A Community-Based Approach To Sharing Knowledge Before, During, And After Crisis Events: A Case Study From Thailand

By: Laddawan Kaewkitipong, **Charlie C. Chen**, and Peter Ractham

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A community-based approach to sharing knowledge before, during, and after crisis events: A case study from Thailand

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a b s t r a c t

This study adopts a structuration perspective to examine the knowledge sharing activities within local communities using social media to combat the 7-month 2011 Thai flood crisis using a qualitative case study. The crisis represented a unique situation wherein social media was used extensively during the most catastrophic flood crisis in Thailand. Data were collected from focus groups and in-depth interviews with flood victims, community leaders, NGOs, politicians, large enterprises, and Army leaders. The study divides the crisis event into three phases: pre-, during-, and post-crisis, treating each as both separate and interrelated, due to the changing information needs. The socialization and structuration theories were used as theoretical lenses to investigate how social media can play an important role in knowledge sharing activities in each phase of a crisis. The case study shows that social media can be adapted to fit the information and knowledge needs in each phase. This study's findings are useful and relevant for crisis managers, and clarify the potential usefulness of social media as a knowledge sharing tool during a crisis.

1. Introduction

The annual damages from the world's natural disasters has been growing since 2005, reaching $378.3 billion in 2011, the highest on record, according to USA Today (Rice, 2012). Hence, minimizing the negative impact of natural disasters has become an important social issue for both government and academia. Mass collaboration amongst the general public in responding to imminent crises is becoming a social norm, primarily driven by social media (Hoffman & Novak, 2012). Social media are 'a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow for the creation and exchange of user-generated content' (Kaplan & Haenlein, 2010, p. 61). The social media and the rapid proliferation of social networking applications, such as Twitter, Facebook, and YouTube have become a great mass communication tool affecting how citizens of the world communicate, collaborate, and coordinate with each other (Lai & Turban, 2008) during a crisis. For instance, the public have turned to social media in the face of natural disasters, including the earthquake in China, the bushfires in Australia, the nuclear disaster in Japan, and the flood in Thailand. Facing uncertainty during such crises, a growing number of people choose social media as a source of updated information about the disaster areas and to share information in support of those who suffer. Governments also use social media to reach people more quickly, to keep people informed of the crisis status, to avoid the spread of false information, to answer questions from victims' families, to monitor the situation, and to direct donations to those affected. Using social media to help the public pull through during a crisis has become a new global phenomenon.

Much theoretical and empirical evidence demonstrates social media's effectiveness as a knowledge sharing tool during crises for governments, agencies, and communities (Lachlan, Spence, & Lin, 2014a; Lachlan, Spence, Lin, & Del Greco, 2014b; Lachlan, Spence, Lin, Najarian, & Del Greco, 2014c; Palen, Vieweg, Liu, & Hughes, 2009;Sutton, 2009). For instance, governments can assess the degree of damage from floods, social pressures, and victims' emotional states based on the nature and content of public discussion in social media communities (Al-Saggaf & Simmons, 2014).

However, most previous studies focus only on the impacts and consequences of a crisis during the crisis and in the post-crisis

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phase. To our knowledge, there is no study focusing on how different stakeholders, including government agencies and communities, are involved throughout the crisis cycle pre-, during-, and post-crisis. There is also a lack of research into how different stakeholders use social media as a mass communication tool to interact with each other and help the general public throughout the entire crisis cycle. Investigating a crisis from a process perspective is a systematic and comprehensive approach to address all activities and strategies implemented throughout a crisis (Seeger, 2006). It is also unclear how social structure or the relationships among users would evolve. To close the research gap, this study addresses two important research questions: (1) How can social media be used for knowledge sharing among different stakeholders throughout the crisis cycle? (2) How does social media change the social structure among stakeholders throughout the crisis cycle?

Hence, this paper offers a detailed case study of how social media was used throughout the life cycle of the 2011 Thai flood, a crisis that lasted 7 months and was the most catastrophic flood in Thailand in the past 50 years. Interestingly, this crisis represented the first time that social media played an important role as a communication medium during a crisis in Thailand. This case study examines several social media platforms, including Facebook, the most popular social media platform in Thailand, Twitter, and YouTube.

In the following sections, we discuss how various types of social media can be used during a crisis and the role of social media as a knowledge sharing tool. Second, we review the socialization theory and structuration theories, the theoretical lens through which this case study is investigated. Third, we outline the methodology and analytical approach. Fourth, we outline the 2011 Thai flood disaster in three phases: before, during, and after the crisis. Finally, we describe the practical and academic implications of this study's findings.

2. Literature review

This study aims to provide insights into the use of social media for knowledge sharing and the evolution of the social structures among all parties involved throughout the crisis cycle. To achieve the first objective, we first examine the different social media- based solutions used to combat natural disasters and share knowledge. After examining the potential of social media for crisis and knowledge management, the socialization theory is adopted to examine the processes through which individuals or organizations share and exchange information and knowledge (Fisher, 1986) in their roles throughout the crisis cycle. To achieve the second objective, the structuration theory is adopted to help describe the evolving structures (e.g. rules and resources) (Giddens, 1984) of those involved in the crisis. Examining the subsequent interactions of all parties involved and how they share knowledge throughout the crisis can clarify how social media influences social structure evolution in a crisis.

2.1. Social media-based solutions to natural disasters

Social media's instant connectivity and open platforms have effectively shortened response times in efforts to coordinate onsite and online activities (Palen et al., 2009) through its instant information sharing and collaboration features (Boyd & Ellison, 2007; Hiltz, Diaz, & Mark, 2011). Social media continues to operate while more traditional methods fail during disasters, providing yet another advantage (Shankar, 2008). For instance, the public used Twitter to disseminate real-time information from the disaster site to international communities to source creative solutions and immediate aid during the 2010 Haiti earthquake, saving many lives (Sarcevic et al., 2012). The public, or general users, are increasingly replacing journalists as front-line reporters sharing information about crisis events, and governments as problem-solvers to propose effective crisis management solutions.

Existing literature on crisis communication (e.g. Seeger, 2006) suggests that government should listen to public concerns, be accessible throughout the crisis, convey a message of self-efficacy, and communicate compassion. Social media are well-equipped to provide governments with the means to conduct all of these communication activities. Social interactions among online community members provide crowdsourced solutions, allowing for egalitarian participation while helping a government assess the current and evolving stages of each crisis (Fung, Gilman, & Shkabatur, 2013). Thus, social media are one of the most useful and appropriate communication tools for crisis management.

In addition, social media are increasingly accepted as effective knowledge sharing tools to combat crises, and different applications have been used to combat recent crises worldwide. For instance, Information portals, such as Wikis and individual blogs provided alternative news sources during the 2007 Southern California Wildfires (Palen, 2008). People in the US used Twitter to share information during Hurricane Sandy (Lachlan et al., 2014a). Lachlan et al. (2014a) also suggested that Twitter may be a useful source of data to evaluate the needs and responses of varying audiences and victims. BP used YouTube as a channel to educate victims, communicate recovery plan, and to restore the company's image during the Mexico Gulf Coast oil spill in 2010 (Muralidharan, Dillistone, & Shin, 2011). Flickr groups were also created to share pictures and report updated status information during Hurricane Katrina and the Indian Ocean earthquake and tsunami (Palen, 2008). Social geolocation systems were used to share geographical locations and their situations during the 2011 flood crisis in Thailand (Kaewkitipong, Chen, & Ractham, 2012).

Adaptability is one major reason that social media have been successfully used to combat crises (Yates & Paquette, 2011), as users adapt social media to fit their needs during a crisis, and to collaborate with others to produce useful content and information and to help others through in the crisis. Additionally, the way in which online community members interact and cope with crisis events can create dynamic and spontaneous social structures. During a crisis, there is no readily available top-down structure directing users in the information exchange process. Bottom-up self-organized communities are a by-product of social media's embedded features. Therefore, its use to cope with each crisis event provides ample opportunities to understand the existing self-organizing social structure and its evolution from the interactions between different components of systems that become disorganized during a crisis (Miller, 2010).

