

How Members of the Public Have Used Facebook and Twitter in Response to a Disaster:
A Comparative Case Study

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by

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Dedication

This is dedicated to the members of the public in the Atlanta area who responded to the snow and ice storms of 2014 through social media by unselfishly and unsparingly volunteering to help one another, and by seeking help.

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I thank all those who helped to make this research succeed. Notably, my wife, Jane, assisted in the project and put up with me while I did it. Michelle Johnston Sollicito provided Facebook data and her personal experience in creating the Facebook group that helped people during the Atlanta snow disasters of 2014. My adviser, Dr. Katherine Rowan, encouraged me to adapt her work and guided me through the development of this thesis. Chris Pavlovich checked the coding for reliability. My colleagues at the U.S. Department of Health and Human Services provided enthusiasm and collegiality, encouraging me to work toward the goal of better using social media in disaster response and recovery.

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Abstract

HOW MEMBERS OF THE PUBLIC HAVE USED FACEBOOK AND TWITTER IN RESPONSE TO A DISASTER: A COMPARATIVE CASE STUDY

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Social networking through Twitter, Facebook and similar platforms is widespread and is a main avenue through which members of the public communicate about, during, and after disasters. These Internet- and smartphone-based platforms facilitate discourse among people affected by a disaster and those who want to help them. Such discourse, instances of communication constituting organization, can create *ad hoc* self-help communities. These communications can be measured as to effectiveness in providing help in emergencies. This thesis compares communications by members of the public using the Facebook group SnowedOutAtlanta and the Twitter hashtag #snowedoutatlanta during the Atlanta snow and ice storm that began January 28, 2014. Using the CAUSE Model (Rowan, Botan, Kreps, Samoilenko, & Farnsworth, 2009) as a basis for identifying functional goals in crises, the first 500 Facebook group posts and the first 500 Twitter posts were analyzed. Messages were coded for indications of Enactment (i.e., behavior, such as offering or accepting shelter), Connection (information that could

help others, such as reports of traffic safety conditions of specific sections of specific roads), Comment (messaging related to the storm but which did not render aid, such as personal emotional reaction to the storm), and Spam (messaging unrelated to the storm or to promote sales of products, such as advertisements for songs). Results indicate Facebook group traffic showed strong evidence of fostering provision of aid such as offering and providing shelter and transportation to people stranded by the storm, while Twitter users mostly provided information such as personal comments, with little evidence of providing aid. The findings demonstrate the potential for applied research in social network platform use related to providing help during disasters. The findings also provide guidance for emergency communicators and members of the public that platforms such as Facebook can facilitate provision of aid, while platforms such as Twitter can facilitate information exchange.

Keywords

Facebook, Twitter, disaster, emergency, social media, behavior change

Chapter One: Social Media, Networking, Facebook and Twitter

Social Media Background

Social media are available to anyone with Internet access to a computer or a mobile phone, and make users at once consumers and producers of information (Pew Research Center's Internet and American Life Project, 2014). This world-ranging availability fosters social networks, defined as “a dedicated website or other application that enables users to communicate with each other without regard to distance by posting information, comments, messages, images, etc.” (Oxford Dictionaries, 2014). Social networking, fostering conversations by keystroke and video among people who might never meet physically, blurs the definitions of friend and neighbor (Pew Research Center's Internet and American Life Project, 2014).

The social networking platform Twitter allows people with a Twitter account to communicate quickly and constantly (as twitterers) with short bursts of information termed tweets – 140 characters including spaces, as well as looping video (Vines) of no more than 6 seconds. People who read the tweets are followers (Twitter Inc., 2013). Because its short messages have the personal-journal look and feel of blog posts, Twitter constitutes a short burst form of blogging (Merriam-Webster), termed microblogging.

The social networking platform Facebook allows quick and constant communication but without the 140-character limit on text, and facilitates posts of longer videos, pictures and other graphics. As with Twitter, Facebook users must have an account. The account can include a profile (their information), a page in which they can post comments and other material, and a group in which other users can post (Facebook, 2014). Facebook reported 829 million daily active users on average in June 2014 (Facebook, 2014).

Definitions: Disaster and crisis

In this thesis, a disaster is defined as “a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources” (International Federation of Red Cross and Red Crescent Societies, n.d.). Considering disaster as a form of crisis, and noting that the question at issue in this thesis concerns the achievement of organizational goals to help citizens respond to crisis, this thesis defines crisis as a specific, unexpected event that creates great uncertainty and threatens high-priority goals of an organization (Seeger & Sellnow, 1998) (Sellnow & Seeger, 2013).

Researchers have defined social media as “digital tools and applications that facilitate interactive communication and content exchange among and between audiences and organizations” (Austin & Liu, 2012). An electronic form of communication, social

media takes many forms, including video, audio, text and combinations of these. In 2014, 74% of all Internet users used social media (Pew Research Center's Internet and American Life Project, 2014). A nonscientific survey of 30 social media marketing professionals, asking for their definitions of social media, found descriptors such as ``engagement,’’ ``interactions,’’ ``conversations,’’ ``speed’’ and ``user-generated content’’ (Cohen, 2011). Examples cited included Facebook, Twitter and blogs, in which people other than the owner or manager of a site can participate by creating content electronically on the site. These social media descriptors were contrasted with non-interactive communication in which content is provided solely by the owner, manager or staff of the medium, such as is found in print newspapers.

Twitter as a disaster communications tool of organizations

Twitter use is widespread. A report in October 2013 on a filing by corporate owner Twitter Inc. of San Francisco, CA, with the U.S. Security and Exchange Commission related to Twitter's initial public offering of shares said that Twitter had more than 500 million active account users (Yeung, 2013). An August 2013 report by the Pew Internet and American Life Project said, ``The percentage of internet (sic) users who are on Twitter has more than doubled since November 2010, currently standing at 18%’’ (Smith, 2013). Facebook is the most popular social media site among Internet users, with 71% of Internet users having a Facebook account in 2014, compared with 23% for Twitter (Duggan, Ellison, Lampe, Lenhart, & Madden, 2015). Users might not stay with Twitter. A Reuters/Ipsos survey in October 2013 of 1,067 people who had joined Twitter found 36 percent said they did not use it (Oreskovic, 2013). However, the potential to use

Twitter expands as new devices and platforms proliferate and replace older ones. Current Twitter-capable devices include cellphones (especially smartphones), as well as tablets and Internet-connected computers. Use of such hardware is widespread. For instance, as of September 2012, 45% of American adults had a smartphone, 61% had a laptop, and 18% had a tablet computer (Pew Internet and American Life Project, 2012).

Twitter has been gaining use by organizations, although one qualitative analysis of tweets by 73 nongovernmental organizations suggests most tweets were not attempts to encourage action by members of the public such as attendance at events or making donations (Lovejoy, 2012). In this study of 2,437 tweets in November 2009, only 15.6 percent called for action; other functions studied were providing information or creating a sense of community.

Disaster, however, presents an urgent need for action, and Twitter's audiences have attracted interest among emergency communicators who need to reach people affected by a disaster (Tucker, 2011). Twitter had more than 20 million tweets about superstorm Sandy (which struck the New York City area on October 26, 2012) from October 27 to November 1, 2012, which was more than double the previous two days' traffic (Pew Research Center's Project for Excellence in Journalism, 2012). Widespread use of Twitter by public officials as a response to Sandy was a demonstration of their awareness of its usefulness in public involvement (Colmer, 2012). As an example, employees of the electric utility Con Edison used Twitter to engage in online interactions with customers about local dangers and the state of repairs (Bosker, 2012). The U.S. Centers for Disease Control and Prevention (CDC) monitored social media traffic such as

Twitter during Sandy to help it ascertain the needs of the public for information. The information that CDC disseminated in response was posted to users of Twitter as well as YouTube and similar sites, and CDC officials monitored the responses to decide on follow-up communication (Dempsey, 2013). CDC also used Twitter to spread information, such as ``Home contaminated by mold? Learn what to do'' followed by an Internet link to more information (Centers for Disease Control and Prevention, 2012).

