

Maldonado, Edgar; van Gorp, Annemijn; Pogrebnyakov, Nicolai

## Conference Paper

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# **A Friend in Need: Emergency Responders' Social Media Use and the Effects on Response Practices**

**Dr. Edgar Maldonado**  
The Metropolitan State  
University of Denver  
emaldon3@msudenver.edu

**Dr. Annemijn van Gorp**  
The Hague University of  
Applied Sciences  
a.f.vangorp@hhs.nl

**Dr. Nicolai Pogrebnyakov**  
Copenhagen Business School  
nip.int@cbs.dk

## **Abstract**

The popularity and ubiquity of social media (SM) have permeated private and public institutions. These last ones, and in particular those governmental agencies that deal with emergencies, have begun using social media in their operations. The impact of SM as a tool within emergency relief organizations and their external activities is still under research. Using qualitative and quantitative data this study aims to identify the various ways in which emergency responders use social media. The study also analyzes for which purposes emergency responders use SM and the impact this has on the organization.

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

## **Introduction**

According to Twitter (2013), in a typical day, more than 500 million of Tweets are sent. Meanwhile, Facebook's users upload more than 350 million of pictures in the same period of time (Internet.org, 2013). This traffic of messages and pictures increases during special events, including catastrophic events or emergencies. Although some U.S. Government entities have shown interest for this kind of data, they are still struggling on finding ways to take advantage of it (Kavanaugh et al., 2012). In addition to the technical challenges (Imran et al., 2014), guidelines and procedures are incipient or nonexistent (Hiltz et al., 2014).

Nevertheless, social media technologies have started to change the way emergency response is carried out. While the role of social media for information sharing between government or aid organizations' and citizens has been discussed relatively often (e.g. Hughes & Palen, 2009; Palen et al., 2010; Qu, Wu, & Wang, 2009), relatively little has been written about the extent of emergency response organizations' use of social media to support the execution of their relief operations.

While social media have been pointed out as having the potential to increase situational awareness for emergency responders (i.e. information provision from affected communities and citizens to responders), a variety of challenges have been identified as well. Some of the problems encountered include 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 impede adoption. These challenges include limited organizational support for IT and innovation, limited IT staff and resources (Tapia, Bajpai, Jansen, & Yen, 2011). Despite these challenges, social media use by emergency responders is growing.

This study aims to expand our knowledge of this field. First, we aim to identify the various ways in which emergency responders use social media. For example, they can be used for

information sharing purposes, for data collection purposes, or for communication with citizens, other organizations, or internally within the organization. Our study will probe into the relative importance of these uses for responders to draw conclusions about the role of social media for disaster response. This is different from extant studies looking at interorganizational knowledge sharing using social media (e.g., Yates and Paquette 2011). Second, we will analyze the impact that the use of social media by emergency responders has on the organization. We will investigate the various benefits and challenges these different types of uses bring, the impact of social media use on interorganizational collaboration between responders, as well as on staff skills and training. Based on the findings, the paper will finalize with practical recommendations on integration of social media into emergency relief practices.

This initial study will focus on the emergency relief organizations that provided assistance to the 2013 floods and fires in the U.S. state of Colorado. The Black Forest fire (Colorado Springs) of 2013 was the second most expensive wildfire in the history of Colorado in terms of insured losses, and the Colorado floods of 2013 will end up costing close to \$2 billion (CNN Money). The flood took place around three months after the fires, and the affected areas were geographically distributed. Given the quick changes in adoption and use patterns of social media, their recent occurrence of these disasters provides an opportunity for an up to date assessment and analysis of social media use during emergency response.

## **Method**

### *Qualitative methods*

The objectives of the study will be addressed with both qualitative and quantitative analyses. First, interviews have been carried out with governmental and nongovernmental organizations involved in emergency response. Organizations that have been involved in the response to the recent 2013 Colorado floods and fires were asked about how they use social media, both for disseminating information as well as collecting information, and the impact that these practices have had on their individual operations and collaboration patterns with other emergency responders.

All the three institutions that contributed with this research are based in Colorado, U.S. The first institution is a Fire Department serving one of the main cities of the state. The second institution acts as a body coordinator for health and emergency issues between three of the state counties (subdivisions of a state that provided some local governmental services). The third organization acts as a link between the state of Colorado and the Federal government in matters related to emergencies.

### *Quantitative methods*

To gain better insight into the use of social media by emergency relief organizations, an analysis of Facebook posts was conducted. The focus of this effort were state-level emergency response organizations in the United States. A list of these organizations was obtained from the Natural Hazards Center at the University of Colorado (University of Colorado, 2014). 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.

