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Strategies and Barriers in Implementing Emergency Response on Social Media for the Washington Air National Guard

CAPSTONE REPORT

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Abstract

This study explores the barriers and best practices for consideration by the Washington Air National Guard for the implementation of a social media program for use before, during and after crises within the state of Washington. This research is also intended for similar organizations who wish to implement social media into their crisis response plans. The annotated bibliography provides content on barriers to consider and social media best practices used by other crisis response organizations.

Keywords: Air National Guard, crisis communications, disaster management, emergency management, situational-awareness, social media

Table of Contents

Introduction to the Annotated Bibliography

Problem

Boin and 't Hart (2010) define emergency management as responding to "not just mega-fires nor only natural disasters but the full range of major disturbances that can victimize [sic], paralyse [sic] and traumatize [sic] societies, for example, pandemics, infrastructure breakdowns, terrorist attacks and outbursts of mass violence" (Boin & 't Hart, 2010, p. 357). Boin and 't Hart (2010) note the frequent use of the term *crisis management* for emergency management, reflecting the "unscheduled, undesirable, urgent and threatening" (p. 357) nature of the events that trigger a response. A crisis can cause several challenges for the impacted communities; a main challenge is uncertainty, turning people into information seekers hoping to gain an understanding of the situation (Lachlan, Spence, Lin, Najarian, & Del Greco, 2016).

In the aftermath of a crisis, citizens look to authoritative news sources or government agencies to provide credible information about the impacted community (Lin, Spence, Sellnow, & Lachlan, 2016). There is a high demand from impacted citizens for information from the media and public, and channels of timely and accurate information are of vital importance (Panagiotopoulos, Barnett, Bigdeli, & Sams, 2016). Information that citizens seek varies depending on the role they have in a crisis; "the information they find valuable may be very personal-that is, hearing that a friend or loved one is safe, or it may be more broadly applicable, such as the status of a certain neighborhood or town" (Imran, Castillo, Diaz, & Vieweg, 2015).

Traditionally, crisis communication has been viewed as a top-down approach, where the authorities handling the crisis direct the citizens on situation management (Haataja, Laajalahti, & Hyvärinen, 2016). Traditional means for communicating information about crises to citizens have included television, radio, and newspapers (Haataja et al., 2016). Common information shared by

the authorities before, during, and after a crisis includes advice, situation descriptions, cautions, closures, and rumor prevention; authorities also seek information, such as reaching out to the public to assist in identifying a persistent threat (Panagiotopoulos et al., 2016).

In more modern times, social media applications, which allow anyone with a computer or digital device to produce and broadcast information, have allowed for a multi-directional approach to crisis communication (Haataja el al., 2016). In the context of this study, social media is defined as "tools that enable open and online exchange of information through conversation, interaction and exchange of user generated content" (Simon, Goldberg, Aharonson-Daniel, Leykin, & Adini, 2014, p. 1). Social media tools can be useful in producing, sharing, collecting, and accumulating information; these commonly include YouTube for sharing movies, Flickr for sharing photos, and social networking sites like Facebook or microblogging sites like Twitter to allow content to be shared and distributed in near real time to a wide audience (Haataja et al., 2016).

Social media has extended communication channels for society, playing a vital role before, during, and after crises such as natural disasters and complimenting the communication roles played by traditional media (Takahashi et al., 2015). Lachlan et al. (2016) note that in addition to seeking information during crises, social media has also enabled people to become information producers who constantly update their statuses during the events. Twitter has emerged as a useful social media tool to rapidly disseminate information during disasters (Genes et al., 2014). "Twitter, a service where users can share short messages of text with or without photos or links to websites, is resilient, available via cellular, Wi-Fi, or broadband connections on mobile or desktop computers. The messages have a global reach, but can be directed very locally" (Genes et al., 2014, p. 2). Genes et al. (2014) cite examples of how Twitter was used

during and after the Haiti earthquake in 2010 and the Japan earthquake in 2011 by local officials, survivors, and relief workers to communicate on available shelter, search for the missing, and coordinate relief efforts.

Social media can also be used to facilitate responses to crises after an event (Liu, 2014). For example, crowdsourcing can be used to gain a better situational awareness of the impact of the crisis, map the affected area, organize large amounts of data through common information tagging, or filter and curate large amounts of crisis information into actionable information (Liu, 2014). In this context, crowdsourcing is defined as "the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, especially from an online community" (Haataja et al, 2016, p. 141). In a survey of emergency management experts, one respondent shared his view supporting the power of crowdsourcing, which he claimed facilitated "mobilizing the people to take common actions and to have a common understanding about the crisis" (Haataja et al, 2016, p. 148). One example of the use of crowdsourcing in response to a crisis happened during the Kenya Westgate Mall attacks of 2013, where the authorities used social media to ask citizens to identify family and friends who went to the mall on the day of the event and had not returned since the attack started, in an attempt to identify potential hostages (Simon et al., 2014).

Other social media tools that have been used before, during, and after crises include YouTube to show people how to prepare and Facebook and Twitter to give users additional preparedness tips before a crisis happens and to connect with users over time so they know where to find trustworthy sources during a crisis (Haataja et al., 2016). Lachlan et al. (2016) note "As the public grows increasingly reliant upon mobile and social media technologies during

crises and other unanticipated events, it becomes critical for emergency management agencies and responders to understand the nuances surrounding their use" (p. 648).

The Washington Air National Guard (WA ANG) is tasked with protecting the citizens of Washington and their environment and property through homeland defense, security, and all facets of emergency management, including mitigation, preparedness, response and recovery activities (Washington Military Department, n.d.). However, WA ANG currently has no formal social media response plan during crises and other unanticipated events. As a result, WA ANG find themselves left out of the conversations transpiring on social media during crises and are unable to leverage social media tools to facilitate information sharing and relief and rescue efforts. Further, WA ANG cannot take advantage of tools like crowdsourcing to gain situational awareness of an area impacted by a crisis prior to entry into the area or to collect data to identify possible missing persons and map their last known locations. The purpose of this study is to inform organizations like WA ANG on best practices in employing social media tools before, during, and after crises.

Purpose

Social media has reshaped the nature of digital information sharing and networking, becoming a relevant space for officials and citizens to interpret information and intervene through all phases of an emergency event (Panagiotopoulos et al., 2016). The purpose of this annotated bibliography is to present literature that addresses the problem of emergency management organizations that do not leverage social media tools before, during, and after a crisis. The study presents literary sources on best practices that have been employed by organizations who use social media while responding to crises. Specifically, the annotated bibliography presents resources that: (a) identify common barriers for emergency management

organizations when implementing a social media program for use before, during, and after a

crisis and (b) uncover best practices for emergency management organizations in implementing a

social media program for use before, during, and after a crisis.

The ultimate purpose of this study is to facilitate the development of a social media

response plan for the Washington Air National Guard, identify barriers related to implementation

efforts, and identify best practices in overcoming these barriers and successfully implementing a

social media response plan for emergency management. The findings of this research will

directly benefit the Washington Air National Guard, who respond to crises throughout the state

of Washington as called upon by their Governor.

Research Questions

Main question. What are the best practices in using social media for emergency

management responders to gather information from and relay significant information to citizens

before, during, and after a crisis?

Sub-question. What are barriers for emergency management responders when

implementing a social media plan for crisis management?

Audience

The target audience for this study is the Washington Air National Guard Commander and

Director of the Joint Forces for the Washington Guard, Brigadier General Jeremy Horn. This

stakeholder is charged with commanding Air National Guard operations for Washington State as

well as the Washington National Guard Joint Staff, Homeland Response Force, Civil Support

Team, Counter Drug Program, State Partnership Program, and State Guard within the state of

Washington (Washington Military Department, n.d.). General Horn and those in charge of the

units he commands thus will benefit from a study on ways to effectively incorporate social media

into crisis response protocols. In addition, Army National Guard organizations and leadership in other states and other entities interested in developing crisis communications through social media will benefit.