2.2. Social media and knowledge sharing

Collaboration technologies provide appropriate means to share knowledge. Often, information is shared at the early stages of a crisis in a top-down hierarchical fashion or through a chain of command, such as from a government to its people. However, people can use social media to circumvent the traditional knowl- edge sharing process and communicate directly from anywhere and at any time. It also provides two major benefits during a crisis: (1) the process to reuse knowledge is simple, and (2) it is possible to eliminate the reliance on a formal liaison structure, including personnel and systems (Yates & Paquette, 2011).

A major reason that most knowledge sharing projects fails is they have no effective mechanism to share tacit knowledge because of its "stickiness" (Probst & Borzillo, 2008), and it can only be interpreted effectively in right context. It is thus important to

understand the relational dimension of knowledge sharing (Levin & Cross, 2004). The relationship-based strength of social media for sharing knowledge in an open and unstructured manner can aid in disseminating tacit knowledge among ordinary citizens, non-governmental organizations (NGOs), and governments. Thus, social media can increase the effectiveness of information and knowledge transfer, and prevent information overload while combating the crisis (Jennex, 2010). However, very few studies have investigated the process of using social media to share relevant information and knowledge to effectively combat a crisis.

2.3. *Socialization theories and knowledge sharing*

As social media has the potential to become knowledge sharing tools to combat crisis, it is important to understand how to use these effectively. Socialization theory and Fiske's Relational Models Theory (RMT) are two socialization theories that used to uncover the socialization process whereby people in the community share information, knowledge, and values (Van Maanen & Schein, 1979). These micro-individual level theories are useful in closely examining the detailed process of how knowledge was exchanged throughout the Thai crisis event.

Socialization strategies range from highly institutionalized (structured and collective) to individualized (unstructured and differentiated) (Gilpin, 2010). Institutionalized strategy operates in push mode between government agencies and other/local agencies to the online community comprised of ordinary citizens and NGOs. Individualized strategies operate in pull mode between and from online communities to government agencies.

Fiske's Relational Models Theory (RMT) can help clarify the duality of information and knowledge flows during a crisis (Boer, Berends, & van Baalen, 2011). RMT asserts that knowledge sharing patterns vary according to four fundamental forms of social bonds: communal sharing, authority ranking, equality matching, and market pricing (Fiske, 1991). Communal sharing among a group of people is equivalent and undifferentiated, so knowledge shared among community members is public property owned by all members within the same community. Distinguished members in the community are recognized based on their expertise (Boer, van Baalen, & Kumar, 2004); thus, knowledge sharing activities are often voluntary. Authority ranking-based knowledge sharing is asymmetrical, wherein higher-ranking members (government officials) push information to lower-ranking members (ordinary citizens), expecting loyalty to the authority in return (Menon, Thompson, & Choi, 2006). Equality matching or the reciprocal mode of knowledge sharing occurs when members exchange their knowledge with other members for similar knowledge (Kollock, 1998). Market pricing-based knowledge sharing occurs based on the utility values (e.g. profit, reward, promotion) of sharing knowledge with others (Davenport & Prusak, 1998). Online community members often adopt communal sharing and equality matching modes of knowledge sharing. These modes 'pull' information from the bottom and in unstructured format. On the other hand, governments often adopt the authority-ranking mode to 'push' information to the public. Table 1 summarizes the relationships between socialization strategy, RMT, and information/knowledge sharing modes in the crisis context.

2.4. *Structuration theory and its role in understanding crisis events*

Structuration theory has been widely adopted in IS research (e.g. Chang, 2014; Larsson, 2012; Puron-Cid, 2013). However, most studies were conducted at the organizational level, so scholars have suggested that the theory be applied to understand broader social phenomena (Jones & Karsten, 2008). In this study, we therefore adopt structuration as a theoretical lens to view the use of social media to reduce uncertainty or mitigate crises via inter-entity communication and intentional actions. According to Giddens and Pierson (1998),

> We should see social life, not just as society out there or just the product of the individual here, but as a series of ongoing activities and practices that people carry on, which at the same time reproduce larger institutions. (p. 76)

Therefore, we use this approach to examine the use of social media before, during, and after the 2011 Thai flood in the ongoing activities that were part of social changes or the reproduction of social structures. In addition, to understand what is happening, we need to understand 'why individuals are motivated to engage in regularized social practice across time and space and what consequences ensue' (Giddens, 1994: p 14). In this case, the structuration approach will clarify how the power of social media and human interaction could structure innovative ways to survive the flood. The meta-social-level theory is appropriate and useful for explaining the unexpected outcomes of IT implementation and adoption (Veenstra, Melin, & Axelsson, 2014).

Structuration theory focuses on relationships between individuals and society, highlighting that social phenomena are the product of both structure and agency. Human action (agency) is guided by structure, and structure is created through action (Chiasson & Saunders, 2005). The two-way relationship between agency and structure is referred to as the duality of structure and agency.

Therefore, it is important to understand structure and agency to fully understand structuration theory. According to Giddens (1984), structure comprises rules and resources that can be used by human agents in social reproductions. Rules can be conceptualized as normative elements and codes of signification. Resources are both authoritative (e.g. an ability to command or coordinate others) and material/allocative (e.g. goods, money, or other tangible items). The former is derived from coordinating human agents' activities, while the latter stems from the control of material products. Allocative and authoritative resources mediate power. If an entity loses business and social legitimacy, they may lose their ability to dominate resources (Chiasson & Saunders, 2005). For instance, shortly after the 2011 Fukushima radiation accident, social media effectively replaced the Japanese government in its allocation of material resources. Agency is a conceptualization of human action, defined by Giddens (1984) as 'transformative capacity' or the capacity to make a difference. Human action is a dynamic social

Table 1
Relationship between Socialization Strategy and Knowledge Sharing (RMT model) during Crises.

Socialization strategy	Fiske's relational Model theory	Information/Knowledge sharing Modes
Individualized	Communal sharing	Bottom-Up/Push Mode
Individualized	Authority ranking	Bottom-Up/Push Mode
Institutionalized	Equality matching	Top-Down/Pull Mode
Not relevant	Market pricing	Not relevant

process, based on rules and resources (Chang, 2014). Structuration theory holds that human agents are knowledgeable and competent, and can usually explain most of what they do.

Structuration is a process in which structures reproduce social systems (Lamsal, 2012), and asserts that human agents' (e.g. individuals, governments, and NGOs) actions constantly interact, with repetitive interactions forming and reproducing the social structure. Rules and resources may facilitate or constrain human agency during this process. Thus, human interaction and social structure have a reciprocal relationship from the structuration and self-organization perspectives (Giddens, 1984; Mingers, 1996). A social structure can emerge from human interactions, and this newly formed social structure (a new culture, an approach to combat crises, a moral code, etc.) is dynamic and continues to evolve as human interactions increase. Therefore, the self- organizing or structuration process can help produce new rules of interaction to cope with the changing environment and reduce environmental uncertainty (Küppers, 1999).

Fig. 1 illustrates the links between each human agent dimension (interaction) and the social structures moderated by three modalities. Human interactions consist of three distinct dimensions: communication, power, and sanction. Social structure consists of three distinct dimensions: signification, domination, and legitimation. These distinct dimensions interact with each other via modalities or methods, which include interpretive schemes, facilities, and norms. Modalities provide answers to questions such as why and how a certain course of action occurs in a society.

Giddens (1984) describes three forms of structures, including.