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 is 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.

<i>Category name</i>	<i>Definition</i>	<i>Examples of posts</i>
<b>Emergency preparedness and updates</b>	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	<i>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].</i>  <i>Hurricanes can produce inland tornadoes and flooding. Know how to get your house and family ready for these kinds of hazards.</i>  <i>Great news from Black Forest Fire: 75% containment.</i>
<b>Emergency response organization operations</b>	News and updates about internal organizational operations; contact information; volunteer and employment opportunities	<i>Volunteers are vital to recovery. How do you volunteer or give to help in tornado recovery? Tell us here. We are proud of you!</i>  <i>Remember that we have a Twitter feed!</i>  <i>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]</i>
<b>Non-emergency related updates</b>	Updates not related to an emergency; conversation with Facebook users	<i>Congresswoman Susan Brooks starts hearing proceedings.</i>  <i>Hay Resources and Information [link]</i>  <i>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!</i>

Table 1. Classification of Facebook posts of emergency relief organizations

The sample was split into a training, cross-validation and test sets. A bag-of-words approach was used for feature identification, with 290 most commonly occurring words in the sample used as features to classify a post. 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.

## **Results: Qualitative Analysis**

### *Platform Use*

All interviewed organizations have been using social media; some for a longer period than others (ranging from 5 to 1.5 years). It occurs that in the last two years there has been particularly more activity, as it was indicated that there are more followers etc.

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. At a distance these are followed by others like LinkedIn, Pinterest, YouTube, which varies per organization.

The platforms are used for a variety of reasons. Twitter is used most because it enables quick information sharing and lends itself well for further distribution (retweeting) of the messages. In comparison to Twitter, Facebook is also called a 'static' platform by one interviewee. However, one interviewee indicates that they see some organizations use Facebook being used as the primary social media platform. Facebook enables longer messages to be posted. Often a mix is used, but different messages are put on the different platforms.

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

### *Disaster Preparedness vs. Disaster Management*

Prior to a disaster social media are used for sending out preparedness messages and general education. It is also indicated that prior to disaster one goal is to build up followers before emergency, so that many people can be reached during an emergency. One interviewee indicates that as part of building a followers' base, creating an emotional connection is important, as well as using entertainment.

The use of social media during disasters depends on the role the organization plays. Overall, the key use of social media during a disaster seem to provide information on the disaster; e.g. where people can turn to for help, opening times of health centers, who is the local emergency responder, etc. Further, organizations may also use it 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.

However, not all information is pushed. For example, a Fire Department indicates that it does not provide specific incident related information in situations that are not major disasters (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.

### *Data verification*

Data verification does not seem to be a major problem; and is felt as similar to face to face contacts and need for 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 post 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 people 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.

#### *Organizational Procedures SM Use*

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 organization indicates to have a social media policy and procedures in place. 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 preplan 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.

#### *Organizational (staff) Acceptance*

Social media acceptance and adoption 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.” Yet, it is also believed 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.

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 SM and shows how it's used in disasters. Another organization indicates that the use of social media is sometimes discussed during meetings with other organizations. Thus, not as formal training, but informally organizations are developing best practices.

#### *Inter-Organizational Use of Social Media*

Organizations indicate to first of all use social media to repost messages sent by other emergency responders/organizations. 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.”

For inter-organizational relationship purposes also different platforms are felt as being most appropriate depending on the phase. One interviewee for example indicates that it is felt that Twitter is not the best platform in between disasters, but that Facebook is better because Twitter is too fast. Facebook is then used 3 or 4 times a day which increases the chances that other organizations see their messages. Thus, at that time the more static nature of Facebook is more useful.

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 disaster, which was then shared publicly; organizations like the Red Cross, other nonprofits, emergency responding organizations, etc. As the list kept expanding, 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.

#### *Overall barriers*

Overall, the key barriers to social media use to date are first of all the buy in from management, to see this as an important area and thus allocate resources to social media

monitoring and communication. While all interviewed organizations have to some extent overcome this problem, the resources allocated are still limited. Not having fulltime staff dedicated to the task is felt as a problem.

#### *Overall benefits*

All interviewees primarily see benefits in social media use. The benefits come from enabling better branding of the organization, enabling two way communications, better information gathering, and more efficiency work processes.

#### *Branding*

Branding is very important. All interviewees indicate that social media helps provide better awareness to the public about what the organization is and does.

#### *Two way communication*

Two way communication is felt as being rather new with social media (“we haven’t had that really too much”). Also in terms of negative talk social media seem an outcome: “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”.