Denis and Palen (2013) note that emergency management groups often lack the support for social media staffing or have a hard time allocating resources to operate on social media during an event, with their audiences left unengaged as a result. Emergency management leaders can use this study to better understand the support their organizations need to implement effective social media programs for crisis management and thus can provide the manpower and resources necessary to ensure their audiences receive timely communications via the most appropriate means before, during and after a crisis such as a natural disaster.

This study provides background information on how other organizations have used social media for crisis operations and identifies best practices utilized through these efforts. Sources in the study also identify considerations and barriers to entry for social media communications. With the information provided, the stakeholders can make informed decisions of whether the value added to crisis response with the addition of social media programs warrants the allocation of resources towards these efforts.

Search Report

Search strategy. The focus for my research is the Washington Air National Guard, who has no social media crisis response plan. I sought the best practices in using social media to keep the community informed while responding to crises that include natural and manmade disasters. I also considered any sources related to implementation of a social media program, such as barriers to overcome during implementation. My strategy coming into this study was to leverage some of my prior successes in finding sources on this topic by dissecting new references

uncovered during my search to determine if I can select more impactful reference material. I evaluated resources I found during my search to determine if they were useful in better defining my problem; identifying barriers in implementing a social media response before, during, or after a crisis; or identifying a strategy to use while responding to a crisis on social media.

Key terms. The key terms with which I have had the most success in surfacing applicable sources for this study include:

- Twitter disaster,

- social media AND emergency management,

- Twitter emergency,

- Twitter AND National Guard,

- Emergency management AND Twitter,

- Social media AND emergency, and

- Emergency management AND social media AND barriers.

Databases and search engines. I used the University of Oregon Library and Google Scholar to complete initial search efforts, but also utilized other databases that yielded sources on this topic including:

- Academic OneFile,

- Academic Search Premier,

- Association for Computing Machinery (ACM),

- Business Source Complete,

- Directory of Open Access Journals (DOAJ),

- Elsevier ScienceDirect Journals Complete,

- Institute of Electrical and Electronics Engineers (IEEE) Xplore,

- Public Library of Science (PLoS) Journals Open Access, and

- PubMed Central Open Access.

Documentation approach. I collected all references through Zotero, which is a freeware resource collection software. Once collected, I evaluated the resources to determine if they were useful to the intent of this study; I kept the resources deemed useful in a folder for use. If I evaluated a resource as weak or not useful, I placed the source into a backup folder for later consideration. Once I collected my resources I further organized them using Zotero's folder and note feature, tagging each entry based on the categories I selected for my annotated bibliography: barriers to implementing a social media program before, during, and after crises, or best practices in implementing a social media program before, during, and after crises.

Reference evaluation criteria. I evaluated references using the list of criteria retrieved from the Center for Public Issues Education (2014) "Evaluating Information Sources" guide. The criteria listed to evaluate sources are defined as authority, timeliness, quality, relevancy, and (lack of) bias (Center for Public Issues Education, University of Florida, n.d).

- Authority. I considered a source to be authoritative if the source was peer-reviewed and from a scholarly source.

- Timeliness. Since social media is a relatively new field and is continuously evolving, I selected sources for the annotated bibliography that were published within the last five years, with the exception of two sources that were published in 2010 and 2011 that included information I deemed important to the study.

- Quality. I determined quality by checking to make sure the authors used proper grammar, spelling, and punctuation, structured the content to flow cohesively, and demonstrated clarity in the direction of the writing.

- Relevancy. I determined relevancy of sources by selecting only topics and sources related to the focus of the research and the research questions.

- Lack of bias. Lastly, I took great care to ensure the sources I selected were free from bias and were written to facilitate research and understanding of their stated topics. I avoided publications from vendors selling related products or services who demonstrated a clear bias.

Annotated Bibliography

The following Annotated Bibliography presents 15 references that examine social media use by emergency management organizations during a crisis. References are selected to provide organizations interested in implementing social media in this context with a background on identified barriers for use as well as best practices. References are presented in two categories that address the research questions in this study. The first category includes scholarly articles that identify barriers to implementing a social media program before, during, and after crises. The second category explores scholarly articles that help to identify best practices in implementing a social media program before, during, and after crises.

Each annotation consists of three elements: (a) the full bibliographic citation, (b) an abstract, and (c) a summary. The abstracts are complete as published. The summaries have been written to extract ideas that are most relevant to this study, but the ideas originated from the authors of each article and are not the ideas of the author of this annotated bibliography.

Barriers to Implementing a Social Media Program Before, During, and After Crises

Beneito-Montagut, R., Shaw, D., Anson, S., & Brewster, C. (2013). Governmental social

media use for emergency communication. *Proceedings of 10th International ISCRAM Conference, Baden-Baden, Germany* (pp. 828-833). Retrieved from

http://www.iscram.org/legacy/ISCRAM2013/files/152.pdf

Abstract. The possibility of crowdsourced information, multi-geographical and multi-organisational [*sic*] information flows during emergencies and crises provided by web 2.0 tools are providing emergency management centres [*sic*] with new communication challenges and opportunities. Building on the existing emergency management and social media literature, this article explores how institutions are using and adopting social media for emergency

communication. By examining the drivers and barriers of social media adoption in two European governmental agencies dealing with emergencies, the paper aims to establish a framework to examine whether and how institutional resilience could be improved.

Summary. This article provides insight into the barriers of integrating social media into emergency management organizations. The authors use surveys and build case studies on two different organizations who have similar responsibilities. To gain different perspectives the authors selected one organization that has used social media in crisis management, and one that has not. The organization using social media responded to the authors' survey explaining that they have barriers that stem from departmental policies, like restricting them from following individual users and responding to individual users. Other barriers this organization reported included lack of staff, which prohibited them from using social media more intensively and developing better strategies, as well as lack of training and guidelines, which presented a barrier for users to implement new ideas like incorporating a blog.

The second organization recognized the usefulness and significant impact for society that would be realized with the implementation of social media into their organization, but cited several barriers preventing their organization from participating. A lack of clear strategy and rules surrounding social media use was cited as a major concern. Age differences between the leadership who could support social media's use and the younger employees that would know how to use it was also mentioned as a key barrier. Fear of losing control of information in a crisis was mentioned as another foundational barrier preventing entry into social media use; the organization reported feeling that high information control belongs to the leaders of the organization in an emergency and not the staff or the citizens.

This article is important for this study because it explains several barriers to consider and address prior to adopting social media for use in an emergency management organization, as well as providing insights into the mindset behind organizations who are hesitant to implement a social media program during a crisis.

Haataja, M., Laajalahti, A., & Hyvärinen, J. (2016). Expert views on current and future use of social media among crisis and emergency management organizations: Incentives and barriers. *Human Technology*, *12*(2), 135–164.

https://doi.org/10.17011/ht/urn.201611174653

Abstract. Our research explored the use of social media among crisis and emergency management organizations and we present the main incentives and barriers experts perceive in social media adoption by such organizations. The data were gathered via an international online questionnaire sent to crisis communication and management experts. The results indicate that crisis and emergency management organizations use social media specifically to disseminate information to citizens but also increasingly to receive it from citizens. They are motivated to use social media because of the possibility for communicating through them directly, rapidly, and widely, as well as for building responsible relationships and situational awareness. Lack of knowledge, time, and role models for implementation, as well as inflexible and old-fashioned organizational culture, were the main barriers mentioned for not utilizing social media. Based on the results, further effort should be put into promoting the dissemination of knowledge, best practices, and experiences of using social media across the various actors and organizations providing crisis response.

Summary. The authors of this research set out to uncover barriers and incentives for using social media in a crisis by surveying 29 emergency management experts, Another goal of

the study was to explore the direction of social media use for future crisis communication within

their organizations. The authors chose to protect the anonymity of the respondents by masking

the identity of each participant. The survey responses indicated that a small group of

organizations that do not use social media during crises see value in the use, but identified the

barrier of not having the resources to allocate towards social media operations during the time of

a crisis. Another respondent mentioned that their barrier is organizational-driven due to an

inflexible and old-fashioned culture, along with the organization's perception that interaction

with citizens is not their role during a crisis. Beyond the lack of resources and cultural barriers, a

lack of role models to follow in establishing and utilizing social media programs was also

mentioned as a barrier, solidifying the need to identify best practices in this area.