- Structure of signification. Formed or altered when human agents draw upon stocks of knowledge to justify their actions and produce meaning in their communications. It also structures how they make sense of their knowledge and thus communication. Signification is about participants' belief or understanding of what is happening in the community (Cohen, 1987). Therefore, participants will act according to their understanding, and hope they can improve their understanding of the current situation after taking some actions. For instance, people suffering from a natural disaster will first talk to people wearing a police uniform for help. If they could not obtain the necessary aid from the police officer, they might turn to Red Cross volunteers or village leaders.
- Structure of domination. Formed or altered when human agents use facilities or resources to gain or exercise power. Moreover, it structures or dictates how human agents use their resources, and thus their power. As participants search for new meaning in their actions, human agents often exercise control of authoritative and allocative resources to regulate their actions and make a routine out of their behaviour patterns. For instance, to prevent a disaster area from becoming chaotic, government officers may reallocate rescue teams, food, and clean water based on the degree of damage in the area.
- Structure of legitimization. Formed or altered when human agents sanction their actions based on moral norms or standards. Additionally, it dictates how human agents define and understand their norms and thus what can be sanctioned. Sanctions can be positive (e.g. reward, praise) or negative (penalty, scolding). Sanctions serve the purpose of enforcing the normalization process. The agent gains authoritative resources derived from socially granted power that is associated with legitimacy (Chiasson & Saunders, 2005). For instance, to implement a policy or control, government may mobilize military forces or promote rescue team leaders to an interim government officer (legitimation).

Understanding the production and reproduction of these three structures can provide insights into the effect of social interactions on communities.

In this study, we view government agencies and online communities, including citizens and NGOs, as major entities of the social system during a crisis event. These two entities recursively interact to produce and evolve into a social system that combats the crisis. Our case analysis will identify the ongoing information and knowledge sharing interactions between these two entities.

3. Research method

As there is no established theoretical framework explaining the dynamic changes in social phenomenon and various actions in each phase of a crisis, we chose a case study research methodology to fit the exploratory nature of this research. Yin (2008: 13) states that this methodology can be used to 'investigate a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident'. Hence, the research setting, which consisted of multidimensional interactions between stakeholders who instinctively interact to manage the crisis, fits the criteria for a case study research methodology. In addition, Yin (2008), Pan and Tan (2011), and Walsham (1995) state that a case study can be used to answer the 'how' questions stemming from an event that has no prior theory to clearly explain the phenomena. This further support the use of this methodology in our research setting to explain the methods behind complex processes and the events throughout the crisis lifecycle, and to understand the dynamic interactions between different stakeholders by collecting their chronological actions (An & Cheng, 2010). This method allows us to observe and analyse how different stakeholders shared their knowledge during the flood and how the overall social structure gradually changed between the pre- and post-crisis periods. Hence, an interpretive approach, such as a case study method, fits our research due to the setting's complex nature, wherein different knowledge sharing processes were extremely chaotic and had high levels of uncertainty (Klein & Myers, 1999).

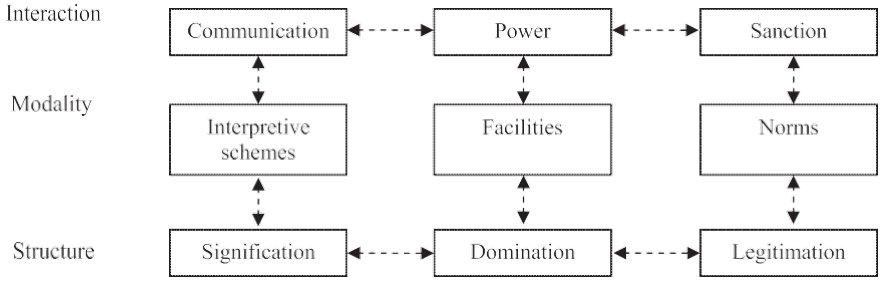

Fig. 1. Dimensions of the duality of structure (Giddens, 1984).

Initially, we collected and analysed the data concurrently. We rigorously reviewed the relevant literature to build a set of theoretical themes and constructs from various fields such as social media applications, crisis management, and socialization and structuration theories. These themes and constructs served as our theoretical lens to provide an initial guideline for data analysis (Walsham, 1995). The literature revealed relevant knowledge for the case context as well as provided theoretical guidance and a sensitizing device to direct the rest of data collection and analysis (Klein & Myers, 1999).

By applying these theories to the unique nature of our case, we expect to both understand the social phenomenon and discover new findings. The 2011 Thailand flood crisis was the most catastrophic in more than 50 years. More importantly, the crisis represented the first time that social media played an important role as a communication medium during a crisis in Thailand. In retrospect, the main communication tools during the 2004 tsunami in the southern part of Thailand were largely 2G cellular phones and SMS services, where communication lines between different stakeholders were less complex than the social media available during the 2011 flood. In some ways, the use of social media during the 2011 flood represents the first paradigm shift in terms of how information and knowledge are shared and exchanged during a crisis. More importantly, the 7-month period of the flood crisis had distinct phases in the crisis timeline.

3.1. Data collection

In July 2011, a tropical storm triggered a 7-month long flood crisis, with floods throughout the provinces in North, North East, and Central Thailand. This on-going disaster resulted in 815 deaths, and affected 13.6 million people. About 7700 square miles of farmland and seven major industrial estates were inundated, the worst flooding ever in the history of Thailand in terms of the amount of water and people affected. Disruptions to the food and manufacturing supply chains resulted in about US$ 45.7 billion dollars in economic damage and losses, and affected the regional production of automobiles and hard disk drives.

Social media played a pivotal role that transformed the social structure during the crisis. Individuals, communities, and organizations used their Internet and 3G enabled computers, smart phones, and tablet PCs to access social media and communicate, collaborate, and share various types of information and knowledge. Examining the knowledge sharing activities among these key stakeholders provides insights into social media's potential and limitations to combat crises.

We collected data in two phases. First, after the flood subdued in March 2012, we collected archival data from various sources, such as flood-related social media groups. We include Facebook, Youtube, and Twitter in this study, and will refer to the pre-existing or emerging social media groups primarily dedicated to flood crisis information/knowledge sharing as online communities. We collected additional secondary data from local Thai and English newspapers, government websites and reports, magazines, and published books that record factual stories about the flood from different angles. According to Yin (2008: 103), 'documents play an explicit role in any data collection in doing case studies.' He also emphasized the importance of using documents and archival data to corroborate and augment evidence and provide specific details for information from other sources.

After collecting the documents and online sources, we summarized the events based on the initial data analysis, which triggered the second phase consisting of planning the primary data collection process. We constructed a sensitizing device in terms of the socialization and structuration theories which provided a guideline to establish research constructs and arguments for the primary data collection from the interviewees in the second phase.

For the second phase data collection, we contacted relevant people, such as flood victims, Thammasat evacuation centre personnel, the most influential NGOs who issued warnings and shared information about the flood, business leaders, heads of governmental agencies, and an army lieutenant (the complete list of stakeholders is listed in Appendix A).

Once granted permission to collect data, we conducted in-depth interviews and focus groups with the various stakeholders. The data collection process lasted 4 months and included 56 stakeholders affected by the flood crisis in the interviewing process. The interviews began with open-ended questions such as 'How did you use Social Media to cope with the flood crisis?' and 'Which types of social media were the most useful and how did you adapt their usage to the flood crisis?' After we gained an initial understanding of the situation, we proceeded to in-depth questions related to the knowledge sharing aspects of the situation. We asked such questions as 'What types of information were shared and how did you relay this to others in the community?' and 'How did you manage to share useful information or knowledge created in your community with other affected communities?' After the interview data were recorded, they were transcribed into English by a professional translator.

By interviewing various stakeholders and asking questions in focus groups, we were able to gain well-rounded insights of the phenomenon and to triangulate data with other sources, such as newspaper articles, government reports, and documents, to increase the research validity as suggested by Yin (2008).

3.2. Data analysis

The data was analysed at a holistic level where individual, groups, institutions and society shared information and knowledge with one another before, during and after the flood crisis. We categorized the participants into two main categories: government agencies and online communities. The former involves various government units operated under the commands of the government; the latter includes the victims, the student volunteers, the NGO, the ex-deputy Bangkok governor, the Thai army, the YouTube channel, and the Facebook group, whose use of social media was not under control by the government.