Twitter use transcends international boundaries, and emergency communicators outside of the United States also have used Twitter. After the Great East Japan Earthquake in March 2011, the chief Japanese rescue and recovery agency created its own Twitter account, and got more than 100,000 followers almost immediately, although all of the followers might not have been in the area most affected by the quake, (Wilensky, 2012).

Twitter Inc. has expanded its product line based on the interest that emergency communicators have in using Twitter during a disaster. In September 2013, the company added Twitter Alerts to let government agencies and other organizations send emergency announcements to twitterers who sign up to receive alerts through this service (Peña, 2013).

Twitter as a disaster communications tool by members of the public

A number of studies found people use Twitter during a disaster for situational awareness. A qualitative analysis found tweets about flooding along the Red River Valley in the United States and Canada in March and April 2009 could be classified as messages designed to provide quick information, attention or visibility concerning a situation, and

to feel connected (Starbird, Palen, Hughes, & Vieweg, 2010). In some cases, connectedness and situational awareness coalesce. An analysis of tweets related to Oklahoma grassfires in April 2009 and the Red River floods in March and April 2009 in North Dakota found tweeters shared their situational awareness of the latest developments, such as the extent of the damage (Vieweg, Hughes, & Starbird, 2010). After the Haiti earthquake of January 12, 2010, Twitter users internationally self-organized, using a codification system (Tweak the Tweet) for situational awareness that made it easier for emergency responders to classify and respond to local-level tweets for assistance (Starbird & Palen, 2011).

Other reasons for tweeting as a response to disaster include giving or receiving emotional support, or venting emotion. Although emotional reaction is not inevitably a helpful behavior, emotion can be a motivator to change or not to change behavior, so emotion is relevant to the questions this thesis explores. Questionnaire responses from twitterers affected by California wildfires in October 2007 indicated that the socialization of finding and sharing information through online discussion groups enabled them to reduce their stress (Sutton & Palen, 2008). Socialization is an important motivator to action in a disaster; interviews of survivors of Hurricane Katrina in 2005 found interviewees wanted social confirmation from friends and family when they made final decisions about whether to evacuate (Taylor, Priest, Fussell Sisco, & Banning, 2009). As a form of social media, Twitter presumably could provide such confirmation; however, the study by Taylor, Priest, Fussel, Sisco, & Banning did not examine social media.

Although few studies have considered whether people change their behavior in part because of tweets, studies suggest that behavior change mediated by tweets is possible. An analysis of tweets related to a shelter-in-place warning at Rensselaer Polytechnic Institute in Troy, NY, prompted by a fleeing armed robber found that, of 587 tweets indicating the recipient received the warning, 64 indicated the recipient took action (Tyshchuk, Hui, Grabowski, & Wallace, 2012), but the study was not designed to investigate the possibility of a cause and effect relationship. A study focusing on campus shootings at Johns Hopkins University, Middle Tennessee State University, and the University of Texas found twitterers described what they were doing (Heverin & Zach, 2011). Here as well, this was not necessarily in response to advice in the tweet stream about how to respond. An analysis of messages in the tweet stream related to Americans' responses to the 2010 H1N1 flu pandemic found instances of recommending wearing facemasks and avoiding occasions in which a person might be infected. Again, the study was not designed to see if the twitterers had acted based on tweets (Signorini, Segre, & Polgreen, 2011).

Facebook as a communications tool in disasters

Facebook's massive number of daily users, noted earlier, is part of its potential value in an emergency. As with Twitter, Facebook can be accessed through smartphones as well as computers. Although Twitter's short-message format might be easier for a user to handle on a smartphone, Facebook reported that, as of June 30, 2014, it had 1.07 billion mobile monthly active users (Facebook, 2014). Compared with Twitter, far less is reported in the literature about the use of Facebook in a disaster of any form, even

corporate business crises, and it appears Facebook is underused. A study of Fortune 500 companies found only 309 with Facebook pages, and only 28 communicated with stakeholders about a company crisis between Jan. 1, 2011 and Sept. 1, 2011 (Ki, 2014). However, interest may be growing. On October 15, 2014, Facebook announced its Safety Check tool, through which users affected by disaster can notify friends and family about whether they are safe, check on other users in the area affected by the disaster, and mark friends as safe (Facebook, 2014).

Social media's place in the media mix during disaster

Emergency managers commonly use social media such as Twitter to send information to people and monitor the traffic for issues of concern (Dempsey, 2013). It is rare for authorities to follow up to see if their messages generated behavior change; their goal – the standard by which they measure achievement – seems to be reached at the transmission point. Interviews with 37 local emergency managers in 8 states found the managers thought themselves successful if they put out messages about emergency preparedness through conventional channels such as news releases (Veil, Littlefield, & Rowan, 2009).

Twitter is one of myriad avenues for communication, and studies of the content of tweets – the research focus of the vast majority of those reviewed here – commonly do not delve into the other avenues, which remain as possible confounders if the measured outcome is behavior change as a result of messages sent through social media. Although researchers have found about 1 in 4 Americans who use the Internet use Twitter, the converse is that about 3 in 4 do not, and those who use Twitter use other media as well

(Duggan, Ellison, Lampe, Lenhart, & Madden, 2015). A pattern of findings indicates twitterers consider broadcast media more credible than Twitter in a disaster. Respondents to a mail survey of residents of the Charleston, SC, area, asked about two hypothetical hurricanes, overwhelmingly said they preferred radio and TV as the ways to learn the status of severe weather. Internet instant messaging and social messaging (Twitter was not mentioned specifically in the questionnaire) were next to last and last respectively (Taaffe, Garrett, & Yuan-Han Huang, 2013). And social media users can divide their uses among differing forms of social media depending on their purpose. A convenience sample survey of Japanese university students after the Great East Japan Earthquake found the students reported using Facebook more often as an information source; in contrast, they used Twitter to check the safety of family members and friends. They also used Twitter to seek and provide information about the event itself (Jung, 2012).

The capacity of users of social media to self-organize in response to disaster has been shown to facilitate the gathering, analysis and provision of information, especially to emergency responders, through crowdsourced digital volunteer networks, notably involved in geomapping. Liu, reviewing these efforts, creates a strategic model for analysis of communication as it plays out through organization, the crisis crowdsourcing framework (Liu, 2014). The framework's six dimensions are: Why (identifying the problem so as to identify those who need to work on it), Who (identifying skills and workers), What (identifying interactions among the players), When (specifying the time in which activities take place), Where (identifying location in which the players act, including location in cyberspace), and How (identifying interfaces in social,

technological, organizational and policy arenas ((Liu S. B., 2014). Although the Liu work concerns itself with information flow, the dimensions it expresses could be extended to mutual aid activities.

In summary, members of the public make wide use of social media in their lives, but too little research information exists on how they use social networking to help each other or to seek help during a disaster. Previous research has found that members of the public use social media for situational awareness, including checking on people in their social networks (notably friends and family). Professional emergency communicators use social media to advise the public, and monitor social media traffic for situational updates. These uses, valuable as they are, do not fully tap the potential of social media platforms to facilitate public self-organization for mutual aid. This study examines the extent to which social media facilitates provision of mutual aid during a disaster. These phenomena are illuminated by a theoretical lens, the CAUSE model, which highlights the goals people pursue when coping with physical hazards (Rowan, 1991; Rowan, Botan, Kreps, Samoilenko, & Farnsworth, 2009).

Chapter Two:
The CAUSE Model as a Lens for Analyzing Social Media
during the Atlanta Snow Disaster of 2014

Theory Background

Emergency communicators have had relatively little robust theory to guide decision-making about the use of social media such as Twitter and Facebook. This is to be expected in a new field, and not only in emergency communication. “There are only a handful of studies exploring the use of social media in public relations” (Briones, Kuch, Liu, & Jin, 2011). Although there have been more studies since, far more has yet to be learned, and theorists are only taking first steps in the process of analysis of data and conclusions that could guide tactics for communicators. This is not to say that the field is devoid of applicable theoretical foundations. Broader models developed for different purposes can be tested in this form of communication.

