JUST KEEP TWEETING: EMERGENCY RESPONDERS' SOCIAL MEDIA USE BEFORE AND DURING EMERGENCIES

Complete Research

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Abstract

This study investigates how emergency response organizations use social media during emergency preparedness and response. Using qualitative (interviews and documents) and quantitative (Facebook posts) data, the study identifies several uses of social media in emergency preparedness and emergency management, as well as the organizational context that affects this use. Findings indicate that social media support various purposes of use, including information dissemination, obtaining input from the public and other organizations, and participation by other emergency response organizations. Branding of the organization during the emergency preparedness phase was found to be an important aspect of information dissemination, and helps social media to be useful tool to connect with the public and other organizations during the emergency response phase. Nevertheless, social media use in the emergency response domain still has to overcome leadership and staff adoption barriers.

Key words: Social media, emergency response, organizational IT use, IT adoption

1 Introduction

Emergency response organizations increasingly use social media such as Twitter and Facebook, to gain a richer operational picture during an ongoing emergency. These tools also can be used to promote awareness and prepare the population for a possible emergency such as floods. However, emergency responders, as well as government agencies in general, are still struggling to find ways to take advantage of these new technologies (e.g. Kavanaugh et al., 2012). In addition to technical challenges (Imran et al., 2014), guidelines and procedures are incipient or non-existent (Hiltz et al., 2014).

This paper focuses specifically on emergency response organizations. Emergency response organizations are involved at the time of an emergency and include fire departments, police, and medical staff (Solis et. all, 1997, p. 1). Emergency response organizations usually are also involved at the preparedness and aftermath level and focus on emergencies occurring within a defined area over which these organizations have responsibility.

Even though the use of social media for information sharing between emergency response organizations and citizens has gained increased attention (e.g. Hughes & Palen, 2009; Palen et al., 2010; Qu, Wu, & Wang, 2009), as well as social media use by volunteers during emergency situations (Reuters et al. 2012, 2013), relatively little research on the use of social media by emergency responders with other stakeholders has been conducted. Further, while most research on emergency responders' ICT use focuses on the emergency response phase itself, little is known about the use of social media throughout various

phases of the emergency response cycle, even though prior research suggests that different technologies are used during various phases of emergency response (e.g. Stephens et al., 2014).

To address this gap in research and practice, this paper seeks to answer the following research question: How do emergency response organizations use social media in emergency preparedness and response? We first develop a conceptual framework based on a model that represents generic organizational use of social media, which we extend with some emergency response-specific factors. We use this framework to identify what factors influence the use of social media by emergency responders for emergency preparedness and emergency management purposes, through both qualitative and quantitative study. By doing so, our study probes into the relative importance of these uses for responders to draw conclusions about the role of social media for emergency response. In addition, we develop an initial model with factors that influence social media use by emergency responders that in later studies can be tested with a larger body of participants. Next, we start with a literature review to develop a theoretical framework. In section 3, we explain the methods used, followed with results in section 5, a discussion in section 6 and conclusions in section 7.

2   Social Media Use and the Emergency Response Cycle

2.1   Technology adoption: Task and Context Linkages

The relation between the use of certain technologies and (work) tasks, and thus the question of which technology is used for what type task, has been subject of study for many years in multiple domains. Studies have focused on how social and technical aspects affect each other and together determine the use of technologies. A famous example of one such theory is Media Richness Theory, which argues that the task (ambiguity of the message that is to be communicated) should match the technology. The theory argues that the more ambiguous the message, the richer the technology should be, or in other words, the more information carrying capacity it should have (as determined through speed of feedback, ability to personalize the message, availability of multiple cues, and language variety) (Dainton & Zelley, 2011; Lengel & Daft, 1988).

Media Richness Theory and related theories on social and technical aspects and their effects on the use of technologies have been critiqued as being too rational and deterministic, which has led others to expand the focus towards inclusion of social context (e.g. work practices). Other theories such as Social Influence theory and the Dual Capacity Model do not only focus on the task and media features, but also on social influences like group norm that may affect people's preferences to use certain theories (Stephens and Saetre, 2008). While such differences at the individual level can be found, also at the organizational level certain factors have been found to influence technology use. Indeed, Oliveira and Welch (2013) found that social media use among public sector organizations is influenced by organizational context, including innovativeness and external influence. In addition to organizational context, the authors found that different social media tools are used for different purposes and thus have varying usage patterns. Finally, these usage patterns have also been found to depend on technology affordances.