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.”

#### *Information Gathering*

Finally, information gathering is one of the primary reasons to use social media, which brings many benefits. 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.”

#### *More efficient work processes (less calls; 1:n communication)*

Due to these various benefits, overall, social media are even believed by some to enable more efficiency in work processes. 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].”

### **Results: Patterns of Facebook use by emergency response organizations**

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). The least active months were January, February and March 2011, each of which accounted for less than 1% of posts.



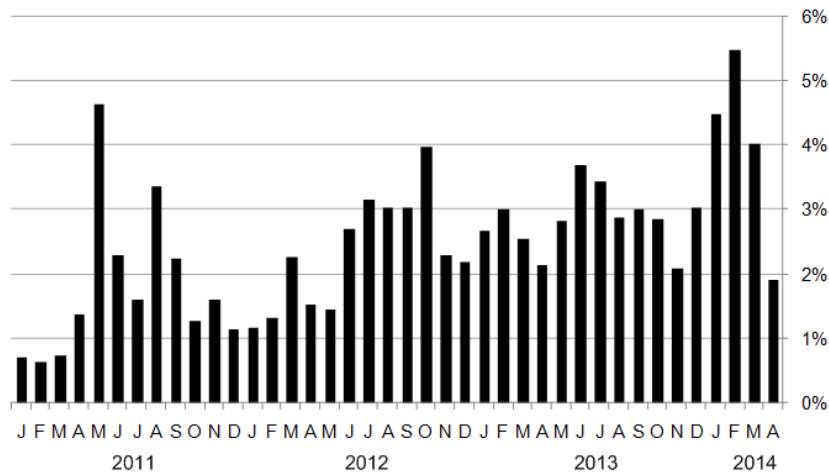


Figure 1. Distribution of ERO Facebook posts over time (as percentage of total number of posts).

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 (ERO) 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.

## Discussion

*Discussion qualitative findings:* Emergency relief organizations have begun using SM in their operations. Although the main use for this technology has to do with branding and information provider, organizations recognize there is a potential for two way communications, information gathering, and as an instrument to improve processes. Social media is seen as a tool that could be integrated in specific emergency relief related activities, but the know-how is still in the making. Top managerial positions are carefully taking steps towards the inclusion of SM in operational activities. With the support of the top decision-making level, SM use will become institutionalized and procedures and guidelines will follow.

*Discussion quantitative findings:* The quantitative analysis complements qualitative data from interviews to paint a broader picture of social media use by emergency responders. Emergency preparedness and updates messages are still a big percentage of the type of information that is being posted in Facebook. This kind of data may, for example, allow to probe into differences between organizations in terms of their social media interactions to determine if these differences can be explained with benefits or barriers of social media use for organizations, or staff competence in that area. This data may also be useful in drawing parallels between social media interactions and changes in which emergency responders provide relief (future research).

## **Conclusions**

The study has shed more light into how social media are altering emergency response practices by investigating specific avenues of social media use to aid in disaster relief. Findings indicate that SM is being used in the emergency relief environment. Among the platforms, Twitter is key platform followed by Facebook. Others are used as well, but not as extensively (e.g. Pinterest, Youtube, Instagram). They all have slightly different types of uses/target groups.

About the specific use of SM, still little direct help requests coming in via SM are received. Even when information related to an emergency is received by SM, verification by other media takes place. The role of Social Media varies across agencies, as well as the amount of resources dedicated. Since SM requires permanent monitoring, staffing maybe a problem. Even with the limited resources, SM has shown to be a good way to push information into the public. The range of information goes for organizations' branding to material related to emergency preparedness.

Finally, it seems that SM use still has to overcome leadership's adoption barriers. Some organizations have embraced SM with the approval of top managers, but most find skepticism from the top level. Possibly, when new generations become part of the decision-making level, the adoption will accelerate.

## **Practical recommendations:**

Although the small scope of this research, the authors have come with the following recommendations for emergency relief organizations' use of social media:

1. Keep records of all interactions. That data can be used to justify SM activities, and to explore better practices.
2. Review guidelines used by private companies in the use of SM, since they have polished the use of SM for branding and pushing information.
3. Try to establish a "SM partnership program" with other emergency relief agencies. By doing that, resources can be shared, providing a better covering of social media venues.

## **Future Research**

One of the subjects in this research offered organization's internal guideline for the use of SM. The authors plan to collect available guidelines and analyze them. Using known practices from the corporate world, the authors plan to create a guideline template to be used in the Emergency relief sector.

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