, providing estimates of the damages and losses and helping communities in their recovery efforts. During the long term mitigation phase, the media act as disaster information provider through coverage of nonlocal disasters (via movies, documentaries, news and special programs) which eventually helps the community to raise disaster awareness and prepare for future events (Rodriguez 1997). It is evident from the above discussion that even the contents of the transmission changes during various phases of disaster management, the media are still perceived to serve a didactic function because it is assumed that people keep watching, reading, and listening to obtain information on disaster mitigation, response and recovery (Quarantelli 1996).

Social Media

Social Media refers to the applications that are either completely based on user generated content or in which user generated content and the actions of users play a substantial role in increasing the value of the application or service (Kaplan and Haenlein 2010). Nowadays, various sorts of Social Media applications

ranging from instant messaging to social networking sites offer an instrument for the audience to interact, connect and communicate with each other and their mutual friends (Pine 2007). These applications are intended to generate, initiate and circulate new and emerging sources of online information about audience's experiences of using products, brands, services and/or issues by allowing them to "post", "tag" "digg" or "blog", and so forth on the Internet (Senior and Copley 2008). Recent trends in the use of Social Media underline the fact that there is not only an increasing number of people opting for the use of Social Media applications, but there is also a significant increase in the number of these applications (Dennis and Valacich 1999).

Further to the increase in Social Media sites and applications, it is also revealed that the overall status of Social Media has moved from "buzz word" to a "strategic tool" (Eyrich et al. 2008). As a result, it has gained momentous attention both from researchers and practitioners. On one hand, practitioners are developing skills to better utilize this online communication technology (Dunn 2010), and on the other hand, researchers are developing models to examine various aspects of the use of Social Media in dissimilar settings (Eyrich et al. 2008) – disaster management as an example.

Although, the role of media in disaster management and significance of Social Media is discussed in above sections, it is also important to note that this paper does not position Social Media as a substitute to a traditional media such as TV, Radio and newspaper but highlight the significance of Social Media as an additional mode of communication, when sharing of information is critical – such as in disaster management.

"Australian Approach" to Deal with Disasters

Being the world's sixth largest country (by area), Australia has got its share in terms of natural disasters. This country has a long and atrocious history of natural disasters including floods, severe storms, bushfires, earthquakes and landslides (Australian Government 2011a). Such events not only cause great financial hardships for individuals and communities but also result in loss of life; which has become part of "Australian folklore" (Hughes et al. 2008). Despite the fact that natural disasters are merely impossible to prevent completely; the Australian government, disaster management agencies and most importantly the Australian people have shown their resilience to cope with and to manage the consequences of such disastrous situations. The sense of "community" and "neighborhood" - what is known as "Australian Spirit" - plays a tremendous role in enabling individuals and communities to deal with the devastation of disasters. During a disastrous events such as Victoria bush fires in 2009 and Queensland floods in 2011, the affected people received not only the remarkable support from their fellow Australians but incredible support and help from all over the world. The strategic, social and moral support received from "local and global community" fuelled the efforts of bringing life to normal after somber effects of disasters on the lives of Australian people.

Further to the significant role of communities during unusual circumstances of disasters, it is equally important to mention that the sense of community is an integral part of Australian culture. Better known as a "Sport loving nation", Australian people like to share their feelings and emotions with others. They prefer to be in "community" where everyone can look after each other during normal circumstances or the unusual situation created by any disaster or emergency. Further to their natural affection toward sports and games, they are very much inclined toward the use of new technologies and technological trends. For instance, with the total Australian population of about 22 million, there are more than 25 million mobile phone subscribers, 17 million Internet subscribers and about 9.5 million people using FaceBook (Internet World Stats 2011).