This article is important for this study because it contributes to understanding barriers of

entry into social media integration during a crisis while also providing insight into desirable

outcomes in social media adaptation, like educating citizens on crisis preparation prior to a real-

world crisis.

Hiltz, S. R., Kushma, J., & Plotnick, L. (2014). Use of social media by U.S. public sector

emergency managers: Barriers and wish lists. *Proceedings of the 11th International*

ISCRAM Conference, University Park, Pennsylvania, USA (pp. 602-611). Retrieved from

http://ww.w.iscram.org/legacy/ISCRAM2014/papers/p11.pdf

Abstract. Semi-structured interviews were conducted with U.S. public sector emergency

managers to probe barriers to use of social media and reactions to possible software

enhancements to support such use. The three most frequently described barriers were lack of

personnel time to work on use of social media, lack of policies and guidelines for its use, and

concern about the trustworthiness of pulled data. The most popular of the possible technological

enhancements described for Twitter are filtering by category of user/contributor, and display of posts on a GIS system with a map-based display.

Summary. The authors use an open-ended interview format to identify barriers and possible tool improvements associated with social media use for emergency management organizations during a crisis. The study consisted of eleven interviews with practicing emergency managers. Primary barriers the authors identified included a lack of people, time, policies, guidelines, appropriate technology, training, and trustworthiness and agency prohibitions against the use of social media. This research also examined technology and social media shortfalls, including filtering challenges and lack of a geographic information system (GIS). The authors also present possible solutions for facilitating social media use during a crisis, including better filtering during a crisis to facilitate categorization of user or contributor, along with map integration to understand the geographical location where each post originates.

This article is important for this study because it identifies common barriers in using social media in response to a crisis as described by emergency management organizations. The emergency experts in the study also discuss how to make social media use even more impactful during emergency response; this information could lead to more powerful social media tools in the future or assist in identifying which tools might work best to achieve desired results.

Plotnick, L., Hiltz, S. R., Kushma, J. A., & Tapia, A. (2015). Red tape: Attitudes and issues related to use of social media by U.S. county-level emergency managers. *Proceedings of the ISCRAM 2015 Conference, Kristiansand* (pp. 182-192). Retrieved from http://idl.iscram.org/files/lindaplotnick/2015/1225_LindaPlotnick_etal2015.pdf

Abstract. Social media are ubiquitous in modern society. Among their uses are to provide real-time information during crisis. One might expect that emergency management

agencies in the U.S. make use of social media extensively to disseminate and collect crisis

information as that is where the information flows most freely and quickly; yet, these agencies

are not fully exploiting the capabilities of social media. A survey of 241 U.S. emergency

managers at the county level shows that only about half of these agencies use social media in any

way as of 2014. Most do not have any formal policies to guide their use. Of those that do have

formal policies, about one quarter actually forbid the use of social media. This study describes

the barriers that impede use of social media by these emergency managers, and the ways in

which they are currently used, and recommends steps to improve this use.

Summary. The authors of this research used a survey to poll 241 individuals in the

emergency management field via a questionnaire on established barriers in using social media

for emergency management. The authors set out to quantify the difficulty of each barrier for the

organizations surveyed. Barriers associated with the survey included topics related to sending out

and collecting information via social media. The authors included questions on the following

topics related to barriers to sending out information via social media for emergency

management: lack of staff, guidance, skill sets, training opportunities, experience with social

media, and support from senior management. The authors included questions on the following

topics related to barriers to collecting information via social media during a crisis: lack of staff,

skills, training, and experience with social media; concerns about the trustworthiness of publicly

generated data; information overload; and the limitations of social media. The authors also

examined which actions via social media were most valuable to the organizations polled for the

survey.

The authors found that the barrier that posed the greatest difficulty related to sending out

information via social media for emergency management was lack of staff to support social

media use; they also noted that this barrier affects all aspects of social media use during a crisis.

The authors found that other than a lack of staff, the barrier that posed the greatest difficulty

related to collecting information via social media during a crisis was trustworthiness of the data.

Finally, the authors found that the following actions via social media were the most valuable for

the emergency management organizations polled: providing specific information to the public,

alerting the public of risks and providing other risk communications, public relation efforts,

countering rumors, and increasing situational awareness.

This article is important for this study because it quantifies the difficulty of each barrier

associated with social media use during a crisis and outlines the importance of various social

media uses for an emergency management organization. This article also breaks barriers into two

separate categories, which provides a greater depth of information on barriers for different facets

of social media use during a crisis.

Tapia, A. H., Bajpai, K., Jansen, J., Yen, J., & Giles, L. (2011). Seeking the trustworthy

tweet: Can microblogged data fit the information needs of disaster response and

humanitarian relief organizations, 10. *Proceedings of the 8th International ISCRAM*

Conference, Lisbon, Portugal (pp. 1-10). Retrieved from

http://idl.iscram.org/files/tapia/2011/991_Tapia_etal2011.pdf

Abstract. Message data has, as yet, not been adopted by large-scale, international

humanitarian relief organizations in an instrumental fashion. While the largest of these

organizations have adopted messaging as part of their Public Relations functions, few have used

any form of message data originating in the field, at the time of disaster. The message data being

contributed by bystanders and those affected by a disaster, as it is happening, has largely been

deemed as unverifiable and untrustworthy, and thus construed as unsuitable for incorporation

into established mechanisms for organizational decision-making. In this paper, we describe the discursive barriers to the use of microblogged data by Humanitarian NGOs during times of disaster. We present data and findings from a study involving representatives from thirteen humanitarian organizations. Our analysis suggests that the organizational barriers, both in terms of function and structure, and the data itself, form barriers to organizational use of microblogged data. We propose three socio-technical solutions to surpassing adoption bottlenecks, namely bounded microblogging, microblogged data as contextual data, and/or use of computational solutions.

Summary. The authors examine the barrier of the trustworthiness of data collected from public social media interactions during a crisis. The study was conducted through interviews of 13 individuals from 13 distinct humanitarian relief organizations. Beyond discussing this barrier, the respondents address strategies for coping with the barrier of collecting unconfirmed data via social media during a crisis; strategies noted by respondents include triangulating data among multiple people posting about a crisis and having an embedded, trustworthy eyewitness on the scene to confirm the situation. Although this research polls humanitarian relief organizations, this article is important for this study because recommendations that come from the research are barrier specific. A substantial takeaway from this study is to consider incoming data as contextual or ambient data to provide supplemental information to an ongoing event.

Best Practices in Implementing a Social Media Program Before, During, and After Crises

Denis, L. A. S., & Palen, L. (2013). Mastering social media: An analysis of Jefferson County's

communications during the 2013 Colorado floods. *Proceedings of the 11th International*

ISCRAM Conference, University Park, Pennsylvania, USA (pp. 737-746). Retrieved from

http://www.iscram.org/legacy/ISCRAM2014/papers/p93.pdf

Abstract. We report on the social media communications and work practices of the Jefferson County Type III Incident Management Team during the September 2013 Colorado Floods. In this case study, we examine flood-related communications across three platforms: Facebook, Twitter, and the team's blog for insight into how this innovative team coordinated their communications to meet the information needs of a community outside of the media spotlight. Using a mixed method approach of interviews and social media content analysis, we describe their online behaviors in relation to the needs of the emergency response as a whole. We report on adaptations to their work practice that allowed them to extend traditional communications with social media to create an integrated communication plan. Finally, we look to the team's experiences for direction in how to use social media in emergencies generally.

Summary. The authors of this article interview members of the Jefferson County Incident Management Team (JeffCo IMT) to discover best practices for social media response gleaned from their use of social media during the September 2013 Colorado floods. Quantitative analysis was also used to frame the teams use of social media to compare this organizations social media response to other organizations' responses to similar crises. JeffCo IMT stated that best practices they identified included using relevant hashtags and frequent messages in the early days of an event, which they noted helped them to establish a presence on Twitter and allowed them to establish other platforms as valuable information sources, including a blog, Facebook page, and Google Maps. When talking about leveraging Twitter as a communication source during an event, one member of the team emphasized the importance of creating standalone tweets, so that each tweet could tell a story without requiring the information consumer to go back and read other tweets to gain a context.