CAUSE Model

An approach is needed to guide emergency communicators, including members of the public, toward messaging that could lead to behavior change. Rowan’s CAUSE model could be useful for this purpose (Rowan, 1991; Rowan et al., 2009). The model is a tool for analyzing communication about physical hazards; it also identifies evidence-based strategies and tactics for communication and indicates key areas in which the

strategies and tactics may fall short. CAUSE is an acronym for five tensions inherent in the management of physical hazards and their associated communication goals. These tensions emerge because of the predictable demands involved in communicating about physical hazards. That is, because physical hazards such as storms may be frightening, communication may be marred by a lack of Confidence in communicators (i.e., their motives or competence). Because people are often unaware of the hazard itself or remedies for it, communication is harmed by a lack of Awareness. Because communication about physical hazards may be hurt by a lack of deep understanding about the hazard or its management, communication must enhance Understanding. Because understanding of a problem or solution does not necessarily involve agreement, communication must encourage Satisfaction with solutions. And because even when solutions are accepted, people may or may not enact them, communication about physical hazards must encourage actual behavior, or Enactment.

Researchers have used the CAUSE model to examine Facebook interactions between members of the public and a major drug manufacturer during a product recall in 2012 (Ledford & Anderson, 2013). This study found consumers and the company studied pursued all five CAUSE model goals in their Facebook communication. The Enactment goals were that consumers would stop using the recalled product and get rid of it, preferably by destroying the product or sending it back to the company. Confidence requires that the source of information be worthy of trust; in this study, the company

fostered Confidence by taking responsibility (apologizing) and creating a voluntary recall. Awareness requires public knowledge of the problem; the company fostered Awareness by notifying consumers about updates to its recall update center.

Understanding requires knowledge of the underlying problem – in this case, the potential for health risks caused by the faulty product; the company fostered Understanding by sending individual messages to consumers that no adverse effects have been reported but that there was some risk to health in the faulty product. Satisfaction requires a clearly stated solution that people feel they can accomplish; the company recommended returning the faulty product. Enactment (or motivating behavior) is the end result; the company fostered Enactment with specifics about how to return the product.

Among the conclusions of the study was that the model could be used to identify shortfalls as well as successes in communication; e.g., consumers were aware of the risks but seemed to lack self-efficacy, resulting in little evidence of Enactment. Ledford and Anderson (2013) therefore concluded that the company's messages might be improved by adding efficacy appeals such as making product return easy, noting how easy product return was, and possibly enhancing consumers' self-efficacy by noting that returning the product was a step consumers were capable of taking.

Although the CAUSE model was designed for professional risk communicators, it is not a great stretch to apply it to a study of crisis management by members of the public. In addition, the model has practical value; in contrast to models that focus more

broadly on the nature of communication, the CAUSE model focuses on delineating the tensions and obstacles typically encountered when physical hazards are managed and evidence-based guidance on addressing and overcoming these obstacles. However, the model was not originally intended for examination of public use of social media. Another limiting factor is that the model was created for examination of conventional one-way messaging from risk communicators in organizations to their audiences. In such cases, the communicators have goals, and often communicate as part of planned campaigns. Social media communication, in contrast, commonly is multidirectional, lacks strategic (or possibly any other) campaign planning, and generally involves individuals rather than organization representatives. What social media and conventional messaging share is agency – the capacity to use messaging to achieve a goal. The capacity to assess agency exists in the CAUSE model, and this thesis pares down the model to concentrate on that assessment.

The issues that can be approached through the CAUSE model have many aspects. This thesis considers Enactment, the aspect of primary importance in investigating social network use during disaster – whether people enact behaviors such as rescuing or otherwise aiding the stranded. Because the model fosters a focus on what people do rather than simply what they say they intend to do, it is particularly appropriate for a study of behavior during a severe storm.

Limitations of the CAUSE model and development of additional terminology

In adapting a model designed for one purpose to work in another, care should be taken to reduce the possibility that the model is misapplied: across the range of human behavior, one size does not fit all. This is the case in adapting the CAUSE model to analysis of discourse in social media. One crucial area for consideration is in how the analysis should be approached. An instance: Because the CAUSE model can be used to help identify communication gaps, its key points are often stated in the negative (e.g., lack of Confidence). Such an approach privileges weaknesses in communication and thus gives a higher priority to measuring the weaknesses. This thesis, however, grapples with understanding strengths. As a result, some elements of the model proved less useful in this thesis. Confidence, Awareness, Understanding or Satisfaction were more closely aligned to perception of the message than to whether someone took action based on the message. The CAUSE model's Enactment category was extremely valuable, however, because it alerts the analyst to a type of post that is extremely important in an emergency. One way to describe this is, "I, the writer of this post, offer to perform a specific action, or I request a specific form of help."

One limitation of the CAUSE model is that it does not specifically address the important process of self-organizing essential in crises and disasters. As Quarantelli and Dynes (1972) and Tierney, Lindell, and Perry (2001) have established, in disasters, victims are the first responders. After a hurricane, for example, those who have lost

power or who have had parts of their houses fall on them are often, once they are able, the first to assist their neighbors coping with similar challenges. However, the model does tap fundamental communication goals likely to be pursued when any physical hazard is encountered; therefore, it is used in this study because of its capacity to illuminate communication behavior, particular behavior associated with offering or providing aid, the E (Enactment) in CAUSE. Analysis of social media using CAUSE may detect patterns indicating forums in which messages posted on social media offering shelter or aid lead to contexts in which aid or shelter was received and accepted, a phenomenon essential in disaster response.

The Case for Analysis:

Use of Facebook and Twitter in the Atlanta Snow Disaster of 2104

One documented use of Facebook in a disaster relates to the snow and ice storms that struck northern and central Georgia in January and February 2014, notably the January storm's effect on Atlanta, which received one to three inches of snow and ice (National Oceanic and Atmospheric Administration, 2014). The National Weather Service had warned the public, the media and government officials on January 27 that significant snow and ice could take place during rush hour the following day, using phrases such as "Dont (sic) wait to make plans for work/school" and "Not a bad idea to stay off the roads if you're able!" (National Oceanic and Atmospheric Administration,

2014). However, as a Southeastern city, Atlanta is unaccustomed to such storms, and this one caught officials and members of the public largely unprepared, notably in regard to travel and road treatment, with few snowplows or sand/ice trucks (The Associated Press, 2013). Schools and many workplaces did not close in advance of the storm, and a combination of afternoon-evening rush hour traffic and icy highway surfaces led to gridlock on local roads and interstates, stranding thousands of travelers, many for eight to 20 hours (NBC News, 2014). Others did not get as far as the highways and were stuck at work or at school (NBC News, 2014). Hotels and motels were open, and some businesses offered shelter to strandeers (Copeland, 2014). Often, however, travelers and their worried families were left to fend for themselves.

A response organized by a Marietta, GA, Facebook user, community activist and IT/e-business consultant, Michelle Johnston Sollicito, became a leading venue in which members of the public could help each other. As snow and ice built up and travel became treacherous in the afternoon of January 28, Sollicito launched SnowedOutAtlanta from her home as a Facebook page and soon converted it to a group in order to handle the fast-building site traffic, which quickly became the fastest-growing site in Facebook history, with over 50,000 users (Sollicito, Snowed Out Atlanta: The Inside Story of the Fastest-Growing Facebook Group in history, 2014). Area residents queried the latest road conditions and provided updates (Sterbenz, 2014). They offered strandeers places to stay in their homes and received acceptances of the offers (Garner, 2014). Acceptance of the

offers also took place through the group. Messages were posted as text, video and an interactive map that showed locations of shelter or strandeers. Similarly, residents with four-wheel drive vehicles capable of traveling on the roads took medicine to people and took them to or from health care facilities (Sollicito, Snowed Out Atlanta: The Inside Story of the Fastest-Growing Facebook Group in history, 2014). The site was praised as more effective than those of public officials (Garner, 2014).