2.2   Usage Patterns, Organizational Context, and Technology Affordances

Next, we discuss how usage patterns, organizational context, and technology affordances, have been found to influence social media use in organizations in non-emergency settings.

Social media technologies have been found to be used for different purposes. Multiple studies have identified broadly four usage patterns of social media 1) external dissemination of information (one-to-many communication similar to broadcasting); 2) request for input/ feedback on services (2-way communication between citizens and organizations); 3) internal collaboration (knowledge sharing and collaboration within the organization); and 4) facilitation of participation by citizens and external stakeholders (collaboration between citizens and organizations at a level higher than described under 2) (McAfee, 2006; Mergel, 2010; Oliveira and Welch, 2013).

A number of studies on social media use in the domain of emergency management have already been conducted. Indeed, all four uses as identified above can be observed in the domain of emergency management. While social media usage for information dissemination purposes is the most commonly discussed type of use (e.g. Merchant, Elmar and Lurie, 2011), other patterns of usage have been described. For example, Yates and Paquette (2011), in their study on knowledge management, found that social media have been used for both internal collaboration and participation purposes (i.e. for establishing coordination methods with external aid agencies). The use of these social media technologies helped in decision making during the emergency response phase. Hughes (2014) in turn reports on the information generated by the public that was pushed over social media that have helped emergency responders in their response efforts. Further, Reuter et al. (2013) argued that for volunteers in emergency response settings information distribution, peer-to-peer communication, coordination, intuition, internal connections, external points of intersection and promoting the existence of emergent (volunteer) groups are of importance in the design of social media software.

These various usage patterns have been found to also in part being influenced by organizational context and the affordances technologies provide. For example, while various uses of social media technologies by emergency responders have been identified, their organizational context also influences which type of social media technology is being used and how, or perhaps even why such technologies are not used at all. While Oliveira and Welch (2013) found innovativeness and external influences to matter in the public sector in general, in the emergency response domain specifically some of the problems surrounding the use of social media are related to the vast amounts of data generated; e.g. difficulties to process the vast amounts of data, receiving inaccurate and untrustworthy information, and information overload (e.g. McClendon & Robinson, 2012; Palen et al., 2010). Besides these data-related challenges, a number of organizational challenges have been found to affect adoption. For example, Tapia, Bajpai, Jansen, & Yen (2011) found some of these factors to include limited organizational support for IT and innovation, limited IT staff and resources. Hiltz, Kushma, and Plotnick (2014) add lack of personnel time, and lack of policies and guidelines for use.

Finally, the affordances provided by technologies have been found in instances to affect ICT usage and adoption patterns. Condon and Robinson (2014) for example find that emergency managers' use of different media depend on various factors such as their roles, the functions of their messages, and the affordances the technologies provide. The authors stress the influence of affordances that different media provide, such as media being synchronous/asynchronous, moderating functionality, or the extent of structure that a medium presents, on the use of these technologies.

2.3 Emergency preparedness and emergency management

Even though affordances, organizational context, and purpose of use are known to influence the particular use of certain social media technologies, in the emergency response domain another factor that likely matters is the phase of the emergency management cycle. Emergency management has been defined as the process that deals with preparedness, response, mitigation, and recovery activities (Petak, 1985). The use of social media technologies has been found to vary across these phases. For example, while ample evidence points to the increasing role of social media during emergency response efforts, a study by Stephens et al. (2014) found that during the emergency alert phase of an active shooter emergency at a U.S. campus in 2010, social media were hardly used. The authors show that different ICTs are used to notify members of a community about an emergency than the ICTs used during the sense making process of an emergency.

3 Research Framework

Following the factors identified above that were found to influence social media use in organizational settings outside the emerging domain; including usage pattern, organizational context, and affordances, and task as related to emergency management phase, this study seeks to provide more insight into how these factors, and possibly others, together influence social media use. In particular, the study will look

for evidence of the following usage patterns: external dissemination of information, request for input, internal collaboration, and facilitation of participation. The literature review already identified a number of examples of these usage patterns in the emergency response domain. We will examine to what extent these factors indeed are reflected by emergency responders that are subject of our study and how these generic patterns may be reflected in more specific types of use by emergency responders.