JeffCo IMT recommended using a blog to expand on content that could not fit on other platforms such as Twitter, which at the time had a 140-character limit. The team used a Google Interactive Public Information Map to identify hazards for the public; this tool was used to expand the context of Twitter posts and could be embedded and used on other sites to provide an authoritative informational resource that was persistently updated by the team. They also crowdsourced crisis photo submissions by publishing a standardized form built through a Google Form that they shared through Twitter, their Facebook page, and their blog site, receiving 57 responses. The team used their crowdsourced photos to assist in documenting the severity of the flood. Finally, they used their multi-channel approach to broadcast safety notices and closures and address rumors like doubt expressed by the public towards the resilience of local dams and the availability of water supplies. The reason this study is so important is because JeffCo IMT sets many examples of how to use several social media channels (Twitter, Facebook, Google Maps and Docs, and blogs) to provide value to the citizens they serve during a crisis.

Genes, N., Chary, M., & Chason, K. (2014). Analysis of Twitter users' sharing of official New

York storm response messages. *Medicine 2.0, 3(1),* 1-5.

https://doi.org/10.2196/med20.3237

Abstract. Background

Twitter is a social network where users read, send, and share snippets of text ("tweets"). Tweets can be disseminated through multiple means; on desktop computers, laptops, and mobile devices, over ethernet, Wi-Fi or cellular networks. This redundancy positions Twitter as a useful tool for disseminating information to the public during emergencies or disasters. Previous research on dissemination of information using Twitter has mostly investigated the characteristics of tweets that are most effective in raising consumer awareness about a new

product or event. In particular, they describe characteristics that increase the chance the

messages will be shared ("retweeted") by users. In comparison, little has been published on how

information from municipal or state government agencies spreads on Twitter during emergency

situations. Retweeting these messages is a way to enhance public awareness of potentially

important instructions from public officials in a disaster.

Objective

The aim of this study is to (1) describe the tweets of select New York State and New

York City agencies by public officials surrounding two notable recent winter storms that

required a large-scale emergency response, and (2) identify the characteristics of the tweets of

public officials that were most disseminated (retweeted).

Methods

For one week surrounding Superstorm Sandy (October 2012) and the winter blizzard

Nemo (February 2013), we collected (1) tweets from the official accounts for six New York

governmental agencies, and (2) all tweets containing the hashtags #sandy (or #nemo) and #nyc.

From these data we calculated how many times a tweet was retweeted, controlling for

differences in baseline activity in each account. We observed how many hashtags and links each

tweet contained. We also calculated the lexical diversity of each tweet, a measure of the range of

vocabulary used.

Results

During the Sandy storm, 3242 shared (retweeted) messages from public officials were

collected. The lexical diversity of official tweets was similar (2.25-2.49) and well below the

average for non-official tweets mentioning #sandy and #nyc (3.82). Most official tweets were

with substantial retweets including a link for further reading. Of the 448 tweets analyzed from

six official city and state Twitter accounts from the Nemo blizzard, 271 were related to the storm, and 174 had actionable information for the public. Actionable storm messages were retweeted approximately 24x per message, compared to 31x per message for general storm information.

Conclusions

During two weather emergencies, New York public officials were able to convey storm-related information that was shared widely beyond existing follower bases, potentially improving situational awareness and disaster response. Official Sandy tweets, characterized by a lower lexical diversity score than other city- and Sandy-related tweets, were likely easier to understand, and often linked to further information and resources. Actionable information in the Nemo blizzard, such as specific instructions and cancellation notices, was not shared as often as more general warnings and "fun facts," suggesting agencies mix important instructions with more general news and trivia, as a way of reaching the broadest audience during a disaster.

Summary. In this article, the authors analyzed tweets from two weather crises in New York to understand the characteristics of the tweets that were the most widely disseminated through retweets. The authors analyzed 3,242 tweets from Superstorm Sandy and 271 tweets from blizzard Nemo. The authors analyzed the tweets from these two natural disasters and discovered that the tweets that reached the widest public audience were those that provided a self-contained message with simple vocabulary. The authors also noticed that the tweets that were shared the most were those with photos, general tips, 'fun facts' or trivial information versus actionable information, such as specific instructions and cancellation notices.

This article is important for this study because it provides a thorough analysis of actual tweets sent during two natural disasters to determine characteristics of tweets that can be considered best practice to increase the dissemination of information through Twitter.

Grasso, V., & Crisci, A. (2016). Codified hashtags for weather warning on Twitter: An Italian case study. *PLoS Currents*, *8*, 1-32.

https://doi.org/10.1371/currents.dis.967e71514ecb92402eca3bdc9b789529

Abstract. Introduction: During emergencies increasing numbers of messages are shared through social media platforms becoming a primary source of information for lay people and emergency managers. For Twitter codified hashtagging is emerging as a practical way to coordinate messages during emergencies and quickly identify relevant information. This paper considers a case study on the use of codified hashtags concerning weather warning in Italy in three different regions.

Methods: From November 3rd to December 2nd 2014, tweets identified by the 3 codified hashtags #allertameteoTOS, #allertameteoLIG and #allertameteoPIE were retrieved, collecting a total of 35,558 tweets published by 7361 unique tweets authors, with the aim to assess if codified hashtags could represent an effective way to align formal and informal sources of information during weather related emergencies. An auxiliary R-package was built to lead the analytics used in this study. Authors performed a manual coding of users, hashtags and content of messages of all Twitter data considered.

Results: Content analysis showed that tweets were overwhelmingly related to situational updates, with a high percentage containing geo-location information. Communication patterns of different user types were discussed for the three contexts. In accordance with previous studies,

individuals showed an active participation primarily functioning as information hub during the emergency.

Discussion: In the proposed cases codified hashtags have proven to be an effective tool to convey useful information on Twitter by formal and informal sources. Where institutions supported the use of the predefined hashtag in communication activities, like in Tuscany, messages were very focused, with more than 90% of tweets being situational updates. In this perspective, use of codified hashtags may potentially improve the performance of systems for automatic information retrieval and processing during disasters.

Keywords: social media, emergency management, Twitter, severe weather

Summary. The authors of this article analyzed 35,558 tweets from three codified hashtags during the Italian-based winter storms of 2014 to understand if codified hashtags could effectively align formal and informal information sources during weather related emergencies. The authors share Italy's frequent use of the "allertameteo" hashtag, translated to weather warning, during weather events. The hashtag #allertameteoSar was proposed by a citizen on social media to coordinate and codify discussions surrounding the Sardinia floods of November 2013. Following the event, a blogger published preferred tags in January 2014 to use during weather crises throughout Italy consisting of the allertameteo prefix and followed by a 3-letter abbreviation for the region affected.

The results of the study indicate that institutions using predefined, codified hashtags published the bulk of native information during a weather event, and that the citizens seemed to be the most active class of users using the hashtags through extraordinary retweeting behavior, considering citizens produced only 16-19% of the native tweets per event yet produced the largest amount of posts per event by also retweeting tweets posted with the codified hashtags.

The results of the study also indicated that organizing tweets into codified hashtags produced a rate of off-topic tweets that was almost null, as 91% of the tweets with the specific hashtags were related to situational updates. This article is important to this study because it defines established best practices for the use of codified hashtags during a natural disaster, which was found to be beneficial in organizing tweets during a crisis event and in the analysis of an event after it happened.