Functional Needs in Disaster Management – A Social Context

Related studies show that functional needs of disaster management agencies and communities varies during various phases of disaster management life cycle (Sheer and Chen 2004). Similarly, the type of sender and receiver such as emergency management agency or a community member have their own social needs and requirements in disaster management process (Sheer and Chen 2004). This paper looks at three dimensions of possible interaction between communities and disaster management agencies. These dimensions are:

- Interaction between agency to agency (called, A – A interaction)
- Interaction between Agency to community (called, A – C interaction)
- Interaction between Community to community (called, C – C interaction)

Agency to Agency (A–A) Interaction

Dealing with a disastrous event is generally beyond the capacity of a single agency or an organization (Waugh and Streib 2006). Although, most of these agencies deal with the specific set of disaster operations and specializes in their professional domains. They need to collaborate and coordinate with other agencies for information and resource sharing. Yanay et al. (2011) suggest that well planned and effective coordination and collaboration could improve the performance of an individual agency and enhance the outcomes of emergency management plans – especially the plans related to the rescue and response. Further to the above line of argument, it is also found that limited resources in terms of adequate information and technological infrastructure are generally the key hurdles in dealing with the disaster by a single agency (Waugh and Streib 2006). Therefore, disaster management agencies need to work in collaboration with each other. In context of timely and effective information sharing; constant, reliable and flexible communication channels are highly required throughout disaster management life cycle (Shaluf et al. 2003; Toft and Reynolds 1994). Such communications channels should be established and maintained both at inter and intra-organizational levels. In communication context, the following section of this paper discusses various tasks performed during agency to agency (A – A) interaction.

Coordination and Collaboration

A wealth of social and behavioural research presents coordination as a major challenge among the individuals, groups and agencies that respond to disasters (McEntire 2002). In his early work, Quarantelli (1986, p. 1) indicates that *"successful disaster management results from organisations coping well with the communication process, the exercise of authority and the development of coordination"*. Furthermore, Yanay (2011) articulates that the communication and the exchange of information between different teams are pre-requisites to disaster management planning. Effective collaboration between natural disaster response parties including the local population, local government authorities and humanitarian organizations is an essential part of natural disaster management (Oloruntoba, 2005; McEntire, 2002). Communication channels established during mitigation phase serves the basis for meaningful coordination and contributes in improving inter and intra-organization resilience and cooperation. Despite the fact that the importance of coordination in disaster management has been reported in literature, various emergency studies highlights insufficient coordination among responding agencies (McEntire 2002). The involvement of a vast number of agencies can create obstacles in the coordination efforts at the field level. The participating agencies will have their own operating methods and sometimes there is competition amongst them for the limited resources (Long and Wood, 1995). Nevertheless, the successful execution of disaster management plans and to conduct large and complex disaster management operations, agencies need to coordinate and collaborate with each other. In context of using Social Media in disaster management, the major claim made by the majority of Social Media applications is to bring people closer to each other. For instance, FaceBook claims to give people "*the power to share and make the world more open and connected*" (Lee and Bui 2000). Social Media has changed old models of computer-based communication. Web 2.0 creates an "*architecture of participation… to deliver rich user experiences*" (Mansouriana et al. 2006) and the social tools available offer to be "*powerful platforms for cooperation, collaboration and creativity*" (Boyd and Ellison 2008). Several applications of Social Media have the capacity to facilitate the fundamental requirement of disaster management agencies to share and learn from each other's experience and expertise – regardless to their geographic locations.

Agency to Community (A – C) Interaction

Although the natural disasters are rarely impossible to prevent, their consequences could be minimized by better planning and efficient execution of such plans (Asian Disaster Preparedness Centre 2000). One of

the key responsibilities of most of the disaster management agencies is to monitor various situations which could leads toward a potential disaster such as amount of rain fall, level of water in rivers and dams, any uncontrolled bush fire and/or an upcoming storm. In case of any abnormal pattern observed; appropriate, correct and timely warnings need to be issued to the communities. This paper suggests that the interaction between disaster management agencies and communities involves the following three types of tasks.

Education

Majority of the disasters have huge and enduring impacts on human lives and societies (McMichael et al. 2003). In order to minimize the consequences of such events, it is critical to prepare and develop resilient communities by educating them with the appropriate and up-to-date information required to deal with disasters (Paton and Johnston 2001). Traditionally, disaster management agencies are used to conduct seminar and workshops to educate communities about disasters and help people in preparing their emergency response plans. Furthermore, members of the community also share their knowledge and help each other in preparing for disasters (McMichael et al. 2003). With the technological proliferation over the last few years especially the use of Social Media applications such as FaceBook and YouTube has taken the process of education and virtual communication at new heights by making it easy and affective (Selwyn 2009). Currently there are numerous pages on FaceBook and countless videos available on YouTube that discuss about disasters and how to deal with different types of disasters. Considering the growing trend of Australian people toward the use of Social Media applications (Australian Government 2011b), it is anticipated that these applications have tremendous potential for educating and enabling Australians to better deal with disasters.