On Twitter, some twitterers marked their tweets with the hashtag #snowedoutatlanta, but the response was inchoate. As a reference mark, #snowedoutatlanta had no administrator to coordinate aid, although twitterers who included the hashtag were free to offer or seek help, and could expect a broad but undefined audience to read their posts. Similarly, at least some tweets that included #snowedoutatlanta as a hashtag could be expected to show evidence of a managed Twitter account in which someone was coordinating aid efforts, but none were found.

Research Questions

As the CAUSE model maintains, there are fundamental tensions in the management of any physical hazard. Since Atlanta has not historically needed to prepare for many snow disasters, the January 2014 storm challenged residents and officials in many ways. We know relatively little about how social media affects the ways in which physical hazards are managed. Therefore this thesis explores the use of social media in

disaster, particularly the extent to which social media facilitated steps taken through which affected stakeholders helped each other.

Two research questions are presented to explore the frequency of certain types of messaging or communication goals pursued by social media users, particularly the goal of requesting or providing help.

Research Question 1: What types of communications functions did people pursue when communicating via social media during the January 2014 Atlanta snowstorm?

Research Question 2: How might the sorts of communication functions pursued on Facebook differ from those pursued on Twitter?

Chapter Three: Method and Results

Acquisition of data

Data for this thesis were gathered from posts on the SnowedOutAtlanta Facebook site and Twitter entries bearing the #snowedoutatlanta hashtag. One investigator (the author) gathered all data for analysis. The tweets were captured by searching for all tweets with the hashtag, scrolling back through them until the first tweet was reached, then collecting the first 500. These tweets covered the most relevant period, from the start of the storm through the worst of the snow and ice damage resulting from the onset of the storm. The storm began on January 28, 2014, and concluded on January 29. The tweets were saved as a Word file.

For the Twitter material, collecting the raw data was a difficult and time-consuming process because Twitter posts the most recent tweets first and does not offer a method to jump to the earliest posting. As a result, the investigator used continued page-by-page scrolling from the most recently posted tweets to the first one posted.

Facebook had a similar access issue, for the same reasons. With Facebook, there was so much data (including pictures and videos) that the Facebook program continually locked up well before the first post could be reached. Consequently, the investigator contacted the originator of the Facebook site being analyzed, Sollicito. She emailed her

stored posts for analysis; the comma-separated values (.csv) file she sent was converted to an Excel file and stored. The first Twitter and Facebook messages were posted as the storm was starting; subsequent messages continued through the most relevant period for this thesis, when the worst of the storm's effect was happening. The record of posts and tweets thus tracked the development of the storm in real time. For analysis, separate Excel files were created for the 500 Facebook posts and the 500 tweets. The Facebook postings covered the period of the storm, January 28-29, 2014.

Coding Procedure

The coding was done by two people; this investigator and an adjunct professor of Education at George Mason University and the University of Virginia. The coders characterized each entry based on the definitions stated. The coders first attempted to apply all of the CAUSE model terminology, but found many entries could be fitted into more than one category. For instance, an offer of shelter could be characterized as Enactment but also as Satisfaction. This led to the development of new categories, notably Connection and Comment, as discrete from Enactment. Initial disagreements between the coders on how to code an entry using the categories occurred in 5% of entries and all disagreements on coding were resolved through discussion, resulting in agreements on all coded entries. As a validity test, a random sample of 10% of the Twitter data was coded independently by a George Mason University senior who had

been given training in the definitions of categories. There was a 90% agreement with the earlier results.

Concerning the definitions of codes, Enactment was defined as evidence indicating behavior change, such as a person deciding to offer help. Sollicito, in her book, says she and Facebook group managers who worked under her direction linked offers of aid and acceptances (Sollicito, 2014). An example of Enactment in Facebook is: “I am in Acworth and Kennesaw area. I have a crew cab 4x4 truck. Who needs help???” Connection was defined as evidence of communication about specific activities that could facilitate behavior, such as conditions of specific highways. An example in Facebook of Connection is: “Six big rigs were tangled up at the I-85 northbound ramp to I-285 westbound.” Comment was defined as evidence of communication which, although concerned with the storm, could not facilitate behavior change. An example of Comment from Facebook is: “I feel awful for the people who are still stranded this morning in #Atlanta.” Spam was defined as communication unrelated to the storm or primarily to promote sales of a product not directly related to the storm, such as books or music. The definitions were examined by Sollicito, who considered them accurate (Sollicito, 2015). Other communication goals identified through CAUSE such as bids to earn confidence or deepen understanding of a complexity were not coded in this study.

Tweets and posts were examined sequentially from the first messages, with each message coded for content so changes in content could be tracked as the storm progressed. Results of the coding were subtotaled in groups of 10 as a check to ensure all data were being examined. The results also were subtotaled in groups of 100 for analysis.

Each subtotal group showed the frequency of each model element coded. The frequency of model elements in each subtotal group was compared against frequencies in earlier- and later-occurring subtotal groups within the Facebook or Twitter data, to look for differences at various points in the storm. Subtotals in Facebook and Twitter were compared against each other, to look for differences in the frequency of model elements between the two platforms.

Results

Research Question 1 asked whether communication by members of the public affected by the Atlanta snow disaster of January 2014 who were using the social media platforms could be characterized by the codes Enactment, Connection, Comment and Spam. Results of the coding demonstrated that the definitions of the categories were sufficiently discrete to allow entries to be differentiated, and that the definitions worked equally well whether the entries were on Facebook or Twitter. Within the coded categories, there was little difference between individuals' Facebook and Twitter messages in the nature of the information conveyed; e.g., an offer of shelter on Facebook (Enactment) was like an offer of shelter on Twitter, and a Comment about someone worried about a loved one who had not reached home was similar on both platforms.

Research Question 2 asked how the frequency of use of the terms differed on Facebook and Twitter. Results of the coding found that the main difference between the two platforms was in the frequency of messages in the coded categories; e.g., Enactment-coded messages were far more common on Facebook than on Twitter. A chi square test found that the frequencies were significantly different, $p < 0.05$.

Table 1

Total Coded Entries for Facebook and Twitter

	Enactment	Connection	Comment	Spam
Facebook	99	175	221	5
Twitter	8	132	286	74

At the outset, entries on Facebook and Twitter primarily concerned actionable responses to the storm, such as offers of shelter or information about road conditions. As time passed, the focus shifted to more general comments about the storm not related to specific responses and, largely on Twitter, to entries not related at all to the storm. Messages on the two platforms also differed in frequency of the types of actions being taken in response to the storm, and the difference grew more pronounced in later-posted messages.

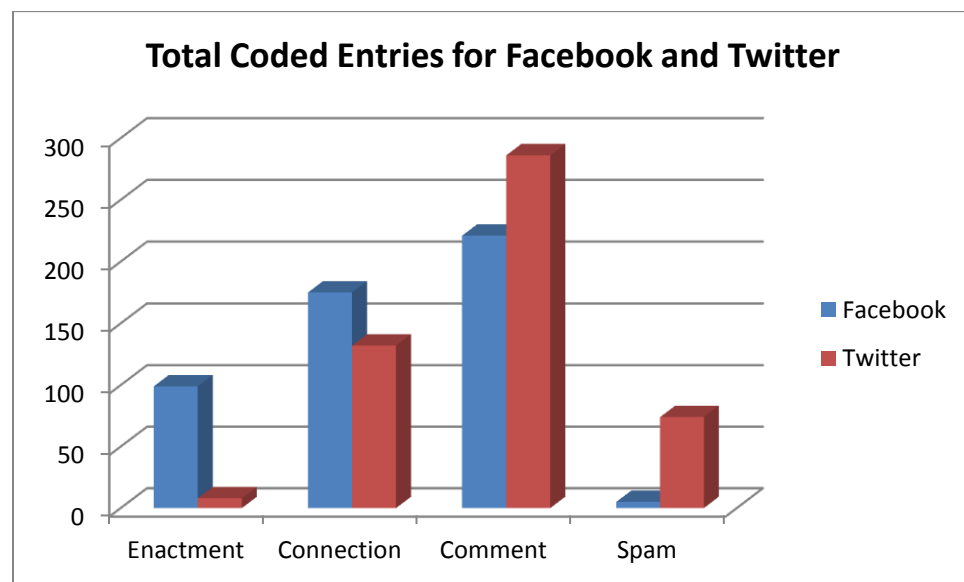


Figure 1. Total Coded Entries for Facebook and Twitter

Facebook postings

For the first 300 Facebook postings, entries characterized as Enactment and Connection (i.e., indicating behavior change or information that could lead to specific behavior change) were more common than entries characterized as Comment. In the fourth 100 Facebook postings, entries characterized as Comment comprised slightly over half. In the final 100, entries characterized as Comment comprised 50%; entries characterized as Spam, which only were found in in this group of 100, were 5%.