Imran, M., Castillo, C., Diaz, F., & Vieweg, S. (2015). Processing social media messages in

mass emergency: A survey. *ACM Computing Surveys, 47*(4), 1–38.

https://doi.org/10.1145/2771588

Abstract. Social media platforms provide active communication channels during mass convergence and emergency events such as disasters caused by natural hazards. As a result, first responders, decision makers, and the public can use this information to gain insight into the situation as it unfolds. In particular, many social media messages communicated during emergencies convey timely, actionable information. Processing social media messages to obtain such information, however, involves solving multiple challenges including: parsing brief and informal messages, handling information overload, and prioritizing different types of information found in messages. These challenges can be mapped to classical information processing operations such as filtering, classifying, ranking, aggregating, extracting, and summarizing. We survey the state of the art regarding computational methods to process social media messages and highlight both their contributions and shortcomings. In addition, we examine their particularities, and methodically examine a series of key subproblems ranging from the detection of events to the creation of actionable and useful summaries. Research thus far has, to a large extent, produced methods to extract situational awareness information from social media. In this

survey, we cover these various approaches, and highlight their benefits and shortcomings. We conclude with research challenges that go beyond situational awareness, and begin to look at supporting decision making and coordinating emergency-response actions.

Summary. The authors of this article examined tools used to process social media messages during a crisis event and identified barriers specific to the effective analysis of social media information during these events. The authors present dashboard tools that can enable visual analysis of social media messages during a crisis, including filtering messages by importance and timeliness, time series graphs showing volumes of hashtags or word use and marking peak activity, maps displaying geotagged messages, and pie graphs showing proportions of different types of messages. The authors identified challenges or barriers associated with processing crisis data, including issues with scalability during a large event, content issues that could occur due to microblogging character limits or unreliable sources, and privacy and ethical issues that could come from geotagging users who do not intend to share their locations. This article is useful to this study because it can contribute to best practices in overcoming barriers to effective social media use during a crisis by providing a large set of tools and considerations for effective analysis of social media communications during all phases of a crisis event.

Lachlan, K. A., Spence, P. R., Lin, X., Najarian, K., & Del Greco, M. (2016). Social media and crisis management: CERC, search strategies, and Twitter content. *Computers in Human Behavior*, *54*, 647–652. https://doi.org/10.1016/j.chb.2015.05.027

Abstract. The current manuscript explores Twitter use and content in the precrisis stages of a major weather event in the northeast. A multi-level content analysis of tweets collected in the lead up to landfall suggests that emergency management agencies largely underutilized the medium, and that actionable information was easier to find when searching along localized

hashtags. The findings are discussed in terms of the Crisis and Emergency Risk Communication (CERC) model of crisis management and implications for emergency management agencies.

Summary. The authors examine Twitter use by the public and government agencies in the pre-crisis phase of winter storm Nemo, which hit the east coast of the United States and Canada in February of 2013. One goal of the research is to understand the rate of tweets for local hashtags (#bosnow) and the nationally used hashtag (#nemo); they found that the rate was 1 tweet every 10-12 seconds versus 2-5 tweets per second, respectively. The concern with the rate of tweets for an emergency management agency is that the number of tweets coming in may cause a competition for attention between agencies and the rest of the Twitter users, therefore generating an overwhelming amount of content.

Although this article shows the overwhelming number of tweets that can be made during the pre-crisis stage of an event, the authors do discuss the best practice of adopting localized hashtags to cut through the noise created by users tweeting using the nationally-accepted hashtag. Upon a deeper analysis of the tweets, the authors discovered that the national-level "#nemo" hashtag was most commonly used for affective release, or intense release of emotions related to the event, rather than informational content about the storm. The authors also discovered that a tweet made with the national hashtag was twice as likely than the localized hashtag counterpart to be a gag or 'humorous' in nature. When the authors analyzed the hashtag "#bosnow," they found that at least half the tweets using this hashtag were informative in nature. Also, by using a word cloud, the authors discovered that the localized hashtags were more systematic and more closely related to the situation.

This article is important to this study because it provides insight into the barrier of information overload via social media during a crisis and provides a best practice of using localized hashtags before, during, and after a crisis to enhance visibility and connections locally.

Lin, X., Spence, P. R., Sellnow, T. L., & Lachlan, K. A. (2016). Crisis communication, learning and responding: Best practices in social media. *Computers in Human Behavior, 65,* 601–605. https://doi.org/10.1016/j.chb.2016.05.080

Abstract. As noted by Seeger (2006) the notion of best practices is often use to improve professional practice; to create research and functional recommendations to use in a specific situation. This essay describes best practices in crisis communication specifically through the use of social media. It provides suggestions and approaches for improving the effectiveness of crisis communication and learning with and between organizations, governments and citizens. Seven best practices for effective crisis communication using social media are outlined.

Summary. The authors of this article provide readers with seven best practices for crisis communication through social media. The article outlines the state-of-the-art concerning best practices in using social media for crisis communication by using theoretical arguments and findings from empirical research to provide a framework for emergency management organizations to consider when implementing a social media response to a crisis.

The first best practice concerns the need for organizations to include social media in their decision-making and policies relating to crisis response. The example the authors provide includes the use of social media by the Federal Emergency Management Agency (FEMA) and Red Cross, who incorporate continuous training on how to enhance emergency response missions through social media tools, technologies, and strategy roadmaps, as well as integrating social media into their policies of how they respond to a crisis.

The next best practice is the recommendation that emergency management organizations should engage in two-way dialogue via social media rather than sending one-way messages. The authors assert that by engaging in a dialogue, agencies can establish followership and ensure social media feeds are primary sources for risk and crisis information in the future.

The third best practice is to establish credibility through media affordances, defined as system-generated cues computed by the media system that are difficult to manipulate, like having too many or too followers on social media; or identity cues, like setting profile information up with official identities. In this section the authors explain how organizations can establish credibility by creating expert accounts with official identities. The authors provide an example of the Center for Disease Control and Prevention (CDC), which encourages members to use the "CDC" prefix when establishing new member accounts. The authors note that the CDC officer of the Chief Information Security Office also vets new accounts for an extra layer of security approval.

The fourth best practice is maintaining a quick and effective posting speed. The authors explain that "Empirical evidence suggests that effective crisis management should focus on being quick with information feeds on social media, which would lead the public to actions by receiving updates from official or authoritative information outlets; the public would also engender a sense that government agencies and organizations have the best interest of the audience in mind" (p. 603).

Next the authors explain that during the early phase of a crisis event agencies will create and promote a hashtag. The authors recommend owning the hashtag the agency starts with throughout all phases of a crisis. The authors explain the responsibility of owning the hashtag as follows: "If an organization promotes a hashtag, that organization needs to police the hashtag

during an emergency and work to ensure useful information is available" (p. 603). The authors mention that national level hashtags are prone to humor or spam, and that agencies need to police the use of the hashtag. The authors also note that tweets made with localized hashtags have been more likely to contain actionable information that citizens can use to prepare for and respond to an event. The authors recommend setting a hashtag for a crisis and sharing it over the radio and other media sources to provide users guidance on where to find reliable sources of information during a crisis event.

The sixth best practice is to build relationships with other organizations and influencers to help spread and receive reliable information. The authors suggest that members of the public can be beneficial in this effort due to larger followings, and that cooperating with the public to share messages related to a crisis can provide greater exposure. The authors advise cooperating with the community using social media, versus seeing other social media users as competition.

The last best practice is to monitor misinformation such as rumors. Rumors about an event can spread quickly due to the lack of information on a crisis from trusted sources. The authors note that rumors can be intentional or may just develop from the lack of correct information.

This article is important to this study because it provides a collection of many best practices to be considered when developing a social media response plan for crisis communications.