We employed both socialization and structuration theories to interpret and analyse the data. The data were transcribed and interpreted at both the institutionalized and individualized levels. Initially, knowledge was primarily pushed from an established government in to the public at an individual level. After the flood crisis persisted and many social structures gradually changed and transformed, the data interpretation at both levels was also changed to reflect the knowledge sharing which changed to the pull multi-directional between different stakeholders including the government, which in turn created a change in social structure during the crisis.

Additionally, we divided data and investigated the crisis into three phases: pre, during and after the crisis. The relevant literature asserts that a disaster should be understood and managed in phases (Quarantelli, 1996; Reynolds, Galdo, & Sokler, 2002; Seeger, 2006) because problems and needs can be more specifically identified and analysed (Mills, Chen, Lee, & Rao, 2009).

We consistently ensured the alignment between data, theory, and our findings (Klein & Myers, 1999) until we finalized the findings. To ensure the interviewees' interpretations converged, we applied the rule of triangulation to the data sources (Dube & Pare, 2003). We used multiple data sources (interviews, focus groups, news report, and archival data) to filter interviewees' and

researchers' 'false preconceptions' to ensure that the data was consistent. Table 2 shows the theoretical guidelines we used to interpret and analyse our data.

4. Results

In 2011, the annual monsoon season started in early June instead of July, a little earlier than usual. In the beginning, the situation was deemed normal by government agencies and the general public. However, in late June the level of rainfall escalated quickly and unexpectedly, raising the water levels behind various dams in the North and Northeast regions to an unprecedented level. Eventually, the Northern provinces were flooded, with the flood slowly spreading through the North Eastern provinces. By late September, the flood covered most of North, North Eastern, and Central Thailand. By the beginning of October, the flood essentially sur- rounded the Nonthaburi and Pathumthani provinces, two buffer provinces surrounding Bangkok. By late October, several areas in the outskirts of Bangkok flooded. Bangkok was seen as the 'Last Frontier' for the Thai government to protect from the flood due to its strategic importance to the Thai economy. However, the government had vastly underestimated the velocity and severity of the crisis, and within a 5 month period from July to November, 65 of Thailand's 77 provinces were affected, with the crisis persisting for seven months. It ended officially in January 2012. This case study is divided into 3 phases: before the flood (mitigation and preparedness), during (response), and after (recovery).

4.1. Phase 1: pre-crisis

There are many useful methods to identify potential risks before a crisis to reduce the negative impact on human lives and property (Van de Walle, Turoff, & Hiltz, 2010). Effective mitigation and preparation efforts in the pre-crisis phase can enable prompt and adequate responses to a disaster. In this case, the situation was deemed normal, with an acceptable degree of risk for the Thai government. Different government agencies such as the Royal Irrigation Department and the Thailand Meteorological Department regularly reported weather conditions and water levels to the central government without sharing the information with one another or with other agencies at both the provincial and national levels. The flood was treated as a regular occurrence that typically occurs every year without considering the worst-case scenario. The pre-crisis measures taken by the government in 2011 were not much different from those in other years. Knowledge sharing between government agencies and from the government to the Thai citizens was centralized and occurred in a top-to-bottom fashion, and thus knowledge sharing between relevant stakeholders was scarce. The spokesperson for the government flood relief operation stated, 'The government had several websites that monitored the water level but the information was mostly between relevance agencies since it was not expected that the situation would escalate into a crisis'.

The Thai government relied on existing government websites such as the Thailand Meteorological Department site to publish weather-related updates so that local government agencies and community members could be aware of any new development or of a potential crisis.

As the flood level slowly increased and the water mass began to travel from the Northern toward the Northeast and Central regions, the government did not feel that it was necessary to warn Thai citizens of the velocity and gravity of the situation, believing that they still had everything under control. Additionally, they wanted to avoid panic due to the uncertain information they were gathering during that time. A web portal called Thaiflood.com was created through a joint effort between various NGOs to pull flood-related data from government and other sources to disseminate information to the public. However, most Thai citizens did not pay attention to both the government and the Thaiflood.com sites, as they were not heavily promoted.

> 'The government didn't do a good job in telling the Thai people about the flood level from the North and Northeast. They seemed to care more about not panicking the Thai citizens than telling them to prepare for the upcoming crisis', (Mr. Sasin Chalermlarb, a representative of the NGO).

Since the government did not disseminate information some active community members turned to social media, including Facebook and Twitter, to share information and knowledge (e.g. how to observe the water level; how to lay sandbags) with each other. However, government agencies considered such information as mostly rumours and chose to ignore or underestimate its importance. Thus, there was a lack of collaboration between government agencies and communities because the government preferred its one-way communication modality.

> 'Our group had followed the flood situation closely. We shared information among us, and we tried to warn our municipal government agents about it. However, the message was very slow in getting to the top people in the municipal office', (leader of 345 Parichart Village Facebook group).

4.1.1. Pre-crisis socialization and structuring between government agencies and online communities

The Thai flood crisis was unprecedented, and involved a high degree of complexity. In response, the Thai government adopted a regulative model based on previous flood-fighting experiences, though a creative model to propose new solutions (e.g. aggressive use of social media to effectively communicate with the public) would have been more suitable than a regulative model to manage

Table 2
Theoretical guidelines for data analysis.

Concepts in socialization theory (Gilpin, 2010)	Concepts in structuration theory (Giddens, 1984)
• Individualized strategy e how individuals planned and responded to the flood crisis in term of collecting and sharing information amongst themselves and from institutional stakeholders such as the government • Institutionalized strategy e how an institution such as a government, private company, army, or NGO coordinates their actions to cope with the crisis in terms of information and knowledge sharing between relevant stakeholders • Push strategy- a communication strategy relying on one-way communication from an institutional agent to individuals • Pull Strategy e an omnidirectional communication strategy where relevant stakeholders can share and exchange information between one another	• The duality of structuration • Significance ↔ Communication e human communication takes place when human actors draw upon stocks of knowledge to justify their actions to produce structures of meaning • Domination ↔ Power e human agents use their powers to allocate materials, information, and other resources to produce a structure of domination • Legitimation ↔ Sanction - human agents sometimes sanction their actions by norms or standards of morality to reproduce social structures of legitimization

projects with high uncertainty (Jaafari, 2003). The government chose a top-down approach to legitimize the social structure (e.g. push information to the public) and sanction human interaction (prohibit the spread of uncensored information). The traditional channel (government websites and/or portals) became the communication norm for agencies and communities.

> 'We frequently disseminated and shared information from various agencies with our citizens. Most people were able to follow our updates through government websites', (spokesperson for the government flood relief operation).

In summary, through the lens of socialization theory, we can see that when preparing for the emerging crisis, the Thai government did not use social media, as they aimed to convey to local agencies and social community members uniform messages of what the government stands for, the roles of the online community members, and what is expected of them. Authority ranking relationships often dominated the pre-crisis stage because the government feared that its authority or status was challenged (Menon et al., 2006). Institutionalized strategy dictates a formal hierarchical relationship, with a fixed sequence and defined timetable to promote direct interaction between agencies and community members. Unified messages broadcast and announced via government websites and TV programs are generally the communication forms used in the institutionalized strategy. Government agencies have strict control of the content in these unified messages, communication channels, target populations, and communication intervals. Local government agencies, such as police officers, city mayors, and government website administrators are responsible for executing crisis management activities based on the unified messages from the central government. The use of the institutionalized strategy to prepare and prevent a crisis is intended to create common and standardized experiences that the public can uniformly interpret and respond to. Through the lens of structuration theory, we can see that the legitimation structure was reinforced as the government attempted to control flows of information based on the traditional approach of one-way communication (norm).