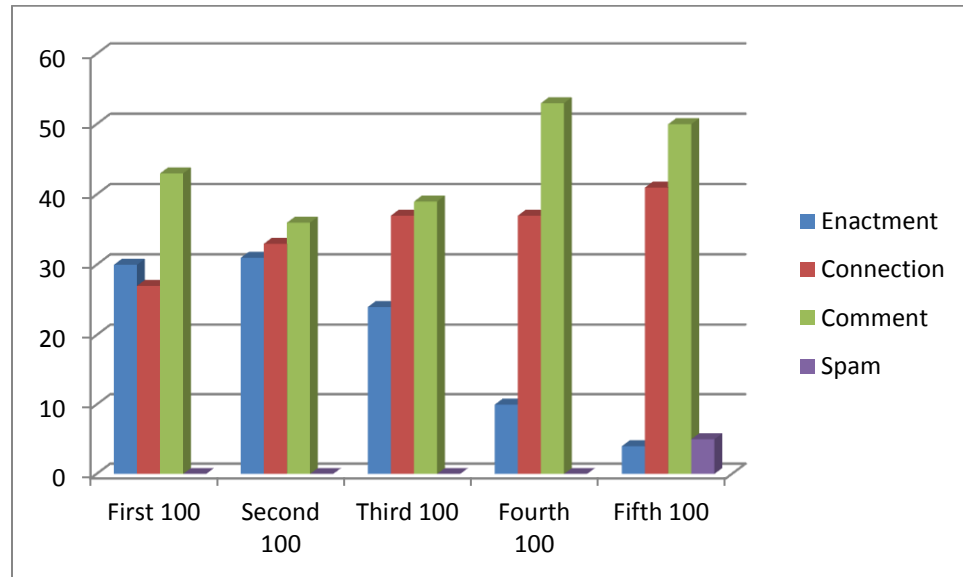


Figure 2. First 500 Facebook Entries in Groups of 100

In the first three groups of 100 on Facebook, Enactment characterized a large proportion of entries. Across all groups, Connection and Comment were more common.

Table 2

First 500 Facebook Entries in Groups of 100

	First 100	Second 100	Third 100	Fourth 100	Fifth 100
Enactment	30	31	24	10	4
Connection	27	33	37	37	41
Comment	43	36	39	53	50
Spam	0	0	0	0	5

Twitter postings

For the first 100 Twitter postings, most were characterized as Connection; in the groups of 100 that followed, most were Comment. Comments characterized as Spam were first noted in the third 100 postings, with the proportion rising sharply in the fourth and fifth groups of 100 comments.

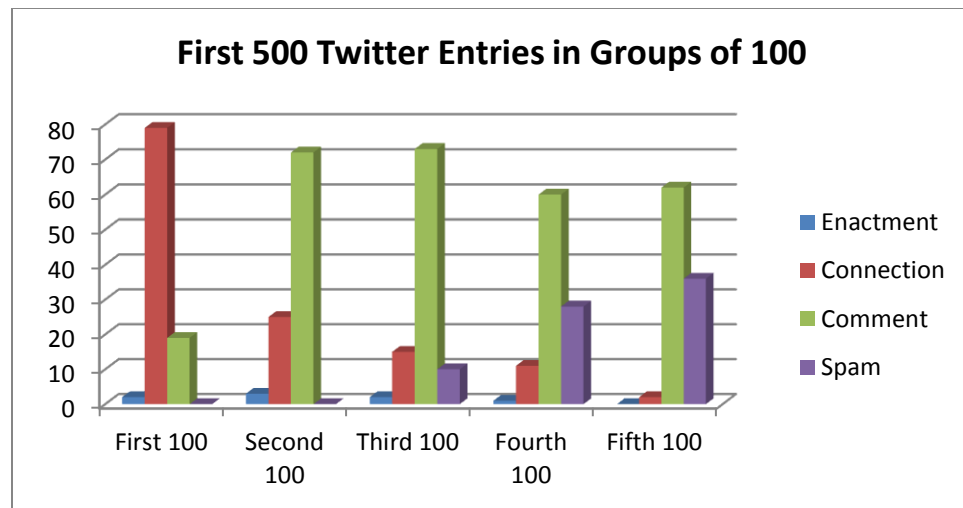


Figure 3. First 500 Twitter Entries in Groups of 100

In Twitter, few of the entries in any group of 100 were characterized as Enactment. In the first 100, there were more Connection than Comment entries. In the remaining groups of 100, there were more Comment than Connection entries. Spam comments appeared in the third group of 100 and continually rose.

Table 3

First 500 Twitter Entries in Groups of 100

	First 100	Second 100	Third 100	Fourth 100	Fifth 100
Enactment	2	3	2	1	0
Connection	79	25	15	11	2
Comment	19	72	73	60	62
Spam	0	0	10	28	36

Comparison of Facebook and Twitter postings

The first 100 entries on both Facebook and Twitter were predominantly responses to the storm, such as offers of shelter (Enactment), or queries about or reports of road conditions (Connection). These entries were made as the storm's disruption of Atlantans' lives began to be striking – the beginning of the period of snarled roads, stranded commuters and children unable to be taken home from school. Some entries are reported as examples in this section of the thesis; more entries are reported in the next section. The first Facebook post (from Sollicito) set the tone for the group: ``Write here about any one

who needs help. Anyone who is stuck in a car and anyone offering shelter for the night.” Responses demonstrating Enactment were specific, actionable, and quick in coming: “I am off Shallowford Rd near Sandy Plains/Gordy Pkwy and can offer shelter.” Similarly with road reports demonstrating Connection: “Six big rigs were tangled up at the I-85 northbound ramp to I-285 westbound.”

However, there were sharp differences between the platforms in the frequency of coded comments, as illustrated in the table and chart that follow.

Table 4

	Facebook and Twitter Entries by Category in Groups of 100									
	First 100		Second 100		Third 100		Fourth 100		Fifth 100	
	Facebook	Twitter	Facebook	Twitter	Facebook	Twitter	Facebook	Twitter	Facebook	Twitter
Enactment	30	2	31	3	24	2	10	1	4	0
Connection	27	79	33	25	37	15	37	11	41	2
Comment	43	19	36	72	39	73	53	60	50	62
Spam	0	0	0	0	0	10	0	28	5	36