Liu, S. B. (2014). Crisis crowdsourcing framework: Designing strategic configurations of crowdsourcing for the emergency management domain. *Computer Supported Cooperative Work (CSCW)*, *23*(4–6), 389–443. https://doi.org/10.1007/s10606-014-9204-3

Abstract. Crowdsourcing is not a new practice but it is a concept that has gained substantial attention during recent disasters. Drawing from previous work in the crisis informatics, disaster sociology, and computer-supported cooperative work (CSCW) literature, this paper first explains recent conceptualizations of crowdsourcing and how crowdsourcing is a way of leveraging disaster convergence. The CSCW concept of "articulation work" is introduced as an interpretive frame for extracting the salient dimensions of "crisis crowdsourcing." Then, a series of vignettes are presented to illustrate the evolution of crisis crowdsourcing that spontaneously emerged after the 2010 Haiti earthquake and evolved to more established forms of public engagement during crises. The best practices extracted from the vignettes clarified the efforts to formalize crisis crowdsourcing through the development of innovative interfaces designed to support the articulation work needed to facilitate spontaneous volunteer efforts. Extracting these best practices led to the development of a conceptual framework that unpacks the key dimensions of crisis crowdsourcing. The Crisis Crowdsourcing Framework is a systematic, problem-driven approach to determining the why, who, what, when, where, and how aspects of a crowdsourcing system. The framework also draws attention to the social, technological, organizational, and policy (STOP) interfaces that need to be designed to manage the articulation work involved with reducing the complexity of coordinating across these key dimensions. An example of how to apply the framework to design a crowdsourcing system is offered with a discussion on the implications for applying this framework as well as the limitations of this framework. Innovation is occurring at the social, technological, organizational, and policy interfaces enabling crowdsourcing to be operationalized and integrated into official products and services.

Summary. Sophia Liu completed a qualitative phenomenological research study to explore the evolution of crowdsourcing in the crisis domain. Liu explains that she developed a framework she calls the "Crisis Crowdsourcing Framework" based upon information she learned during the study. The author outlines six dimensions of the framework as follows:

(1) Why – Identify the information problem to determine the crowd task needed;

(2) Who – Identify the types of crowds and expertise needed for the crowd task;

(3) What – Identify the interaction flows for engaging crowds;

(4) When – Identify temporal aspects in relation to the disaster lifecycle;

(5) Where – Identify spatial aspects of the crisis, crowds, and crowd tasks; and

(6) How – Identify social, technological, organizational, and policy (STOP)

interfaces. (p. 406)

Liu describes each dimension and gives examples as they can apply to a crisis. The first dimension is figuring out what you need the crowd to do related to the crisis; the examples she provides include sensing, tagging, mapping and curating. Crowd-sensing is a task in crowdsourcing to gain a situational awareness of the effects of a crisis on the affected location. Crowd-tagging involves asking the public to assist in tagging information to help organize large amounts of data and enhance the processing of the data. Crowd-mapping consists of asking volunteers to assist in mapping the affected location, which usually is done through professional or participatory geographic information systems such as ArcGIS and OpenStreetMap. Crowd-curating typically means that the public is asked to find actionable crisis information and share it with key stakeholders.

In the dimension of "who", Liu explains that there are several target audiences in crisis crowdsourcing, including affected populations and diasporas, or individuals who might have

been displaced and carry socio-cultural tacit knowledge, such as knowing the language, geography, social networks, and digital volunteer communities of the affected region.

Liu describes the third dimension, "what," as setting the information flow for crowdsourced information. Information flows include parallel sourcing, iterative sourcing, crowd-seeding, crowd-feeding, and crowd-harvesting. Parallel sourcing is when many members of a crowd work on the same task from scratch in parallel and the work combines to provide a collective output. Iterative sourcing is defined as members of the crowd contributing to each other's work, thus facilitating a sequential improvement of crowdsourced data; iterative sourcing differs from parallel sourcing because it does not require each participant to start from scratch. Crowd-seeding relies on certain individuals or groups in the crowd to meet the objectives of a specific task and is used to gain or facilitate a trusted, localized, and controllable crowdsourcing effort. Crowd-feeding is taking information from the crowd and feeding it back to the crowd; the author provides an example of collecting information on individuals who need help, then highlighting those individuals to people who want to help. Crowd-harvesting differs from the other four information flows because rather than asking for something, crowd-harvesting is a passive method of obtaining information; in this information flow the crowd is not asked to contribute anything, but rather someone is collecting or mining information that is needed from the crowd.

The fourth dimension, "when," is considering the elements of the crisis lifecycle where the crowdsource task is needed. Examples of elements of a crisis include preparedness, response, and recovery phases.

Liu describes the fifth dimension, "where," as the necessary identification of the target crisis area on which to focus, where the crowdsourcing information could come from, and where the task is to be completed (via the internet, mobile applications, or physical space).

In the last dimension, "how," Liu explains the need to identify Social, Technological, Organizational, and Policy (STOP) interfaces for the crowdsourcing. The social interface deals with norms, values, beliefs, and practices associated with crowdsourcing. The technological interface concerns understanding the tools and their capabilities to get crowdsourced tasks completed. The organizational interface requires understanding how organizations' internal procedures support or conflict with the efforts of collaboration and contribution during a crisis. The policy interface concerns understanding the legal policies and regulations involved with engaging with crowds and managing crowdsourced data; for example, considerations with personally identifiable information (PII) that may be present on social media sites.

This article is important to this study because it provides a comprehensive framework of best practices for working with crowdsourcing data in the context of a crisis.

Panagiotopoulos, P., Barnett, J., Bigdeli, A. Z., & Sams, S. (2016). Social media in

emergency management: Twitter as a tool for communicating risks to the public.

Technological Forecasting and Social Change, 111, 86–96.

https://doi.org/10.1016/j.techfore.2016.06.010

Abstract. One of the main challenges of emergency management lies in communicating risks to the public. On some occasions, risk communicators might seek to increase awareness over emerging risks, while on others the aim might be to avoid escalation of public reactions. Social media accounts offer an opportunity to rapidly distribute critical information and in doing so to mitigate the impact of emergencies by influencing public reactions. This article draws on

theories of risk and emergency communication in order to consider the impact of Twitter as a tool for communicating risks to the public. We analyse 10,020 Twitter messages posted by the official accounts of UK local government authorities (councils) in the context of two major emergencies: the heavy snow of December 2010 and the riots of August 2011. Twitter was used in a variety of ways to communicate and manage associated risks including messages to provide official updates, encourage protective behavior, increase awareness and guide public attention to mitigating actions. We discuss the importance of social media as means of increasing confidence in emergency management institutions.

Summary. In this article the authors analyze tweets to uncover best practices government agencies use on social media to increase awareness of an incoming crisis and reduce the effects of a man-made crisis such as riots. The authors analyzed 10,020 tweets posted by UK local government authorities following heavy snow that occurred in December 2010 and riots that occurred in 2011, and discovered three main themes displayed by the local government agencies. The first theme included increasing the volume of information the agencies broadcasted to provide timely updates and increase the awareness of the situation. The authors provide the example of communications during the pre-crisis phase of the 2010 winter storm when snow levels were expected to increase by significant amounts; the agency used Twitter to emphasize that the effected population should take precautionary measures and to increase awareness of the ongoing situation.

Next, the authors discovered that the agencies filtered and redistributed valuable information with other sources to expand the information broadcasting efforts. The authors provide an example of government agencies' social media response to a riot, noting that the

agencies shared official announcements, statements from local leaders, and retweets of messages from the police to help de-escalate the crisis and help with collective sense making of the crisis.

Finally, the authors note that the agencies developed their tweets to lead public attention to alerts, warnings, updates and proposed actions. The authors shared the example of the agencies helping to influence public perceptions after the riot and encouraging the public to begin collaborative clean up actions and help identify law offenders, while warning the public of unlawful actions and consequences.

This article is important to this study because it provides several best practices for government agency responses on social media to several crisis scenarios based upon an analysis of two previous crises, one related to a severe weather event and the other related to a man-made event.

Simon, T., Goldberg, A., Aharonson-Daniel, L., Leykin, D., & Adini, B. (2014). Twitter in

the cross fire—The use of social media in the Westgate Mall terror attack in Kenya. *PLoS ONE, 9*(8), 1-11. https://doi.org/10.1371/journal.pone.0104136

Abstract. On September 2013 an attack on the Westgate mall in Kenya led to a four day siege, resulting in 67 fatalities and 175 wounded. During the crisis, Twitter became a crucial channel of communication between the government, emergency responders and the public, facilitating the emergency management of the event. The objectives of this paper are to present the main activities, use patterns and lessons learned from the use of the social media in the crisis. Using TwitterMate, a system developed to collect, store and analyze tweets, the main hashtags generated by the crowd and specific Twitter accounts of individuals, emergency responders and NGOs, were followed throughout the four day siege. A total of 67,849 tweets were collected and analyzed. Four main categories of hashtags were identified: geographical locations, terror attack,

social support and organizations. The abundance of Twitter accounts providing official information made it difficult to synchronize and follow the flow of information. Many organizations posted simultaneously, by their manager and by the organization itself. Creating situational awareness was facilitated by information tweeted by the public. Threat assessment was updated through the information posted on social media. Security breaches led to the relay of sensitive data. At times, misinformation was only corrected after two days. Social media offer an accessible, widely available means for a bi-directional flow of information between the public and the authorities. In the crisis, all emergency responders used and leveraged social media networks for communicating both with the public and among themselves. A standard operating procedure should be developed to enable multiple responders to monitor, synchronize and integrate their social media feeds during emergencies. This will lead to better utilization and optimization of social media resources during crises, providing clear guidelines for communications and a hierarchy for dispersing information to the public and among responding organizations.