In addition, this study will examine how these usage patterns relate to technology affordances, and to what extent innovativeness (Oliveira and Welcht, 2013; Tapia et al., 2011), availability of resources (Tapia et al., 2011), availability of guidelines (Hiltz et al., 2014), and external influences (Oliveira and Welch, 2013) affect social media use. Finally, the study seeks to gain insight in how this use depends on the task – namely as related to the emergency management cycle; and in particular the emergency preparedness and emergency response phases. See Figure 1 for a depiction of the research framework

To date these factors have been either studied in relation to organizations outside of the emergency response domain or factors have been identified separately in the emergency domain. The objective of this study is to bring these factors together in one model and to examine to what extent they are observed in our exploratory empirical study, and which factors are missing, to lead to a more comprehensive model that at a later point in time can be tested in an extended study.
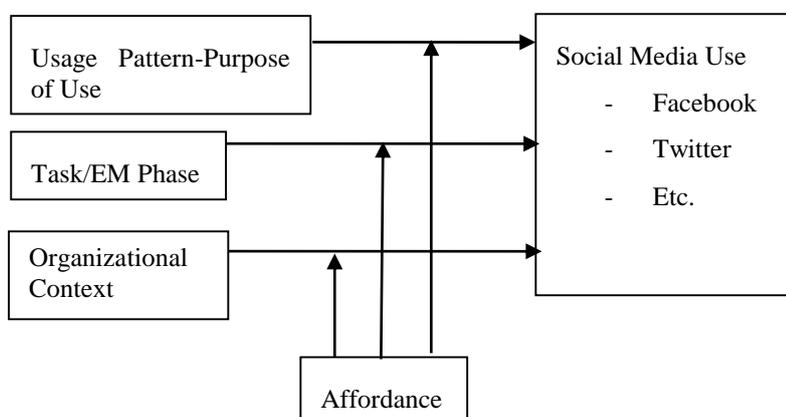

Figure 1.   Research Framework

4   Method

4.1 Qualitative methods

This study has applied both qualitative and quantitative methods as described below. Interviews and document analysis were the qualitative methods used in this research. Three extended interviews were carried out with governmental (state and federal level) organizations involved in emergency response. The organizations were chosen based on their location, namely Colorado, in an area prone to natural disasters including floodings and wildfires (total loss for 2013 Colorado's wildfire was around 420 million of dollars (Badger, 2014)). This means the participating organizations have recently been involved in emergency response, because of which they can provide examples of recent social media use before, during and after emergencies. In addition, the organizations were selected with regard to variety in types of emergency responders (fire department, health, and emergency management), their geographical span (at the city level, county level, and state to federal level), allowing for multiple perspectives to come forward during the interviews. The first institution is a Fire Department serving one of the main cities of the state. The second institution acts as a coordinating body for health and emergency issues between three of the state counties (subdivisions of a state that provided some local governmental services). The

third is a state-level organization responsible for emergency management, which also acts as a link between the state of Colorado and the Federal government in matters related to emergencies. The organizations were asked about how they use social media, the purpose of their use, organizational constraints and opportunities to use these technologies, and the impact that these practices have had on their individual operations and collaboration patterns with other emergency responders.

In addition to the interviews, the coordinating institution (at county level) provided an official document that outlines the policies and procedures followed by the organization on the use of social media information. This document was compared with the Crisis and Emergency Risk Communication Manual (CRCM) of the Center for Disease Control and Prevention of the US (2012).

The focus of the interviews and document analyses were on the emergency preparedness and emergency response phases of the emergency management cycle, because the participating organizations have not recently been involved in other phases of the emergency management cycle (which is also due to the impact of the emergencies these organizations cope with).

Data were analysed by using both open and closed coding. The research framework provides a first deductive model for coding. However, given the exploratory nature of the study, large part of the research was inductive with open coding.

The inductive part of the study was approached by following Urquhart et al.'s (2010) approach to theory generation. Starting with first "slices of data" obtained from news sources and preliminary interactions with practitioners, we formulated initial research categories that served as foundations of the theoretical framework. This was followed by an iterative process of expanding the number of data sources, collecting data with both qualitative and quantitative methods described below, reviewing the theoretical framework and, when necessary, adding more categories as well as further data to existing categories, to the point where these categories became saturated and additional data did not lead to substantial changes in the framework. In parallel we were conducting a densification of relationships between categories, which resulted in the final theoretical framework.

4.2 Quantitative methods

Quantitative methods were used to supplement the qualitative analyses in saturating constructs and relationships in the theoretical framework. An analysis of Facebook posts by emergency relief organizations was conducted to gain more insight into the role the technology played during the different phases of emergency management (preparedness vs. response). Facebook was chosen because it is currently used by 71% of online users in the US, the largest number of all social media platforms (compared to, e.g., Twitter at 18%) (Duggan and Smith, 2013), thereby having a large potential audience and thus likely to be leveraged by many emergency response organizations in preparedness and response. .