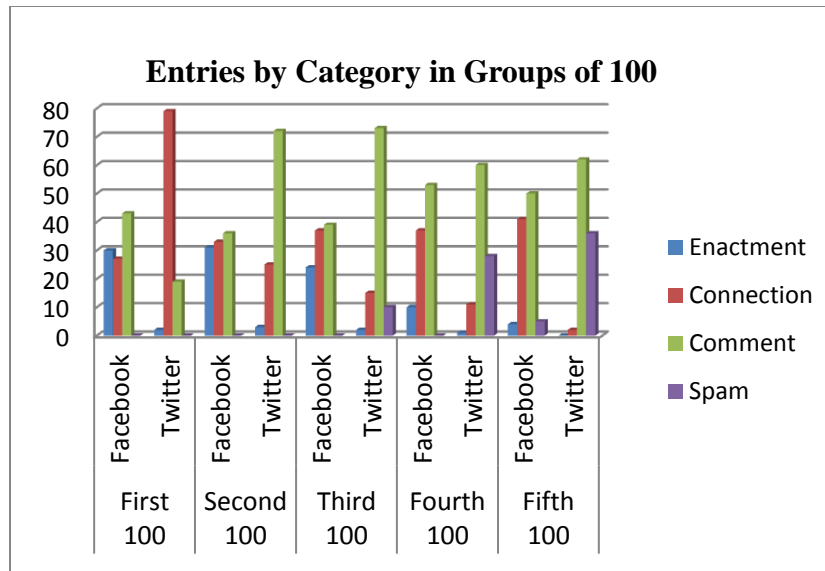


Figure 4. Entries by Category in Groups of 100

In the Enactment category (people offering to help or being helped) there were 30 entries among the first 100 entries on Facebook, compared with two on Twitter. An example of a Facebook post characterized by Enactment has already been given. A similar example from Twitter: “If you're stuck on icy Atlanta roads near Moreland and I-20, I have a house where you can crash.” In Connection, people providing or seeking information related to personally actionable responses regarding the storm, there were 27 entries in Facebook, compared with 79 in Twitter. An example of a Facebook road report characterized by Connection has already been noted. One example on Twitter (from a towing company): “1:30am [#ATLtraffic](#): I-285 E of Roswell Road. Still packed!” In Comment, posts about the storm that did not directly relate to helping someone, there were 43 on Facebook, compared with 19 on Twitter. In these early entries, very little Enactment activity took place on Twitter – it was almost entirely on Facebook.

Connection and Comment messaging was the rule on Twitter. An example (Connection) is the first message in the Twitter data: “Stranded & need somewhere to stay tonight? New FB group called [#SnowedOutAtlanta](#) is connecting people w beds.” An example of a tweeted Comment: “1st snow storm & Dad is still in traffic he is not a fan of snow.”

In the second 100 entries for Facebook and Twitter, usage patterns diverged even more. On Facebook, most postings (31 Enactment, 33 Connection) continued to involve people providing specific responses to the storm; the remaining 36 were Comment. On Twitter, most posts (72) were Comment; three were Enactment and 25 were Connection. Twitter was still showing strength as a medium for sharing actionable information, but non-actionable information such as personal opinions and cute or humorous pictures had come to predominate – a state that would continue for the balance of the entries examined in this thesis.

In the third 100 entries, Facebook continued to have most entries related to actions or actionable information – 24 Enactment and 37 Connection – while Twitter was primarily a forum for personal expression. Almost three quarters of tweets were characterized as comment (73), about the same as in the second 100 tweets. In addition, Spam (entries unrelated to the storm or in which the primary purpose seemed to be promoting the sale of a product not directly related to the storm, such as music) had begun on Twitter, but it had not begun on Facebook.

In the fourth 100 entries, about half of the messaging on Facebook still focused on people helping or seeking help from people (10 Enactment, 37 Connection) but slightly

more (53) were Comment. Twitter users, however, continued to be off the topic of specific help (60 Comment) and increasingly off the topic of help at all (28 Spam).

In the final 100, messages reflected that recovery from the storm was under way, with topics including finding and retrieving towed cars. On Facebook, actionable information was still a large component of traffic (four Enactment, 41 Connection), but they were fewer in number than non-actionable Comment entries (50). For the only time in the data analyzed here, Spam (5 entries) was found on Facebook. Twitter was even less helpful for people seeking help or seeking to provide it: 0 Enactment, two Connection, but 62 Comment and 36 Spam.

Overall, it appeared that frequency of messages fitting the coded categories was different on Facebook and Twitter. There were 175 Connection messages on Facebook and 132 on Twitter; a chi square test found these data were significantly different, $p < 0.05$. There were 286 Comment messages on Twitter and 221 on Facebook; a chi square test found these data were significantly different, $p < 0.05$. As contrasted with the many Enactment messages on Facebook, there were so few Enactment messages on Twitter that a statistically correct chi square could not be performed.

Sample Twitter Postings and Message Patterns

On Twitter, the earliest tweets in the stream consisted mostly of discussion that directed Twitter readers to the Facebook group as a place where they could get help if they needed it. As an example, one twitterer wrote, “Stranded & need somewhere to stay tonight? New FB group called [#SnowedOutAtlanta](#) is connecting people w beds...” Another wrote, [#SnowedOutAtlanta](#) Facebook group is resource for any of you stranded

on the road in Atlanta.” Other messages focused on the Facebook group’s mapping function, which let people describe their needs and mark their locations with pins: “Map to help organize [#SnowedOutAtlanta](#) offers. Add location/contact info if you can help.”

As the disaster unfolded, such messages continued, but others started to appear. Twitterers began to praise the Facebook group without taking the step of recommending specific action (i.e., Comment). One example of such messages is, “Another reason why I love social media: people helping people,” which included a link to the Facebook group. Another: “Check This Out! [#SnowedOutAtlanta](#) Facebook Group Is Helping Folks That Are Stranded!...”

Other tweets also demonstrated knowledge that the Facebook group was a place to go for help; however, because they did not explicitly offer a recommendation that people use the site, they were categorized as Comment; the coding definition for Connection required a clear statement of specific help. One example: “Here are places and people offering shelter in/around [Atlanta],” mentioning the group, but not specifically recommending people use it. In others, the definitional fit for Comment was more clear: “Can’t go to bed bc I’m following the woman trying to get help for stranded day on [#SnowedOutAtlanta](#).”

In many other cases, the Twitter hashtag #snowedoutatlanta was incorporated in messages that had no direct relationship with offers of help such as on the Facebook group. These tweets (Comment) covered a variety of topics, such as criticism of elected officials, updates on individual twitterers’ activities and feelings, and snide comments. The proportion of such tweets relative to help-related messages increased dramatically in

the later tweets; i.e., as time passed from the start of the storm. Examples related to traffic conditions are “Video of cars slipping & sliding - w/some colorful language ;)” “One of the scariest commutes ever..”

There were relatively few tweets reporting the conditions of specific highways (Connection), although some appeared, such as this: “75 & 285 [interstate highways in the Atlanta area] are officially sheets of ice,” with a sad-face emoticon. The lower frequency of tweets related to conditions of specific roads was in contrast to the common use of Twitter to report current conditions in other disasters, such as the Red River flood (Starbird, Palen, Hughes, & Vieweg, 2010). The possible existence of more road condition reports on other Twitter sites was not investigated in this thesis. Examples of criticism of elected officials were “City Officials of ATL need their a** [sic] kicked! Failures” and “Governor Deal in Georgia should be fired for not declaring state of emergency, now we have mess.” An example of personal updates: “It was crazy. Took 3.5 hrs to go 11.5 miles. Abandoned my car and walked the last 1.5 mile,” and “a snowy walk along the creek with my silly husband.” An example of snide comments: “2.5 inches of snow and the South literally becomes the set of the [#walkingdead](#)? Get it together.” Spam became quite common and much of it was unrelated to the Atlanta area. One common spam was an advertisement for readers to get more Twitter followers.

Sample Facebook Postings and Message Patterns

Use of the SnowedOutAtlanta Facebook group was quite different. The Facebook group was organized and moderated for the purpose of seeking and providing help – the form of Enactment that was measured in this thesis – and traffic on the site reflected this.

Most of the early messages, especially the very early ones, were from people offering assistance. One example (Enactment): ``Can offer shelter/warm clothes- off of Robinson Road near Marshalls.” Volunteers who joined to work on the site (contributing to communication as constitutive of organization) kept track of requests. An example: “I have a driver in a White International Tractor right at 285 West and I-75 North Exit been stranded.” They also kept track of whether help was provided, often in the form of a personal update: “Family in Morrow with child who needed food. All is great thanks to great people. Food is on its way to the family.” Other Enactment messages concerned transit, such as offering to bring aid to people: ``Anyone near Fairburn needing a ride water food or ect... gunna be out on 4wheelers helping people.” Many messages were pleas for help, and these were characterized as Enactment because the writer took the action step of pleading. An example of this: “Need ride..my parents have been stranded at Kennestone hospital since 12 yesterday.”