Information Dissemination

In context of disaster management, another type of interaction involving relevant agencies and the people of community is intended to pass and/or to share relevant information. In most of the cases, such information contain regular "updates" rather than a specific "warning" or "alert" on a disaster such as the regular "weather updates", "traffic alerts" and "news headlines". These sorts of information help people keeping them aware and up-to-date about their environment and surroundings. Nowadays, Social Media applications especially FaceBook and Twitter is used as a primary tool – along with the traditional media such as TV and radio – to share and disseminate the latest information to the broader audience (Dennis and Valacich 1999).

Issue Warnings

Further to the regular "information updates", accurate and timely warnings play a significant role in disaster management. Despite the presumed ubiquity and power of advanced technologies, the issuance of accurate and timely warnings are generally not witnessed in most of the natural disasters such as Indian Ocean tsunami of 2004 (Samarajiva 2005). Further to the critical nature of accurate warnings, it is worthy to note that false disaster warnings could have significant impact on people. For instance, after three months of the 2004 tsunami, another powerful earthquake of magnitude 8.7 (on Richter scale) occurred near Nias Island. Thousands of people living on the coastlines of the Indian Ocean ran from their homes. In contrast to the early warning issued, there was no destructive tsunami. However, there were few people who died either in the rush to evacuate or in shock, babies were born prematurely and some looting incidents were also reported from various parts of the coastlines. All these problems were caused by tsunami warnings: 75% of those warnings were false (Samarajiva 2005). False warnings are costly and could have adverse effects on communities. Therefore the contents, time, audience and medium selected for warning issuance are of great importance.

Community to Community (C – C) Interaction

Interaction among community members is equally important as of the two types of interactions stated above. For instance, during mitigation, community members can help each other in preparing for

disasters by sharing their information, expertise, resources and support. Similarly, during disaster or just after disaster, community members are generally the first respondents to the victims (Lichterman 2000). This paper highlights three needs for interaction among community members and discusses how the use of Social Media can facilitate them.

Communication

Interaction in terms of communication among community members remains vital in all phases of disaster management. For instance, during mitigation phase, they communicate with each other either to keep in touch or to assist each other in preparing for disasters. During disasters (or just after disasters), they need to communicate to update their status and to share the devastation caused by the disaster. In addition, it is also found that in majority of natural disasters, the people in the best position to respond immediately are the local affected populations and the local authorities. Hence, the local community plays a crucial role in the emergency operations (Spiegel 2005). Widmer (2003) indicated that for the success of relief efforts, the participating agencies should give importance to local information and cooperate with the local community. Over the last few years, Social Media has proved as an effective, reliable and preferred medium for communication both during normal as well as abnormal working conditions caused by various disasters (Hughes et al. 2008).

Moral / Emotional Support

During and after a disastrous event, one of the key functions of communication media is to fulfill peoples' needs for emotional support, companionship and community ties (Perez-Lugo 2004). According to Perez-Lugo (2004), during disasters, media fulfils more functions than strictly the supply of information, such as providing emotional support and sense of community. Individuals actively look for emotional support from the media, which provides the community with ties (or "communication brigs") between its isolated members with the time period defined by the impact of the natural event (Perez-Lugo 2004). Supporting behavior is demonstrated when people converge with the primary purpose of expressing thanks to disaster respondents and lending moral support to disaster victims. With the proliferation of online tools and applications, the same expressions of support can be found on-line. Over the last few years, various Social Medial applications have proved as an effective tool to provide moral and emotional support to the victims of a disaster (Hughes et al. 2008). "Fans" of a specific "cause" on FaceBook, "followers" of a specific "twit" on Twitter and "viewers" of a specific "video" on "YouTube" can be used demonstrate the support for a particular event.

Communication with the Rest of the World

Since, the use of Social Media is not restricted by the geographical boundaries; it is used to interact with anyone in the world who is sharing the same media application (Boyd and Ellison 2008). In context of disaster management, this could have a huge impact on global community. On one hand, Social Media are used to update others about what actually is happening at the disaster scene and on the other hand it opens new windows for the people to be in-touch with each other and to show their support for those who are affected by a disaster. The Social Media also help isolated individuals to feel connected with the "outside world" (Perez-Lugo 2004).