This effort focused on state-level organizations in the United States responsible for emergency management, such as state Divisions of Emergency Management. A list of these organizations was obtained from the Natural Hazards Center at the University of Colorado (University of Colorado, 2014). These organizations provided additional insights on emergency responders particularly at the state level.

Most of these organizations (46 out of 50) had a Facebook page. Public Facebook posts were obtained for each of the organization with a Facebook presence for the period from January 1, 2011 to April 15, 2014. This resulted in a corpus of 29,989 posts. Since the posts were open to the public and their authors are not identified in the analysis, this data collection method can be categorized as purely observational and without minimal ethical concerns (Lafferty & Manca, 2015).

A classification scheme for these posts was devised after reviewing extant social media message classifications (Coursaris, Van Osch and Balogh, 2013; Yu and Kwok 2011) and an inspection of the post corpus. This classification contains three categories: 1) emergency preparedness messages and updates, 2) emergency response organization operations and 3) other, non-emergency related updates. The definition and examples for each category are shown in Table 1.

A random sample of 1,000 posts from the corpus was manually coded with these categories. This sample was used to train a support vector machine (SVM), a method used among others to categorize a dependent variable based on a set of independent variables, referred to as features (Zubiaga et al. 2011).

Category name	Definition	Examples of posts
Emergency preparedness and updates	Posts with advice on how to prepare for an emergency; links to other resources providing emergency advice; news and updates about an ongoing emergency and advice on post-emergency recovery	The Small Business Administration provides disaster loans to homeowners, renters and businesses of all sizes. Those affected by this disaster may fill out a loan application online by visiting SBAs secure website at [link]. Hurricanes can produce inland tornadoes and flooding. Know how to get your house and family ready for these kinds of hazards. Great news from Black Forest Fire: 75% containment.
Emergency response organization operations	News and updates about internal organizational operations; contact information; volunteer and employment opportunities	Volunteers are vital to recovery. How do you volunteer or give to help in tornado recovery? Tell us here. We are proud of you! Remember that we have a Twitter feed! Information lines are now available to field any questions concerning the potential rising water. The hours of operation for the information lines will be from 8:00 a.m.-4:30 p.m. Monday-Friday and the numbers are as follows: [phone numbers]
Non-emergency related updates	Updates not related to an emergency; conversation with Facebook users	Congresswoman Susan Brooks starts hearing proceedings. Hay Resources and Information [link] National EAS test completed. Likely there were some flaws, but that is why we conduct these tests and drills. .., to identify and resolve issues before the real thing occurs!

Table 1.   Classification of Facebook posts of emergency relief organizations

The sample was split into training, cross-validation and test sets. A bag-of-words approach, where features are based on words contained in the corpus and each document (in this case, a post) is represented as a set of these features, was used for feature identification. Words occurring in at least 1% of the sample were used as features to classify a post, and a linear kernel was used for training. Classification accuracy on the test set was 0.728: in other words, 72.8% of posts in the test set were classified as they were in manual classification. This accuracy level is satisfactory compared to other studies of social media message classification (Yu and Kwok, 2011).

Having thus established the validity of the classification approach, the sample was then used to train an SVM that was used to categorize a larger sample of 10,000 random posts. The results of this categorization are presented below in the Results section.

5   Results

Next, the results of both the qualitative and quantitative analyses will be described, beginning with an overview of the which social media platforms are used and the affordances they provide, followed by the influence of emergency management phase on social media use. Next, the various purposes of use and organizational context that shape social media use will be discussed.

5.1   Platform Use & Affordances

The interviewed organizations have used social media ranging from 1.5 to 5 years. Interviewees indicate that over the last two years social media use has significantly increased, as evidenced by the growing number of followers.

A variety of platforms are being used by the interviewed organizations. Twitter is the first and foremost used platform, followed by Facebook, as indicated by all interviewed organizations. They are followed at a distance by other platforms like LinkedIn, Pinterest, YouTube. Preferences vary per organization. Often a mix of platforms is used, but different messages are put on the different platforms.

The platforms are used for a variety of reasons, including the affordances they offer. Twitter is used most because it enables quick information sharing and lends itself well for further distribution (retweeting) of the messages. One interviewee calls Facebook a 'static' platform compared to Twitter. However, one interviewee indicates that they see some organizations use Facebook as the primary social media platform. Facebook enables longer messages to be posted.