4.2. *Phase 2: during-crisis*

During a crisis, information sharing should address victims' needs by providing immediate help, such as medical services and evacuation (Van de Walle et al., 2010). In this case, social media were primarily used to facilitate communication between online communities and the flood victims. During this phase, the Thai government was still using TV as its primary medium to communicate with local agencies and flood victims about the ongoing situation, and using their websites sparingly as a secondary outlet. However, as the information provided by the Thai government quickly became outdated and obsolete, information sharing through social media by NGOs and citizens began to gain momentum. As the flood crisis persisted, the government began to distribute information using various social media channels and to incorporate these into Thaiflood.com, and initiated a collaboration with a major online social community, called kapook.com, to establish the 'Thailand Information Center', to provide aggregated daily information updates about victims in different areas. At the peak of the crisis, the already stretched government had to allocate their limited resources to front-line aid efforts. Although they tried to allocate some resources for social media communication, most information received from different resources was unfiltered, and some consisted of rumours or inaccurate information. For instance, the Director General of the Royal Irrigation Department told Reuters news on 14 October that 'I can confirm that Bangkok is going to be spared from the flood' (Thepgumpanat, 2011), yet parts of Bangkok were flooded days later.

After the public no longer considered government agencies a trustworthy source of information, online social communities in Thailand quickly mushroomed and became the de facto source of information and medium to share information among Thai citizens. More than 50 Facebook groups formed during the crisis, most established in Bangkok because it was the least affected city.

> 'It was total chaos. At first we were following the news on TV and radio but then time-after-time and day-after-day we kept getting the wrong information from those sources, so we decided to switch to social media to find up-to-date information', said a victim who stayed at an evacuation centre as his single-storey house was completely underwater for 2 months.

These emerging online communities effectively updated information and news about water levels in different areas and located the whereabouts of missing loved ones. Live pictures and videos sent by people from the affected areas were quickly updated and shared among community members. This useful information enabled government agencies to prioritize resource allocations.

> 'We were able to pull some useful information created by Thai citizens from social media and then we disseminated that information through our Royal Army Facebook page', (Thai army representative).

Another government agency-based group, the Flood Relief Volunteer Center, used crowd-sourced intelligence from various citizen sources to help flood victims throughout Bangkok.

> 'We were able to gather information from each affected district. Useful information such as the water level and damage were reported to us and then we relayed that to our members through social media channels', (Director of The Flood Relief Volunteer Center).

Another successful example of using social media to cope with the crisis was the Roo-Soo-Flood (Know How to Cope with Flood) online community, formed by a group of volunteers with experience in mass communication. They made creative use of YouTube to educate people on effective measures of dealing with various flood-related issues, such as forming emergency response plans, timing evacuations, and so forth, and how to avoid unnecessary panic.

> 'Our group started with 3e4 friends who were digital artists. We thought that there was information overload on the public, so we decided to create easy-to-understand You Tube videos about the flood. It became a big hit. We had more than 100,000 views on the first day alone. Our video was being spread very fast and a lot of people befriended us on our Facebook page ... in the end, we had more than 10 videos about the flood to educate people on how to deal with it. Basically, we provided information to people on how to live their lives for the next two months with the flood', (founder of the Roo-Soo-Flood group).

4.2.1. *During-crisis socialization and structuring between online communities*

Since the public had lost trust in government agencies and turned to online communities during the preparation phase, online community sources had higher credibility. Collaborating and coordinating with credible sources is an important crisis

management practice because it can help gather and disseminate accurate and consistent messages, find experts in proper areas, and create strong relationships with the public (Veil & Ojeda, 2010). From the structuration theory perspective, communities used social media to collaborate and build credible sources of information. The grass-roots movement grew into a multi-dimensional information sharing network and strengthened after the social communities gave up relying on the government's one-way efforts (e.g. TV broadcasting, rescue teams) to search for family members.

> 'We basically had to take care of 5000 victims in our evacuation centre by ourselves. I personally used social media to disseminate the necessary information to the people who worked closely with me. We gathered a lot of resources through social media and we tried to keep involvement with the government to a minimum', (Rector of Thammasat University).

Another community leader, the leader of the Charun Fight Flood group also used social media to report information to the neighbourhood.

> 'We waded through water each morning, afternoon, and evening to take photos of the neighbourhood to report the flood situation to our Facebook members. Pretty soon, other flood victims who joined our Facebook group started to share information from inside their homes. We were able to get contributions from people who were stuck in their houses in terms of water levels and other necessary information. Basically, the whole community came together to share information to help one another', (leader of the Charun Fight Flood group).

The government agency was overwhelmed with front-line aid efforts and could hardly divert its limited resources to deal with the omnidirectional information sharing from social media sources. Without the resources to dedicate to filtering the information, the agency often posted inaccurate information on its portal. Consequently, the social media effort not only diluted agency efforts, but also created further chaos. In the face of imminent danger, the communication between agencies and social communities was disrupted.

> 'There was a lot of misinformation passed around during the flood. We were not sure what was right or wrong information as different media outlets often reported contradicting messages, especially the current water level in each affected area', (a flood victim).

Social communities, then, created their own ways to enforce rules and generate resources (information and knowledge). In other words, social structures emerged to fit the needs of each online community. Human interaction primarily took place among members within their own social structures.

During the crisis, community members often exchanged updated information with each other, and expressed different views about the crisis rescue activities organized by government agencies. The individualized pull strategy was often used during the crisis, fostering diversity in public views and expectations about governmental rescue efforts. This pull strategy is informal, and can address the unique needs of heterogeneous members. For instance, some members may use Twitter to send out a short message to close friends and remind them to evacuate their house as soon as they know the latest development in the flood crisis. Other members may post pictures on Facebook showing water levels exceeding the safe zone, and then instantly message their friends. Individualized strategies can promote peer-to-peer interactions and individualized experiences. The intention of sharing information and knowledge with others is primarily based on a social networking sharing culture, such as fairness, identification, and openness (Pi, Chou, & Liao, 2013). During the crisis, online community members bonded and shared knowledge because of a common identity (victims or their relatives) or purposes (e.g. rescuing victims). A communal sharing culture is typically seen during the crisis fighting stage. The idea that 'what is important to me is also important to others' is evident in the information and knowledge sharing process during the crisis stage.

In addition, the individualized strategy has no predefined timetable and sequence to share information between community members and between agencies and members. Only the most urgent and important information will be circulated quickly during the crisis. As a result, online community members often resort to an individualized pull strategy to cope with crises. Equity matching relationships are prevalent because knowledge about fighting a crisis is shared by a person either because another person needs it or because someone has shared something useful. The dyadic relationship can help equalize the benefits for both the sender and recipient (Boer et al., 2011). Government agencies became less influential in online communities while combatting the crisis because they wanted to avoid chaos and were constrained by multiple layers of government regulations aimed to ensure information accuracy before it is shared with the public.

In summary, we can see through socialization theory that during the crisis, social media became the primary information sharing channel for community members. There was little information flow from community members to government agencies. The online communities mobilized social media resources on their own instead of relying on government agencies' central resource allocation. When the communities' members created their own way of using social media to share information and knowledge, they produced the structure of domination according to the structuration theory. The structures emerged and changed according to the needs of each online community (e.g. the Charun Soo Flood group, the Parichart356 group). Social media were employed as powerful tools for online communities to gain power (over the government and its way of sharing information and mitigating the crisis) and thus dominate the situation.

4.3. *Phase 3: after the crisis*

The primary objective in this phase was to enable individuals and organizations to return to normal life, share compassionate stories, obtain emotional and physical support from their peers, and gather the information necessary to recuperate from the flood damage (Ahmed, 2011). Thus, after the crisis, government agencies began to publicize information, such as successful recovery activities executed by volunteer groups, and various medical services available to victims in different locations. Facebook was the main social medium used to offer these post-crisis services. To prevent similar disasters in the future, the Thai government launched the National Flood Prevention Initiative to aggregate and archive past information related to the flood crisis in a central repository database for future reference. The ultimate goal was to turn this initiative into a national-level flood prevention program involving all agencies that participated in the rescue efforts during this flood.