Proposed Research Framework

Based on above discussion, this paper presents a conceptual framework as shown in Figure 2. In social context, the proposed framework put together three dimensions of interactions (such as agency to agency interaction (A–A), agency to community interaction (A–C), and community to community interaction (C–C)) between disaster management agencies and the communities. The framework also underlines the use of Social Media and its role in facilitating the aforementioned dimensions of interactions.

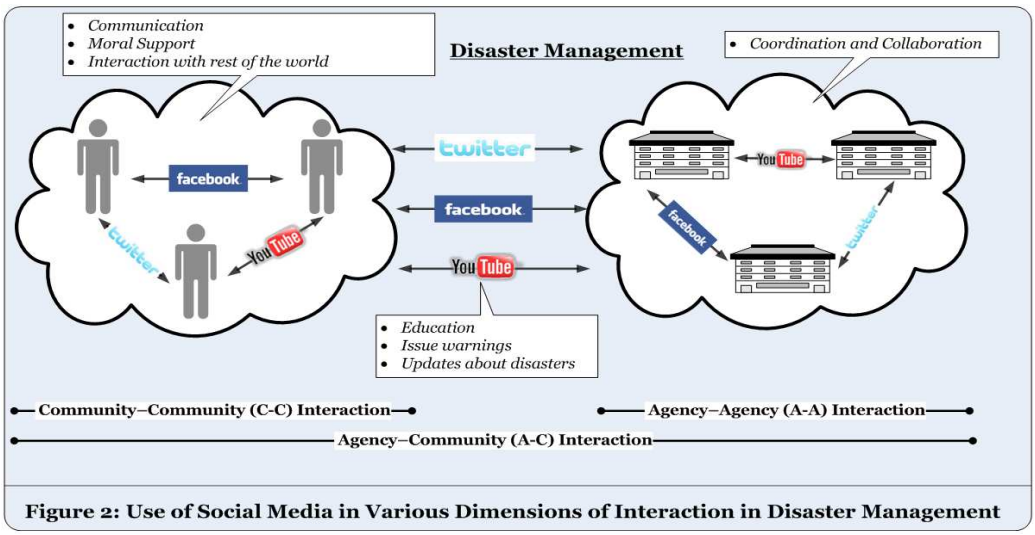

Figure 2: Use of Social Media in Various Dimensions of Interaction in Disaster Management

Methodology and Future Directions

This paper aims to explore the potential of Social Media in Australian natural disaster management. During disaster management process, interactions involving disaster management agencies and communities are examined in this paper. It is further discussed that the disaster management agencies and the communities have their specific functional needs to interact with each other during various phases of disaster management process. Moreover, the role of communication media during mitigation, response and recovery phases is also reported in the above sections. While the significance of Social Media has been already conceptualized and reported above, it is equally important to empirically validate the potential of Social Media in Australian natural disasters. In order to do so, this research will analyze the data collected by two methods. The first method will be the semi-structured interviews that will be conducted with five disaster management agencies within Australia. The selection of these agencies will be intended to get a good mix of cases based on their expertise and operations domains. The objectives of these interviews are as follows:

- To explore the functional needs of disaster management agencies to interact with other agencies and communities during mitigation, response and recovery phases.
- Advantages and disadvantages of using Social Media by disaster management agencies to interact with other agencies and communities during mitigation, response and recovery phases.

The second method will be focus groups with members of the community. Three focus groups will be undertaken with approximately 10 to 15 people per group. Each focus group will include a group of people who have recently been affected with or experienced any natural disaster in Australia. The objectives of these focus groups are as follows:

- To explore the functional needs of the communities to interact with disaster management agencies and other member of the community before, during and after disaster.
- To explore the types of Social Media that can be used by community members during various phases of disaster management life cycle along with their associated advantages and disadvantages.

The data collected from both methods (semi-structured interviews with disaster management agencies and focus groups with community members) will be transcribed in full and will be used for data analysis by using a qualitative data analysis tool such as NViVo. Findings drawn from the collected data would be used to revise the existing framework (if necessary) and highlight the potential of Social Media in disaster management and will facilitate in further enhancing the resilience of Australian disaster management agencies and communities to better deal with natural disasters.

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