Pinterest is seen as a useful tool for emergency preparedness; where safety tips can be given etc. One interviewee mentions that the organization has registered accounts on various other social media tools as well just in case they might want to take further advantage of these tools in the future, including Instagram and Storify.

Organizations use each platform individually. One of the subjects mentioned the need for a "single solution" to facilitate the management of all the platforms, but the subject also mentioned the issue of the cost associated with such software. None of the organizations poses a centralized system to manage multiple social media venues. Nevertheless, they often use Twitter as "hub" to point to other platforms' posts (i.e. tweeting a Pinterest link).

5.2   Emergency Preparedness vs. Emergency Response

5.2.1   Qualitative Findings

As the example of Pinterest already points out, certain social media lend themselves better for use in certain phases of the emergency response cycle than in others. Interviews reveal that prior to an emergency social media are primarily used for sending out preparedness messages and general education. In addition, at this time social media are used with the objective to build up the number followers, so that once an emergency strikes, many people can be reached easily. One interviewee indicates that as part of building a followers' base, creating an emotional connection with the followers is important, as well as using entertainment.

For maintaining relationships with other organizations different platforms are felt as being more or less appropriate depending on the emergency management phase as well. One interviewee for example indicates that it is felt that Twitter is not the best platform to be used in between emergencies (preparedness phase), but that Facebook is better because Twitter is too fast. Facebook is then used 3 or 4 times a day,

which increases the chance that other organizations see their messages. Thus, during the emergency preparedness phase the more static nature of Facebook is felt to be more useful.

The analysed documents also make a clear distinction between the use of Social Media during the emergency management phase and the day-to-day activities (i.e. emergency preparedness phase). The County Emergency Operations Plan specifies that the only Social Media platforms to be used during an emergency are Twitter and Facebook. The document also describes the assignment of Rumor Control Specialists, persons that will monitor social media and provide updates to the manager.

5.2.2 Quantitative Findings

The quantitive analysis also suggests differences in technology use depending on the phase of the emergency management cycle. The three most active months for Facebook activity within the time period considered here (from January 2011 to April 2014) were February 2014, which accounted for 5.5% of all posts in the corpus, followed by May 2011 (4.7%) and January 2014 (4.5%) (see Figure 1). Interestingly, these spikes of activity are related to major emergencies: snow storms in the north-eastern states in January—February 2014, hurricane Sandy in October 2012 and the tsunami in the Pacific Ocean in March 2011. The least active months were January, February and March 2011, each of which accounted for less than 1% of posts, and generally winter months tend to be less active (with the exception of the winter of 2014).
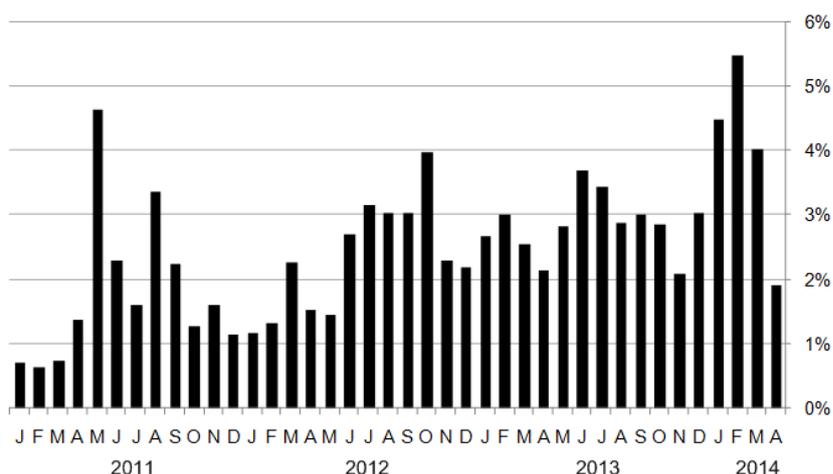

Figure 1. Distribution of emergency response organizations' Facebook posts over time (as percentage of total number of posts).

As for the distribution of posts across categories, the majority (88.4%) of posts in the examined sample of 10,000 Facebook posts were in the "Emergency preparedness and updates" category. "Emergency response organization operations" posts constituted 10% of the total posts, and "Non-emergency related updates" 1.5% of posts. At the same time, non-emergency related posts received the highest average number of "likes": 15.1 per post. Emergency preparedness posts received 6.3 "likes" and ERO operations 8.2 "likes" on average.