> 'We set up a national-level flood prevention program to take care of the Thai people after the flood. Basically, we provided the necessary information to our citizens on how to file a flood victim claim, so each household could get up to 20,000 baht ($500) to fix their houses and help them cope with hardship

after the flood', (Spokesperson for the government flood relief operation).

The director of the Flood Relief Volunteer Center used Facebook to call for volunteers to clean up the community. He said:

'We used social media to call for thousands of people to come out on the street to attend the 'Big Cleaning Day', where people gathered and helped clean up each other's neighbourhoods'.

In addition, the Flood Relief Volunteer Center also used Facebook to provide updates about several volunteer projects around Bangkok (the centre of most volunteer projects), since it was the last city hit by the water, and the first to recover from the flood. The volunteer centre provided daily updates on its Facebook page, in terms of which volunteer projects need how many people, or what kind of resources they needed that day (e.g. more plastic bags, more rice). During the day, the volunteer centre updated the situation several times to let those who want to volunteer know which projects already have enough people and resources and which still need more people and how to join those projects. This was a cre- ative and useful way to call for volunteers and allocate sufficient resources for each project.

After the crisis, government agencies and many online social communities began to share information about the volunteering activities available to assist victims in their recovery process. Many agencies continued their corporate social responsibility (CSR) efforts by building relationships with people who were actively involved in various rescue efforts during the crisis.

'PTT used social media extensively to help the flood victims. As the biggest Thai oil company, we used social media to disseminate information about oil and natural gas availability, since a lot of people needed to mobilize their assets after the flood. The information about oil and gas availability was very important to the flood victims', (Vice President of the Corporate Communication Department at PTT).

A large number of people collaborated to organize and promote recovery activities on Facebook and Twitter. These social members also used these two media to provide moral support to each other and to victims. Other social communities used YouTube to share parodies and homemade video clips with victims to help reduce their stress levels during the recovery process.

'We created a funny and memorable video of the flood, in the hope of lightening victims' moods. In a way, we wanted this memory to be shared among community members so they could remember this flood for a long time and to share what we as a community went through', (Leader of the 345 Parichart Village Facebook group).

4.3.1. Post-crisis socialization and structuring between government agencies and online communities

During the recovery phase, both government agencies and online communities recognized their inefficiency and ineffectiveness in dealing with such a large-scale project with its high degree of uncertainty. They began to identify the importance of overall efforts to leverage social media to their advantage. The National Flood Prevention Initiative is a national effort to archive all lessons learned from this disaster and to use them to avoid making similar mistakes in the future. Their actions produced new structures of meaning for the use of social media to combat flood disasters. In the meantime, social communities have continued to use social media to help the remaining disaster areas by drawing upon stocks of knowledge (e.g. recovery advice) from the public. Social media enabled communities and government agencies to gain a sense of control through meaningful actions (e.g. volunteering, donations, food supplies, recovery advice, jokes, and expressions of caring and empathy) that promoted a sense of self-efficacy (Veil, Buehner, & Palenchar, 2011). As such, social media became a new platform for communities and government agencies to share information and support. Their actions also produced new structures of mean- ing for the use of social media in the recovery phase.

'I believe social media is possibly the most important tool for the future in combating crises. I used it effectively and learned many valuable lessons during the flood. I'll definitely use it again in the future with my group when the next disaster hits', (Ex-deputy of Bangkok's Mayoral Office).

The major efforts of government agencies and online communities were to help victims recover from the damage and return to a normal state after a crisis. The success of some online communities in assisting rescue efforts may be brought to the attention of government agencies to receive recognition. Government agencies can also use some lessons learned during the crisis to improve the recovery effort. The two-way communication process between government agencies and community members began to take shape. Since most community members did not have the resources to support rescue efforts, they continued to spread and share information with government agencies and to ask for additional resources. In addition, the government continued to push information to the public regarding its available resources to expedite rescue efforts.

In summary, through the lens of socialization theory, we can see that there were simultaneous synchronous and asynchronous flows of information between the government and online com- munities. During the post-crisis period, both the government and communities used social media. Many online communities (on Facebook) acted as small collaboration centres, including government units, to share recovery knowledge (e.g. how to clean houses that have been under water) and gather volunteers for several projects (e.g. the 'Big Cleaning Day'). Recovery efforts were more successful as institutionalized and individualized strategies were employed at the same time. Through the lens of structuration theory, we can see that both government and communities created a new structure of meaning (signification) for the use of social media. Social structures changed, especially in terms of how the government perceived and utilized social media for crisis management.

Table 3 shows how social media were used before, during, and after the crisis to create a new social structure.

Fig. 2 depicts the changing interactions between government agencies and online communities throughout the crisis, with interactions and the use of social media conceptualized through the socialization and structuration theories in each phase of the crisis. Each line indicates the direction and intensity of information flow between government agencies and community members, and between community members.

According to Tapia, Moore, and Johnson (2013), as a crisis progresses, government agencies and communities require different information. Therefore, Fig. 2 also shows the dynamic of information needs throughout the crisis lifecycle. This dynamic accounted for the different interactions among the online communities and government agencies in each phase of the crisis.

In short, the government pushed or published information on their websites using one-way communication to create a legitimate

Table 3
Use of social media in crisis management in terms of socialization theory and structuration theory.

Phases		Socialization theory	Structuration theory
Pre	The Thai government created two official websites and used these to provide weather-related information updates. The government considered the information shared by members in online communities as mostly rumours and chose to ignore them. Attempted to control communication and convey uniform messages	Use of institutionalized strategy to form a collective, uniform structure. Authority ranking-based mode of knowledge sharing	Producing legitimacy: The Thai government adopted a top-down approach to legitimize the social structure (e.g. push information to the public) and sanction their unified messages (prohibit the spread of uncensored information and legitimize their own messages/websites). The traditional channels (government websites and/or portals) became the communication norm for agencies and communities
During	Communication between the government and online communities was disrupted. Online communities began relying on each other to share information and knowledge via social media	Use of individualized strategy for varied, informal communication among communities. Communal sharing mode of knowledge sharing	Producing dominance: structure of domination was produced when community members created their own way of using social media to share information and knowledge. Social media were employed as powerful tools for online communities to gain power and thus dominate the situation
Post	The government began to use social media as its main channel to organize recovery activities	Use of both institutionalized and individualized strategies to create the duality structure of formal and informal communication. The flow of knowledge sharing was changed: both push and pull strategies were used as the government learned that the equity-matching mode of knowledge sharing was also helpful	Producing significance: People's actions produced new structures of meaning for the use of social media to combat a flood disaster. Social media were perceived as a powerful tool (an altered interpretive scheme) instead of a medium that caused rumours and uncontrollable information dissemination