There were many Comment messages, often praising Mrs. Sollicito for creating and administering the site. Other messages thanked other people for their work: “My post earlier about Sharron stuck on New Hope Rd has been taken care of. Stacy Hensel Rutter & 2 other Angels rescued her and a couple others. Thanks for all the help! :-)

****update**.**” Many also praised businesses that welcomed stranded travelers.

Communication messages often focused on specific topics such as road conditions (Connection), in which users asked for information or provided it. An example: “just need to know if 285 east is open? If not are surface roads passable? Thanks! I work in Alpharetta and took refuge in the Sandy Springs Home Depot.” Information provided

was specific and often based on direct observation: “Klondike rd stockbridge is icy where my fiance is he drives semi and he is stuck.” Similar messages involved notifications of changes in towing policies, notably how to contact tow companies to retrieve cars and how to get fees waived.

In contrast to the Twitter messaging, there was almost no Spam or snark in the Facebook group. As noted, participants self-policed the group to remove spam, and called on each other to keep the dialogue focused on the group’s main goals. An example: “PLEASE DONT POST THANK YOUS and ANGRY STORIES or POLITICAL GRUMBLINGS until AFTER the emergency is over - then you can feel free to rant.”

Chapter Four: Discussion

The central research questions in this thesis are what sorts of communication goals people pursued during the Atlanta 2014 snowstorm and whether there was a difference between the communication on Facebook and that on Twitter. The broader question underlying these explorations concerns the extent to which social media provide a picture of the self-organizing that scholars have documented during disaster (e.g., Quarantelli, 1972; Tierney, et al. 2001). This knowledge could guide professional emergency communicators as well as members of the public in messaging that could facilitate behavior change in other disasters.

A crucial goal of emergency communicators and members of the public in responding to disaster is provision and receipt of aid as well as communication that encourages people to take actions that protect life and health and avoid actions that could put them at greater risk. Borrowing a term from the CAUSE model, this can be categorized with the term Enactment—that is, communication that moves people from agreeing that some step is a good idea to enacting it – and the differences in categorizing Enactment between the Facebook group and the Twitter hashtag are salient. The most important behavior, that of offering and receiving help, occurred in the Facebook group; twitterers seemed to be the chorus in the Facebook opera. As noted, 99 of 500 Facebook entries were characterized as Enactment, compared to 8 of 500 Twitter entries.

The data in this thesis could not demonstrate that a tweet referring people to the Facebook group led anyone to seek help through the group. Absence of evidence is not

evidence of absence, but the data suggest emergency communicators who assume that simply sending messages on Twitter will lead to provision and acceptance of aid may need to rethink their assumptions. Emergency communicators also might compare the number of their messages against the vast number of others' tweets in a platform that often resembles a large crowd of strangers shouting in a dark room, and consider whether they are being heard above the din.

In this data set, referral tweets came early in the discourse and trailed off later, subsumed in other subjects of lesser importance in protecting public health. Assuming that tweeting can do some good, it might be a good practice for emergency communicators seeking behavior change to monitor traffic early in the onset of a disaster and to place messages about possible individual actions into this stream quickly. Because the dialogue changed as time went on (fewer messages about health protection), emergency communicators might focus later Twitter communications on reminding users about sites that could help protect public health.

On the other hand, the results indicate great value in using Facebook to facilitate provision and receipt of aid. Enactment data on this site tracked offers of assistance and actions in which people went to the aid of others. Data sometimes reported on the success of those efforts. Success in the group seemed to engender more success; numbers of users in the group grew rapidly, adding to the potential volunteer work force. The Facebook group's managers acted as curators, warning against and weeding out background chatter, thereby concentrating the message traffic on health protection. An example from early in the second 200 posts: "Here is a page to post ONLY what you are able to help with." No

such curation was seen in the Twitter traffic. In contrast to generalities on Twitter, data in the Facebook group was often related to reports of conditions on specific roads.

It should be noted that messaging in the Twitter and Facebook data sets displayed consistent Confidence, the first C in the CAUSE model (Rowan, 1991; Rowan, et al., 2008, 2009) in the capacity of citizens to help each other through social networking. This is in contrast to the consistent criticism of public officials and emergency responders in conventional media and commonly in the tweet stream. Members of the public who use social media seemed enthusiastic and willing to help. Emergency communicators and other organizational responders therefore should consider social networking as more than a place to send messages; if professionals demonstrate they can work in this arena, they might enhance public Confidence in them and their work, building reputation that can help to facilitate behavior change.

Similarly with Enactment: Members of the public helped one another through social networking in specific cases when organization-based responders did not. One can conclude that members of the public and organization-based responders could get more done if they work as a team through social networking rather than either could do separately. For instance, knowing the location of members of the public who are offering shelter in their homes can help officials who run shelters choose sites in areas in which fewer strandeers are being helped privately. Knowing when a volunteer is taking someone to a hospital can alert hospital officials to be ready to receive the person. Learning road reports from people on the roads could help officials track road conditions. There could be even more benefit if the SnowedOutAtlanta Facebook group experience could be

replicated. It is possible to develop a toolkit to guide members of the public in setting up similar groups after other disasters. The benefit need not be limited to shelter and transportation; members of the public might be able to use the SnowedOutAtlanta pattern for other purposes, such as mutual aid in making homes fit for habitation after flooding, or reconstruction of wildlife areas.

Relating This Study's Findings to Those of Others

An intriguing puzzle is the relationship between this study's findings and those of scholars who report that Twitter has facilitated provision of some forms of assistance in other disasters and emergencies. In Chapter One, this thesis described several such studies. For example, Bosker reported on the work of two people in Con Edison's public relations department who responded to individual queries about the state of power issues related to superstorm Sandy. The descriptions in the article suggest that these communications, if they could have been characterized by the definitions in this study, apparently would have been Connection (focused on information sharing) rather than Enactment (focused on provision of assistance, which would have been the function of linemen and other emergency workers). Similarly, Vieweg, Hughes, Starbird and Palen found Twitter use facilitated situational awareness (a concept similar to Connection), although it did not document activities similar to Enactment. Jung found students used Facebook and Twitter to seek and share information about their personal safety (possibly characterizable as Connection). Starbird and Palen's study of digital volunteers using Twitter in the Haiti earthquake disaster also found information organizing and sharing,

not provision of on-the-ground aid by the digital volunteers, many of whom were in other countries.

One possible explanation is that several conditions existed in the Atlanta Facebook group response, and that all are necessary for success. One is the involvement of a strong leader – in this case, Sollicito. Another is her establishment of specific Enactment-related objectives, notably for shelter and transportation. This was striking; other researchers have found the focus in social media was on personal communication, not personal action. Sollicito clearly encouraged users to focus on helping one another, guided the evolving organization of the enterprise, including assignment of tasks, and actively discouraged less-helpful communications, even expressions of thanks.

However, although Sollicito seems to have been a pioneer in using social media for Enactment, she is not the first to apply crowdsourcing organization to disaster response. Patterns seen in Enactment in her group followed those outlined by Liu's framework for gathering, analysis and dissemination of information – activities that might be considered Connection in the terms of this thesis. For instance, Sollicito identified the need for shelter and transportation (Why), and created an online gathering place for people in the Atlanta area to work on the need (Who) and track the flow of mutual aid (What) during the storm (When) in the Atlanta area (Where). As part of a crowdsourced operation, Sollicito worked with many others. The history of crowdsourcing in disaster, especially through the pattern outlined by Liu, indicates that the work done by Sollicito and her colleagues in SnowedOutAtlanta can be seen as

growing out of previous work, which would make SnowedOutAtlanta an extension, not an anomaly, and therefore extendable again.