5.3 Purpose of Use

All interviewees primarily see benefits in social media use. These benefits come from external information dissemination including enabling better branding of the organization, obtaining input from the public and other organizations (two way communication), and facilitating participation (primarily by other organizations).

5.3.1 External Dissemination of Information

The key use of social media during an emergency seems the provision of information on the emergency; e.g. where people can turn to for help, opening times of health centers, who is the local emergency responder, etc. The type of information that is disseminated in large part consists of reposted messages sent by other emergency organizations.

However, not just any information available to the organizations is pushed to the public. For example, the Fire Department indicates that it does not provide specific incident related information in situations that are not major emergencies (e.g. a single house fire), simply because the public is not interested.

Interestingly, none of the interviewed organizations indicate that they use social media to take in direct help requests. One interviewee indicates that such a request may come in once a year, but that they then ask people to call 911.

External dissemination of information is felt to provide clear benefits, by making work processes more efficiently. As one interviewee says, "If all info is put out on Twitter, all media gets the info at once, which cuts down the number of phone calls [we have to answer]."

During the disaster preparedness phase branding is a very important aspect of information dissemination practices. All interviewees indicate that social media helps provide better awareness to the public about what the organization is and does. However, there do not seem to be documented guidelines related to the use of social media as a branding tool. The documents analysed for this study did not specifically include branding activities or procedures among their suggestions. The Crisis and Emergency Risk Communication Manual (CRCM) encourages the use of social media in daily communication activities of the respective organizations, so the public can trust and be aware of the venues once the emergency is in place.

5.3.2 Information Input from the Public and Other Organizations

Interviewees feel that two way communication, enabled by social media, is a new benefit ("we haven't had that really too much"). Organizations use social media to gather info: for example, it is mentioned to be a great way to gather info, photos, where fires spread, and people may not have heard about it, and so forth. Also in terms of negative talk social media seems to be an outcome rather than threat: "It was always a big concern with the leadership, what if someone says something bad to us? This is the WWW, if they don't say it to us, they will say it somewhere else. Now we can respond. Instead of ignoring it". Obtaining information from other organizations is also important. An interviewee explains, "to gather what is going on with our partners, to hearing about what's going on, wild fires, school shooting, or anything else, is the third biggest benefit."

Nevertheless, the extent to which there is a lot of two way communication may also be questioned. As one interviewee puts it: "We really haven't had a whole lot of interaction with communities or community members. Folks who follow us, from the communities, but it hasn't really affected how we interact. So far it's predominantly one way: pushing out information."

The CRCM indicates that, with social media, any person can become a source of information and can facilitate the understanding of the emergency event. Nevertheless, the document also advises to manage rumors by checking for accuracy of all gathered information. The Rumor Control Specialist position is developed further in the County Emergency Operations Plan.

5.3.3   Participation through Social Media

Participation through social media primarily occurs through communication with other organizations, rather than with the public.

All organizations follow other organizations through social media. As one interviewee indicates, they use social media primarily to "build our capacity with our partners, push information, share their info with us, we're just trying to build a bigger operation picture, big community awareness. All of our partners in the Denver metro area work pretty well with each other."

The use of social media also depends on traditional collaboration patterns and protocol. For example, in case of a major emergency, the City of Denver Emergency Management Office collaborates with various agencies that all go to the emergency operations center, with the Fire Department, Public Works etc. The Denver Office then sends updates via Twitter, which other organizations may retweet. This keeps the messages uniform.

Social media have also been helpful in providing insight in who is involved in the response and how. During the Colorado floods for example, one organization created a Twitter list of everybody who was involved in assisting in the emergency, which was then shared publicly; organizations like the Red Cross, other non-profits, emergency responding organizations, etc. As the list kept expending, sub lists were created of groups depending on their role. This provided insight in where people could go for a variety of services; with many related services like where to pick up the mail, etc. different agencies people don't realize they are involved, weather services, etc.

Even though the use of social media is growing, not all organizations are using social media yet. One interviewee feels that often the smaller agencies are not yet sharing information through social media. A reason might just be that they do not have the staffing to do so, or maybe they do not yet know the value of social media use.

One organization indicates that the use of social media enables them to strengthen inter-organizational ties. While social media use has not directly influenced how they work together, sharing each others' messages shows solidarity and hence strengthens the ties.