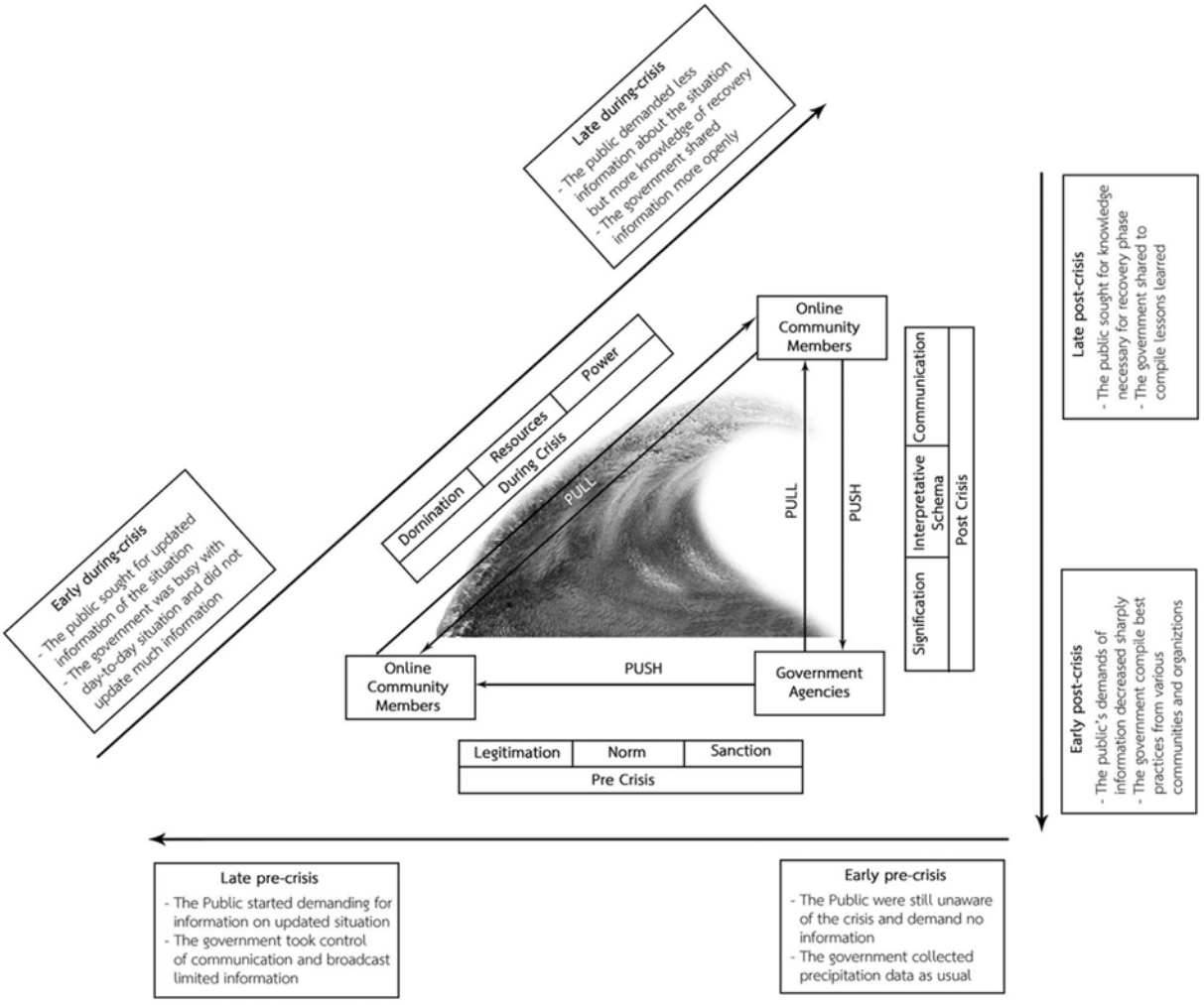

Fig. 2. Conceptual model of 2011 Thai Flood Crisis.

structure of information and communication. The public therefore turned to social media during the crisis as the need for more information dramatically increased, resulting in the emergence of several online communities. The public, NGOs, and other organizations began to share information and knowledge among themselves, since the government failed to provide updates with sufficient and relevant information. The pull-mode of two-way information sharing between NGOs and other online communities was evident during the crisis. Empowered by social media, the public created a structure of domination (the online communities for information sharing) that fit their information needs. After the crisis, information needs changed from the need for updates about the situation to the need for knowledge about how to clean up, how to fix their houses, etc. Both online communities and government agencies realized the usefulness of social media and used it to exchange information with each other in both the push- and pull-modes.

5. Implications

5.1. Practical implications

The case study contributes applicable knowledge for government and community leaders looking to facilitate interactions between users in the same and in different communities, between government agencies and online community members, and to better prepare for a future crisis. Analysing the case through using socialization and structuration theories allows a rich understanding of how social media were used in each phase of the crisis and how social structures changed through the crisis cycle. From the case analysis, we derived both good practices and other practices that require more verification through future research. Following Reynolds et al. (2002) at the CDC, we recommend dividing crisis communication planning into phases, with each emphasizing different activities.

5.1.1. Pre-crisis

The Thai government agencies favoured traditional media (e.g. TV and radio) over social media, drastically underestimated their usefulness in the pre-crisis phase. Lachlan et al. (2014b) also demonstrated a similar trend of underutilizing social media in managing crisis. The government's institutionalized strategy, proved an ineffective socialization strategy in terms of sharing information with the public and helping them prepare for the crisis. The top-down approach of dominating the process of information dissemination and human interaction cannot adequately prepare the pubic for potential natural disasters because of their unpredictable nature.

In other words, the government agencies did not make the information widely accessible and did not communicate the full truth of the situation. However, communicating with honesty and candour, and maintaining accessibility are two of the ten crisis communication recommendations provided by Seeger (2006). Failure to follow such practices caused chaos when the threat became a crisis. Besides, beginning to use social media too late and with no strategy could also result in chaos (Lachlan, Spence, Lin, Najarian, & Greco, 2014c).

Therefore, in this phase, government agencies may want to legitimize the use of social media in knowledge sharing, accept it as a norm, and embrace it as a useful tool, consistent with the CDC's crisis and emergency risk communication outline (Reynolds et al., 2002) indicating that the public should be educated during the pre-crisis period. Governments should establish a central single unit (e.g. a social media command centre or 'war room') and invite online community leaders and members to actively participate in the knowledge sharing process. Formalizing the use of social media in addition to traditional media can provide a more structured line of communication between government agencies and online communities, as well as improve knowledge sharing effectiveness. According to Lachlan et al. (2014a), a social media manager that is capable and experienced in managing communication throughout a crisis should be assigned and provided with the appropriate authorization. Monitoring and analysing information on social media before the crisis could allow a crisis manager or government to identify the public's needs.

5.1.2. During-crisis

Information must be checked constantly for accuracy and further validated, especially that collected through social media, as there may be too many creators, producing too much data, and inhibiting the media's utility (Lechlan et al., 2014b). However, ensuring information accuracy during a crisis is very difficult because there is usually a massive amount of information exchanged, much of which is not properly tagged and managed. Information overload can often occur when social media are used to combat a crisis without understanding the information and knowledge transfer process. Thus, processes or system controls must be in place to monitor and evaluate the information and knowledge being stored and shared (Yates & Paquette, 2011).

To better manage and control the massive flow of information during a crisis, the case study indicates that a strong and active leader of small communities is needed. The leaders of the Parichart345 group and the founder of the Charun Soo Flood group are good examples. They verified and updated information, as well as connected to other reliable networks and online communities that also provide relevant and helpful information. Lachlan et al. (2014c) suggest a similar strategy wherein information from localized hashtags tends to be more relevant and useful. Besides, previous crisis research (e.g. Spence, Lachlan, & Griffin, 2007) has shown that individuals prefer information from within their own social networks rather than messages from centralized sources. Therefore, online communities, comprised of friends and friends of friends could play an important role in bridging gaps between traditional data sources (provided by the government) and widely available unknown sources in social media (Tapia et al., 2013).

For governments, the case study shows that information can quickly disappear on social media, so important information must be repeated. Messages of self-efficacy are particularly helpful for the public as this decreases their feelings of uncertainty, imminent danger, and provides more feelings of control (Reynolds et al., 2002).

5.1.3. Post-crisis

Knowledge sharing is also important in the post-crisis period. Victims need information about how to clean up and deal with potential hazards from flooding, either in their homes or in communities. Social media played an important role in spreading such knowledge after the Thai flood crisis. Many lessons learned by the public were posted on social sites, though the government should make official attempts to validate the shared knowledge by transferring these lessons into an established crisis expert system. In addition to the rewards given to those online communities and their members for their meaningful actions, the government should formally accumulate stakeholders' knowledge and also include this within an official crisis response system (Reynolds et al., 2002). These efforts could not only help reconstruct disaster sites but also transform social sites into trustworthy plat- forms for both government agencies and online community members to use in combating future crises.