Summary. The authors of this article preformed a comprehensive study on Twitter use by government agencies during the Kenya Westgate Mall terrorist attack of 2013. Through this study the authors collected and analyzed 67,849 tweets to uncover best practices for responding organizations to use during crises.

The authors note that agencies provided situational updates through five different classifications of information. The first type of information was providing public warnings, such as cautioning the public to stay away from certain geographical areas due to possible threats. The second type of information was status updates on the crisis; the authors provide the example of the police department tweeting that they had taken control of the mall's ground floor and asking

the public to be patient as they continued to make progress. The third source of information was

sharing information hubs for other official representatives and organizations providing

information on the event, which was accomplished by retweeting other sources. The fourth

source was communication and rumor control; the authors provide an example of the Home of

Presidential and Government News urging citizens to avoid unreliable sources and not to

speculate. The last type of information was reassurances, condolences and verbal reinforcements,

which included confirming to the public that the situation was under control or sending

condolences for the lives lost during the event.

The next best practice the authors discovered included the use of two-way

communication and engagement. This practice included using a cc prefix like those that are used

in emails for mentions on Twitter to notify other responding organizations of situational

awareness. One example of this practice is a tweet from the Ministry of Interior to the Kenyan

Disaster Operations Center, ''Give way to ambulances making their way to #WestgateMall cc

@NDOCKenya'' (p. 7). Not only did this practice provide the other agency with valuable

information, it was also used to keep the public informed of the ongoing situation.

The authors also cited crowdsourcing as another best practice; the authors note that the

Inspector General of the police requested citizen help in identifying families and friends that

might have gone shopping on the days of the attacks to understand who might have been a

potential hostage. Another practice of crowdsourcing included asking for the public to please

retweet warnings to maximize distribution.

Another best practice focused on monitoring for operational security and censorship; the

authors mention the Kenya police asking a user to remove a tweet that contained pictures of

military helicopters preparing to launch an attack on the mall because the tweet had the potential

to degrade operational tactics, as well as the Kenyan Disaster Operation Center asking a media source to remove an article due to possible misleading and confusing content. The authorities also made multiple requests to the media to exercise caution when airing operational footage, stating that operational footage is sensitive information. The author explains this kind of plea was in response to a "hypothesis that the use of social media during urban terror attacks leads to breaches of security" (p. 8)

The authors close by explaining Twitter's support for the event by working with the agencies to verify accounts, thus showing the public that they were a reliable source of information. Prior to this action, tweets were made by government agencies to steer the public towards internally verified sources for information without accounts being verified. The main concern with unverified accounts is that anyone can go onto Twitter and create an account.

This article is important to this study because it provides best practices and insights which can not only be helpful for emergency responders in responding to a crisis, but can also be helpful in the unique circumstance of responding to a terrorist-driven crisis.

Tapia, A. H., & Moore, K. (2014). Good enough is good enough: Overcoming disaster response organizations' slow social media data adoption. *Computer Supported Cooperative Work (CSCW), 23(4–6)*, 483–512. https://doi.org/10.1007/s10606-014-9206-1

Abstract. Organizations that respond to disasters hold unreasonable standards for data arising from technology-enabled citizen contributions. This has strong negative potential for the ability of these responding organizations to incorporate these data into appropriate decision points. We argue that the landscape of the use of social media data in crisis response is varied, with pockets of use and acceptance among organizations. In this paper we present findings from interviews conducted with representatives from large international disaster response

organizations concerning their use of social media data in crisis response. We found that emergency responders already operate with less than reliable, or "good enough," information in offline practice, and that social media data are useful to responders, but only in specific crisis situations. Also, responders do use social media, but only within their known community and extended network. This shows that trust first begins with people and not data. Lastly, we demonstrate the barriers used by responding organizations have gone beyond discussions of trustworthiness and data quality to that of more operational issues.

Summary. The authors of this article conduct 21 interviews across 12 organizations in the effort to capture details of how disaster response organizations work around the barrier of questionable data from social media that is produced during a disaster. A substantial best practice that emerged from this study was the recommendation that disaster response organizations continuously monitor social networks versus attempting to make meaning from the collection of posts made during a disaster on social media. The authors assert that ideal social networks are built by a disaster response organization to connect themselves with other related, trusted experts and organizations. Subjects from the interview explained that they are willing to trust social media data if the data comes from a member of another humanitarian response network.

The authors note that Twitter information that may not be fully trusted can still act as an early warning system and should raise an organization's situational awareness of a possible situation. One interviewee explained that "I often look to social media to know whether I should activate and deploy. If I see a bunch of people tweeting about an earthquake in Japan, you bet I am going to get out of bed. If I see enough people [tweeting] then it gets me up and I make some calls" (p. 499).

Next the authors explain that social media data can be used to provide a deeper contextual understanding of an event. One respondent provided the following explanation of why deeper contextual understanding is important: "Everything is unknown. Up in the air. We used to have to send in guys half blind…We will have one guy doing the first assessment and calling it in, but it's never enough. You never really know until you get there. If you can get some more from some other staff, you know, informally, then it can help" (p. 500).

This article is important to this study because it provides useful insight on building social media networks to provide reliable information related to a crisis, social media data to look out for that might provide situational awareness of a possible crisis, and a recommendation to use social media data to build a deeper contextual understanding of a crisis before responding blindly to an event.

Conclusion

This annotated bibliography provides a summary of relevant scholarly articles that address emergency management social media use before, during and after a crisis. While some emergency management organizations, like the Jefferson County Incident Management Team (JeffCo IMT), have successfully integrated social media into planning for and responding to crises, they are in the minority of groups in the emergency response community that are developing and implementing these tools as part of their crisis response protocol (Denis et al., 2013). The goal of this study was to explore these scholarly sources to: (a) develop an understanding of the barriers of social media use during all phases of a crisis and (b) identify best practices used before, during, and after a variety of crises by emergency response organizations. While the information in this study was gathered specifically for use by the Washington Air National Guard, the findings are relevant for any emergency management organization.

Barriers to Implementing a Social Media Program Before, During, and After Crises

Policy and guidelines. Emergency responder skepticism about using social media to respond to a crisis can stem from a lack of clear strategy and rules surrounding the use of social media during a crisis (Beneito-Montagut et al., 2013; Hiltz et al., 2014). Haataja et al. (2016) also note a lack of role models who have successfully incorporated social media into their emergency response plans as a major barrier for organizations that have not yet adopted social media. Beyond serving as a general barrier for entry into social media use in crisis response, a lack of training and guidelines can also become a barrier that affects the implementation of new ideas like incorporating blogs (Beneito-Montagut et al., 2013). Specific policies related to social media use, such as a prohibition on following individual users and responding to individual

users, present another barrier for some organizations in the use of social media during a crisis response (Beneito-Montagut et al., 2013).

Organizational leadership. Beneito-Montagut et al. (2013) surveyed a European governmental agency charged with emergency response that was not using social media for emergency communication; employees described the age difference between the leadership who could support social media's use and the younger employees that would know how to use it as a key barrier to adoption. In other studies, organizations mentioned old-fashioned culture and inflexibility, with leaders who do not perceive interaction with citizens as their responsibility, as a significant barrier (Haataja et al., 2016). Fear of losing control of information in a crisis was mentioned in the same survey response as another foundational barrier preventing entry into social media use; leadership in the organization responded that "high information control is needed in an emergency and what to communicate and how to communicate is a decision that needs to be made by the leaders, not the staff or the citizens" (Beneito-Montagut et al., 2013, p. 3).