5.4   Organizational Context

5.4.1   Innovativeness: Organizational (Leadership & Staff) Acceptance

Acceptance of social media by both staff and leadership has influenced the adoption of social media. Social media acceptance and adoption by emergency response organizations has taken a while because the value was not clear to everybody right away. For example, one interviewee indicates that "a lot of the older generations, do not necessarily believe in the power. Previously that has been a challenge here." The CRCM emphasizes developing training activities along with the implementation of social media procedures. How to tackle acceptance issues among late adopters are not mentioned however.

Yet, interviewees express that they believe that as younger generations are moving into leadership and management positions future developments are likely to be taken up at a faster speed. In many cases however it took a while for the leadership to be convinced of the need for social media use to be incorporated in their work.

5.4.2   Availability Resources

While the key barriers to social media use to date seem first of all the buy-in from management, the resources allocated are still limited. Not having fulltime staff dedicated to the task is felt as a problem.

5.4.3 Availability of Guidelines

Organizations are in the process of developing procedures for their social media use. Generally, there are only one or two persons from organizations involved in tracking and posting on social media. The time spent on social media varies. Overall, social media are still perceived as rather 'new' tools. As one person says: "Lots of people still figuring out how it's most useful. I am in that category. Lot of what we do is experiment".

One of the participant organizations provided a document that describes communication policies to be considered during an emergency. The document contains a section dedicated to the use of social media. The section advises on what the social media venues are going to be used during an emergency (Twitter and Facebook), what kind of content is allowed to be shared, how to protect the reputation of the organization, and how to avoid personal conflicts in the social media arena. The policy document focuses on the use of social media during an emergency, which contrasts with the Crisis and Emergency Risk Communication Manual (CRCM) by the Center for Disease Control and Prevention of the US that presents a guideline for the development of a comprehensive social media strategy for emergency organizations.

Another organization is still in the process of developing procedures. Some of it is already loosely written on paper, and is responsible for style guidelines, and what to post or no to post. During team meetings it is discussed what kind of branding the organization wants to communicate, what kind of messages and pictures they want to put out, etc. While two interviewees indicate they do not have the time to monitor 24/7 which is felt as not ideal, another indicates to monitor 'all the time'. One person indicates to spend maybe 15 minutes in the middle of the day on social media. If something of interest is found, the appropriate division is contacted to see if they want to act upon the information found. Someone from another organization indicates to check social media a few times a day.

Organizations often work with a theme. One organization indicates to have a theme for the month, and then collect information on what is going on in the organization regarding the theme. Messages are sent out to all the divisions to collect information. All the divisions provide their feedback and their input, for the entire month, in order to pre-plan messages. In addition, the social media person checks social media every day to see what else is happening and what people are talking about, to create some on the fly messages.

Another organization also indicates to have theme for the week. This could for example be about testing smoke detector, or a local marathon, often connected to what is in the news. Posts related to the theme are then created, for example about teams from the Fire Department that are running in the marathon, etc.

5.4.4 External Influences

Because social media use is still in its infancy, none of the organizations indicates to receive training on social media use. All are self-taught social media users. However, one person indicates to have put together a course and started researching social media and stats behind it, and ways to present it to individuals, so that they could use it in their organizations, and understand it better. It has resulted in a 7 hour course that goes over the basics of social media and shows how it is used in emergencies. Another organization indicates that the use of social media is sometimes discussed during meetings with other organizations. Thus, by informally developing best practices, organizations are stimulating each other to incorporate social media use in their work practices.

5.4.5 Data verification

Finally, during all interviews the often heard problem of data verification was not considered a critical issue. As a matter of fact, data verification on social media is felt as similar to face-to-face communication, which also needs verification. One interviewee indicates that data is filtered out by two methods. First, people are identified and called out. That is for example what happened in Boston: People said:

'why is everybody posting a picture of a girl, she wasn't there, didn't die, that kind of thing.' So collaboratively data verification takes place. The second method is that there may be one post about something, for example one posts says evacuations take place on the west side, but many others say it's on the east side. Then by weighing the information it becomes clear what is correct.

Finally, the social media staff themselves might do some verification. One interviewee experienced having seen information on social media, after which a hospital was contacted to verify if the information was correct.

6 Discussion

The results indicate that even though a wide variety of social media technologies are being used, Facebook and Twitter are by far the most popular. Affordances like ease of distribution of messages and how static or quick the information on platforms evolve influence the appropriateness of use of certain technologies.