In addition, social media can be used to express and share support and affection (Lachlan et al., 2014b). In this case study, social media was used during the post-crisis phase to not only share knowledge but to express empathy and caring, improving the general atmosphere while providing a good method for the public to express concerns to government agencies and business organizations.

5.2. *Academic implications and future research*

Beyond the control of most governments, the use of social media to manage a crisis often stems from the increased uncertainty and social instability. The public decides to adopt social media and self-organize their interactions among themselves and with government agencies. In the process of restructuring social dynamics before, during, and after the crisis, structuration theory provided the means to explain how social media-based interactions between agents and communities reduce or increase uncertainty. More importantly, the theory clarifies the human factors (e.g. communication) related to introducing a social medium as a tool to manage a crisis.

Depending on the aspects of socialization theory employed, from institutionalized to individualized strategy, government agencies can interact with community members by controlling the direction and intensity of the information flow. Based on human interactions and social structures, structuration theory considers three distinct dimensions of human agents and social structures: legitimation, resource allocation, and communication modes. Integrating these dimensions into social strategies enables researchers and practitioners to systematically examine any crisis events.

Our conceptual model treats the crisis as process and embeds descriptions of the role of social media within the crisis lifecycle. The model serves the research purpose of understanding the social media communication and knowledge sharing processes to cope with the Thai flood crisis. The general process model could also be useful and applicable in investigating crises in which more traditional communication channels (e.g. TV and Radio) or older technologies are in play because this model focuses on understanding the communication processes across different stages of crisis, independent of the communication technology in focus. Future research may analyse and design effective communication processes, and try to optimize the use of both traditional and social media for effective communication.

Additionally, while some studies investigate how social media can be used to combat a crisis, previous studies usually focus on only one or two phases (e.g. Lachlan et al. (2014c) focused only on the early stage of the winter storm Nemo), or treat crises as a whole whereas. Our model treats each phase as interrelated units (phases) in which information needs change (Tapia et al. 2013). If these needs are not responded to and managed, they could prolong each phase, make the situation worse, and affect the information needs in the next phase. Therefore, future researchers should further investigate each phase and see how various types of social media can play different roles in responding to different information needs during each timeframe. This is also in consistent with Seeger's (2006) argument that communication practices and their purposes differ in each crisis phase.

Lastly, the potential usefulness of social media in times of crisis is clear, and its use during a crisis by both for and non-profit organizations will increase. With that increase, conditions will change as organizations learn and researchers contribute useful suggestions for the effective use of social media to combat crises (Tapia et al., 2013). Thus, the model in Fig. 2 may change considerably. Future researchers could continue work to understand the use of social media to manage a crisis by adding other technologies to our model (e.g. messaging services, Twitter) and more affected parties (e.g. international rescue teams and religious organizations) as elements in the technology-mediated communication process. The expanded model will then have a higher degree of flexibility in offering insight to all the affected parties.

6. Conclusion

The current literature lacks studies into the links between social media, knowledge management, and crisis management. This study examines the use of social media as a crisis-related knowledge sharing tool during the lifecycle of a disaster adopting the 7-month Thai flood crisis as a case study for analysis.

Social media became the technology-of-choice for most crisis victims. The widespread use of technology such as smartphones and high-speed cellular and Internet networks put social media front and centre as an anywhere-anytime tool for victims, government agencies, media, and community leaders to exchange information. However, past research focused only on how to use social media during a crisis during limited phases of a crisis. Our research investigated the entire lifecycle of a crisis and thus offers suggestions for all three phases.

Second, this case study examined the types of information and knowledge shared and exchanged between government agencies and community members. This study revealed many issues (e.g. information overload, inaccuracy, resource misallocation) encountered during the knowledge sharing process to highlight both the potential and limitations of social media as a crisis management tool.

Third, the results indicate that a social media manager plays an important role. Governments should assign a social media manager to manage the various media to respond to the range of information needs. Each online community also requires a dedicated manager or a leader to verify and update the information shared on that particular network.

Fourth, knowledge sharing is especially important in the pre- and post-crisis phase so the public can adequately prepare and recover. During the crisis, accurate, updated information can help to alleviate the feelings of uncertainty or of a threat among the general public. Social media, if managed properly, can be a highly successful method to share such information.

Fifth, government and community leaders can apply the lessons learned from this study and take advantage of social media's strengths to become more effective communicators during the lifecycle of a future crisis.

Finally, it is important to note that we do not aim to generalize our findings to all other crises. There are a number of contextual factors (e.g. type of crisis, local technological readiness) that will require crisis managers to look for or create new ways of using social media. However, our practical implications apply in situations with similar information and knowledge demands. Additionally, future studies could apply the socialization and structuration theories to attempt to understand the interactions and changes unfolding throughout the crisis lifecycle.

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Appendix A

Table A.1
Focus group and interview lists.

Data collection method	Participants	Involvement during the flood crisis
Focus group	Flood victims living in Bangkok and its vicinities (24 Victims)	These victims were affected by the flood for 4 months
	Student volunteers who formed a team to manage the biggest evacuation centre at Thammasat University (15 Volunteers)	Thammasat University was completely surrounded by flood for 2 months before it was completely flooded by the third month. The Thammasat Rangsit campus was the last frontier before the flood entered the inner-Bangkok area
Interview	Ajarn Wanchai Khantee eThe leader of 345 Parichart Village Facebook group and 7 group members (1 Community leader and 7 community members)	Parichart Village (more than 2000 households) was submerged by 2 m of water. Before, during, and after the crisis, the Facebook group was used as the only communication channel for thousands of Parichart Village residents
	Mr. Vittayen Muttamara -The director of the Flood Relief Volunteer Center	The director of a large NGO that oversaw flood aid. This NGO was funded by the Democrat Party, which was in opposition during that time
	Dr. Somkit Lertpaithoon -The Rector of Thammasat University	Dr. Somkit was Rector of the Thammasat University. The Rector was very active in using social media to communicate with the public, his team, and thousands of Thammasat students and staff members. The Rangsit campus of Thammasat University was on the flood route from the North down to Bangkok. It served as a temporary evacuation camp for flood victims for about 2 months before the campus itself was flooded
	Dr. Teerachon Manomaiphibul e Ex-Deputy Bangkok Governor	Dr. Teerachon served on the Mayor of Bangkok's flood crisis team and played an important role in advising the crisis department during the flood
	Founders of the Roo-Soo-Flood (know how to cope with flood) Youtube channel (Two Members)	A team of 20 volunteers (a group of friends) who got together to create digital content such as Youtube videos aimed at sharing useful information with the public to lessen the overall daily panic and pandemonium
	Mr. Sasin Chalearmlarp e An environmentalist and the secretary general of Seub Nakasathien foundation (NGO), a nature conservation foundation (1 NGO)	A representative of one of the most influential NGOs during the flood crisis who often appeared on TV, and an effective social media user who regularly explained and forecast the volatile crisis situation with easy-to-understand messages to the public
	Mr. Wim Rungwattanajinda e Assistant to the Prime Minister during the flood relief operation (1 Politician)	Mr. Wim was an assistant to the Prime minister's office, representing the government and overseeing all flood aid and food distribution activities. He was the main government figure responsible for the crisis response
	Lieutenant Colonel Wanchana 'Bird' Sawasdee e The Thai Army representative and an action movie star (1 Army Lieutenant)	Lieutenant Bird, a popular movie star, was a Thai army representative during the flood crisis. The Thai army played an active role during and after the crisis in helping victims since they had readily available resources, such as large trucks and troops in a number of areas
	Founders of Charun Fight Flood Facebook group (2 Founders)	Charun district is a severely affected area in Bangkok. The area has more than a hundred alleys packed with thousands of households. The founders are two teenage girls who lived in the area and used Facebook as a channel to update the public about the situation
	Mr. Prasert Salinla-umpai e Vice President of the Corporate Communications Department at PTT (1 Business Executive)	PTT is the largest oil company in Thailand, and played a pivotal role in energy distribution during the flood

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