Resources and personnel. Emergency experts in a study by Haataja et al. (2016) explain that a lack of resources or employee competencies can discourage an organization from incorporating social media into their crisis response plans. Lack of staffing resources is an emerging theme that has been shown to be a substantial barrier prohibiting social media use in numerous studies (Beneito-Montagutet al, 2013; Hiltz et al., 2014; Plotnick et al., 2015). Hiltz et al. (2014) note that a lack of technology is also a barrier and further suggest that making software enhancements to improve the filtering of social media users by category of user type and providing teams with a GIS system map could improve social media use during a crisis.

Trustworthiness. Multiple authors mention the trustworthiness of social media data was a concern and key barrier for emergency management organizations in implementing social media programs for crisis response (Hiltz et al., 2014; Imran et al., 2015; Plotnick et al., 2015; Tapia et al., 2011; Tapia & Moore, 2014). Tapia et al. (2011) suggest triangulating data among multiple people posting about a crisis and having trustworthy sources that may have been used before on the scene to ensure socially generated data is more trustworthy.

Best Practices in Implementing a Social Media Program Before, During, and After Crises

Establishing credibility. Establishing credibility can be accomplished by using system generated cues or identity cues (Lin et al., 2016). Lin et al (2016) explain that organizations that have too many or too few social media followers could have trouble establishing credibility. Using identity cues in profiles and setting up account names with official identities can help establish credibility; for example, the Centers for Disease Control and Prevention uses the official CDC prefix for all of their new member accounts (Lin et al., 2016). Verifying accounts on social media is another strategy emergency responders can use to show the public that the information being shared by an organization is reliable (Simon et al., 2014).

Quick response and volume. Speed is important to ensure the information provided while an event is happening is relevant (Lin et al., 2016). Increasing the volume of information shared during an event can help increase public awareness of a situation (Panagiotopoulos et al., 2016). Sharing content from other organizations can help enhance exposure of messages during an event (Lin et al., 2016; Panagiotopoulos et al., 2016). Furthermore, sharing official announcements, statements from local leaders, and retweets of messages from the police can help de-escalate a crisis and facilitate the collective sense-making of a crisis (Panagiotopoulos et al., 2016). Lachlan et al. (2016) caution however that the number of tweets coming in may cause

a competition for attention between agencies and the rest of the Twitter users, therefore generating an overwhelming amount of content.

Two-way communication. Two-way communication is offered as a best practice that can help gain followership and ensure that an organization's social media feed becomes a primary source for future crisis communication (Lin et al., 2016; Simon et al., 2014). Two-way communication has also been used to provide other agencies and the public with situational updates and increase awareness of an ongoing situation (Simon et al., 2014). Simon et al. (2014) provide an example from the Kenya Westgate Mall terrorist attack of 2013 when the Kenyan Ministry of Interior tweeted instructions to make way for ambulances on their way to the mall to the public, and included a cc prefix of NDOCKenya to ensure the other agency received the information.

Standalone tweets and effective messages. A couple of authors note that simple, self-contained posts are favored on Twitter (Denis et al., 2013; Genes et al., 2014). From an interview with the Jefferson County Incident Management Team (JeffCo IMT) following flooding in the state of Colorado in September 2013, Denis et al. (2013) uncover the suggestion of creating standalone tweets so that each tweet can tell a story on its own, without requiring information consumers to read previous tweets to gain a context of the situation. Genes et al. (2014) analyzed tweets sent during the February 2013 blizzard Nemo that struck New York City and discovered that tweets with photos, general tips, fun facts, or trivia information were the most shared messages on Twitter during the blizzard, leading the researchers to suggest that emergency response agencies mix important instructions with more general news and trivia as a way of reaching the widest audience.

Multiple authors recommended that organizations responding to a crisis provide situational updates by using social media (Panagiotopoulos et al., 2016; Simon et al., 2014). Warnings and event status updates were noted as effective types of situational information to share on social media during a crisis (Panagiotopoulos et al., 2016; Simon et al., 2014).

Codified and local hashtags. An analysis of tweets sent during storms indicated that using a codified hashtag to describe local response is a best practice during weather related emergencies and results in focused situational update messages and alignment of formal and informal sources of information (Grasso et al., 2016). However, some authors found that the use of a national hashtag can be prone to spam and information overload (Lachlan et al., 2016; Lin et al., 2016). Lachlan et al. (2016) suggest adopting a localized hashtag to limit the scope and cut through the distraction that may be present at the national level.

Multi-channel approach. Due to Twitter's limit on the number of characters allowed per post, a multi-channel approach is recommended to add context to information shared through Twitter (Denis et al., 2013). Linking content to a blog to provide a longer dialogue or tools like a Google Interactive Public Information Map to identify hazards for the public are examples of ways to increase the context of information posted on Twitter (Denis et al., 2013).

Crowdsourcing. Multiple authors recommended various uses of crowdsourcing via social media during a crisis (Denis et al., 2013; Liu, 2014; Panagiotopoulos et al., 2016; Simon et al., 2014). Simon et al. (2014) note the use of crowdsourcing by authorities in the Kenya Westgate Mall terror attack in 2013 to request citizen help in identifying family members and friends that might have gone shopping on the day of the attack to identify potential hostages and to ask the public to retweet warnings to maximize distribution. JeffCo IMT crowdsourced crisis photo submissions during the floods of September 2013 through a standardized form submitted

to citizens on Twitter, Facebook, and a blog site as a means of documenting the severity of the

flood (Denis et al., 2013).

Liu (2014) contributes a "Crisis Crowdsourcing Framework" where she outlines six

dimensions related to the use of crowdsourcing via social media during a crisis event:

(1) Why – Identify the information problem to determine the crowd task needed;

(2) Who – Identify the types of crowds and expertise needed for the crowd task;

(3) What – Identify the interaction flows for engaging crowds;

(4) When – Identify temporal aspects in relation to the disaster lifecycle;

(5) Where – Identify spatial aspects of the crisis, crowds, and crowd tasks; and

(6) How – Identify social, technological, organizational, and policy (STOP) interfaces. (p.

   406)

Monitoring and analyzing information. Monitoring information on social media can be

helpful as an early indicator of an event (Tapia & Moore, 2014). Multiple authors noted the need

to watch out for misinformation disseminated on social media about a crisis such as rumors (Lin

et al., 2016; Simon et al., 2014). Simon et al. (2014) show that organizations can take a proactive

approach to control the information spread via social media during a crisis and thus increase their

ability to maintain operational security, such as asking the media to control their content; they

note that this proactive approach is effective even in events like terrorist attacks.

Analysis tools can be helpful during an event to help filter messages by importance and

timeliness; show volumes of hashtags, word use and peak activity through time series graphs;

map geotagged messages; and provide pie graphs showing proportions of different types of

messages (Imran et al., 2015).

Incorporating and understanding social media policy. The Federal Emergency Management Agency (FEMA) and Red Cross set examples of incorporating social media into the policies of how they respond to crises, as well as integrating social media into continuous training of crisis responders (Lin et al., 2016). Liu (2014) recommends that prior to using crowdsourcing for emergency management purposes, an organization needs to understand the legal policies and regulations related to engaging with crowds and managing crowdsourced data, such as considerations with personally identifiable information (PII) that may be present on social media.

Final Thoughts

Emergency management organizations have many barriers to overcome when considering the use of social media for crisis response (Plotnick et al., 2015). These barriers can include a lack of policy and guidelines, organizational leadership challenges, lack of resources and personnel, and uncertainty around the trustworthiness of social media data (Plotnick et al., 2015). This study helps to identify these barriers so that organizational leadership can remove the barriers and work towards leveraging social media to assist in crisis communication. This study presents a collection of best practices that can provide guidance to organizations and mitigate barriers when implementing a social media plan for crisis response.

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