Social media were furthermore shown to be used in various ways. First and foremost for information provision, but also for obtaining input from the public and other organizations, and for facilitating participation, mostly by other organizations involved in emergency management. This means that social media are not (yet) employed, at least by the participants of the study, for internal communication purposes; one other common usage pattern (Welch and Oliveira, 2013). One of the reasons could be that social media use in the emergency response domain is still in its infancy, and that perhaps at a later point in time such use will be integrated as well.

As to be expected, information dissemination *during* the emergency response phase itself focuses on providing useful information to the public and other organizations on what is happening where, etc., *before* the emergency response phase (i.e. preparedness phase) information dissemination happens for education but also extensively for branding purposes. Specifically for Facebook, emergency responders generally posted more messages during the summer and early fall months. These months typically experience a variety of natural disasters, ranging from wildfires to tornadoes. The quantitative analysis complemented qualitative data from interviews by showing that particularly emergency preparedness messages constitute a large percentage of the type of information that is being posted in Facebook. During this phase organizations make the public aware of who they are and what they do, and an important reason to do this is to grow a base of followers so that they can easily be reached in times of emergencies. Organizations appear to be succeeding in creating awareness about themselves and sustaining communication: response from the public, exemplified by the number of "likes" of posts, is highest for messages with that purpose. Thus, while findings suggest different patterns of use during different emergency management phases, they are also highly connected phases and types of uses as useful application of social media technologies during the emergency response phase cannot happen without appropriate application of social media technologies during the preparedness phase.

Finally, a number of organizational factors were identified that may influence an organization's use of social media. Organizational innovativeness matters significantly; buy-in from management but also staff acceptance (particularly as social media use to date is large self-taught) are necessary and were noted as having led to slow uptake of social media in the emergency management domain. Limited resources were mentioned as well, as staff do not always have as much time as they would like to be able to monitor social media. While the former affects use of social media during all emergency management phases, the latter primarily affects the emergency response phase. Limited availability of guidelines to date make the use of social media difficult. Although organizations increasingly work at developing guidelines and share best practices, staff often run into questions on how to deal with social media, what to post online, etc. Finally, external influences come primarily in the form of collaborative discussions on how to use social media, which may positively affect social media in the future. Interestingly, the often mentioned data-related problems including verification, were not perceived as problematic.

7 Conclusions

This study aimed to answer the following question: How do emergency response organizations use social media in emergency preparedness and response? Findings indicate that social media support various purposes of use, including information dissemination, obtaining input from the public and other organizations, and participation by other emergency response organizations (Oliveira and Welch, 2013). To date, few direct help requests have been received via social media; moreover, organizations do not act upon such requests. The role of social media varies across agencies, and organizational context including innovativeness, the amount of resources dedicated, availability of guidelines/procedures and external influence all affect social media use. Since social media require permanent monitoring, particularly staffing maybe a problem. Even with the limited resources, social media has shown to be a good way to push information into the public however. Branding of the organization during the emergency preparedness phase was found to be an important aspect of information dissemination, and helps social media to be useful tool to connect with the public and other organizations during the emergency response phase. Nevertheless, social media use still has to overcome leadership adoption barriers. Some organizations have embraced social media with the approval of top managers, but most find scepticism from the top level. Possibly, when new generations become part of the decision-making level, the adoption will accelerate. Then, with the support of the top decision-making level, social media use will become institutionalized and procedures and guidelines will follow.

This study has contributed to theory in two ways. First, we have developed a model that explains a number of key factors that influence social media adoption for emergency response purposes. While various studies in the emergency management domain have pointed out a number of similar factors related to organizational context that influence social media use (e.g. Hiltz et al., 2014 and Tapia et al, 2011), our proposed model brings these factors together as well as adds to it the role of the emergency management phase (i.e. varying uses depending on emergency preparedness vs. emergency response phase). The study indicates that our conceptual model applies well to the participating organizations of this study; with the exception of internal communication patterns as a usage pattern. Further, our study makes sheds more light on the usage patterns, such as branding being a specific (and important) purpose of information dissemination. As such, our study extends the categorization of usage patterns by Oliveira and Welch (2013) to the emergency response domain. To the wider information systems community our study expands the knowledge on technology-task linkages and social influences on technology adoption.

Since this study has been highly exploratory in nature, future research could further test the proposed model. More organizations could be interviewed, but also in a different context (for example outside the U.S.), and quantitative analyses could for example also be applied to Twitter usage by emergency response organizations. Differences between individual organizations could also be explored in more depth, investigating issues such as geographical or staff competence differences in social media use.

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