It may be the case that it is essential for a Sollicito to exist for Facebook to reach its full capacity to facilitate provision and acceptance of aid in a disaster.

On the other hand, Sollicito or others could have just as easily tried to create a helpful platform on Twitter, and, had they tried, it appears they would have been less successful. Twitter has limitations that Facebook does not. One limitation concerns message length (character count and length of videos), which could prevent complex messages related to disaster response, such as those including necessary background information, from being tweeted. Another is audience size, which impinges on the capacity to involve the most people in disaster response. As previously stated, there are more Facebook users than Twitter users.

Limitations

The research model for this thesis is essentially qualitative; the categorizations created by the researcher are descriptive and were applied after review of the data. As with qualitative research in general, observer bias is difficult to rule out. The categorization terms in this study were used in only two of the myriad social media platforms, so their usefulness in the other platforms is not yet known. This thesis marks the first time the categorization terms have been used. For these reasons, the generalizability of the method and of the findings is uncertain. This thesis examined only two data sets, which raises the possibility that other examinations of Twitter and Facebook used similarly (if such sites can be found and paired) might produce differing

results. Because this thesis examined only one form of disaster – a snow and ice storm – the extent of generalizability of its findings to other forms of disaster has yet to be determined. Although the Facebook group was the work of many, it was begun and led by one person, Sollicito. As discussed, she can be seen as a pioneer, not an anomaly, and her actions fit the victim-as-first-responder scenario. But the influence she had on the developed use of the group could indicate that the value of the Facebook group came from her leadership, not simply inherent characteristics of the group. However, little research is available to guide emergency communicators and members of the public regarding the efficacious use of social media in disasters, and this thesis may be an early guide to what members of the public have done and might do again.

Implications for further research

This thesis demonstrates differences in the communication goals pursued on Twitter versus Facebook during the same disaster. Consideration should be given to possible reasons for these differences, especially the success of the Facebook group, because understanding these differences could help to replicate and even improve the success the Atlanta group achieved. A large part of the difference might be described in terms of the communication as constitutive of organization (CCO) model (Putnam & Nicotera, 2009). Communicators in the Facebook group quickly coalesced as an organization while users of the Twitter hashtag showed no evidence of organization. The

ad hoc self-creation of a new social networking community after a disaster was therefore a test case for the applicability of a CCO model.

The CCO model posits that organization grows out of communication rather than communication developing because people have formed an organization. This thesis suggests as a guide to applicability the thinking of McPhee and Zaug (McPhee & Zaug, 2000). The presence or absence of their model's four points – self-structuring, institutional positioning, membership negotiation, and activity coordination – could be examined with the data used in this thesis. McPhee and Zaug argue that organizational communication entails communicators forming, maintaining and changing their organization as a relationship through their dialogues, which perform functions such as coordinating activities, adding and removing members, and negotiating structure and hierarchy – driven by a shared purpose (McPhee & Zaug, 2000). Although this thesis did not code for those elements in the Facebook group, the examination strongly suggests they were present.

Twitter hashtag traffic showed no indication of the presence of moderators, administrators or other users directing the traffic toward a purpose. Such a presence is not precluded by Twitter's structure – each member has a page and can curate the traffic on it in a manner similar to that of the Facebook group – and page owners commonly perform such functions related to their pages. Because the hashtag reflected tweets from a wide variety of twitterers, some indication of a curated site related to the snow disaster would be expected if it had existed. The tweets reflected individual rather than organizational

goals. It may be for this reason that Twitterers rarely offered direct help; almost entirely, the most they did was to recommend the SnowedOutAtlanta Facebook group.

Summary and Implications for practice

This thesis investigated how members of the public affected by disaster self-organized through social media to help one another and the extent to which Facebook or Twitter were facilitated these processes. Use of the Facebook group SnowedOutAtlanta and the Twitter hashtag #snowedoutatlanta during the Atlanta snow disaster of January 2014 were examined in a comparative case study. The first 500 messages on each platform were coded for evidence of messages that lead to behavior change or provision of aid (Enactment); specific information that could lead to specific behavior change (Connection), and information not useful for behavior change (Comment and Spam). Analysis of the coded data indicated that users of the Facebook group were more likely to offer and accept help through this medium; their self-organization can be viewed as an instance of communication constituting organization. In contrast, Twitter traffic did not show such self-organization and far less provision and acceptance of aid. The analysis also indicated that users of the Facebook group communicated to provide shelter, transportation, and d information (e.g., specific road conditions) that could help others far more often than did users of the Twitter hashtag.

The data also indicate that emergency communicators' messaging must come early in a disaster to be most effective. In both platforms, the largest amount of traffic related to provision and acceptance of aid (Enactment and Connection) was in the first 300 entries in Facebook and the first 100 in Twitter. If these patterns can be extrapolated

to the universe of emergency communication in social media, many emergency communicators could have to change some standard practices. The all-too-common bureaucratic procedure of broad circulation of drafts through an agency, deliberation, and reconciliation of small differences in messaging before clearance would delay dissemination past the period in which members of the public are most receptive. Getting messages out very early in a disaster would seem especially to be most valuable for tweets.

The findings concerning Enactment and Connection could guide professional emergency communicators in messaging that could facilitate provision and acceptance of aid in other disasters. Emergency communicators have too little knowledge of how people use social networking in a disaster, and therefore make poor use of social networking's capacity for interactivity. Social networks exist outside of officials' conventional and comfortable one-direction communication framework of official announcements to media that may be received by members of the public who have no voice in the communication process (Veil, Littlefield, & Rowan, 2009). It seems clear from this thesis's results, however, that greater expansion and better targeting of officials' communications through social media could facilitate better response to and recovery from disaster. Some of this improvement could occur through one-direction communication, including monitoring messaging in social networks. For instance, knowing where volunteers were sheltering people could help officials plan where to locate their own shelters. There also would be benefit from interactive communication. For instance, outreach to the people being sheltered by the volunteers (through a

Facebook group or other sites) could provide those people with help in recovery from the disaster. Social media companies and social media-focused agencies have been developing ways in which to facilitate public involvement. Many were discussed at a White House-organized event in August 2014 (Lee, King, & Forde, 2014). The projects include a marketplace that would connect pre-vetted volunteers with requests for help from authorized agencies; support networks for survivors and volunteers, and a real-time crisis map that would show locations and information about needed services, such as gasoline supplies at individual stations (Lee, King, & Forde, 2014).

The findings in this thesis also could guide members of the public as they self-organize in response to a disaster. Before the advent of social media, people affected by a disaster had fewer tools for self-organization; they had to depend for help on government and established agencies such as the Red Cross. They were reduced in agency twice – by the disaster and by their need to depend on aid agencies to help them respond and recover. The Atlanta experience demonstrates that with social media, this no longer has to be the case. It should be noted that, in any disaster, the people first affected also are the first responders; they have to help themselves and each other immediately (Quarantelli & Dynes, 1972). With official responders overwhelmed by the scope of a disaster and unable to respond to all needs, many members of the public voluntarily help others. The Atlanta experience demonstrates that members of the public, self-organizing through social media, can do what official responders are unable to do. As such, there are lessons to be learned and applied. Volunteers in future disasters would benefit from a toolkit to show them in a step-by-step manner how to set up a site, draw public attention to it

virally and through conventional media, and enlist and coordinate the actions of other volunteers to handle the site's traffic to help those in need.

The results of this thesis demonstrate that it is possible to distinguish between sites that promote provision and acceptance of timely aid and those that do not. This thesis also offers a tool by which to gauge this process. The results indicate social networks may be able to improve emergency communication and response because they are multi-directional; users who talk among themselves can form and execute plans of action independently of – and perhaps better than – official responses. The analysis also suggests that it is possible to extend the crisis crowdsourcing framework so as to guide participants' activities in self-organization toward achieving Enactment-related goals. However, as noted previously, this one case study cannot prove the validity and reliability of the method and measurement tools used. Further research is needed to replicate and, it is expected, to refine both.

References

- Federal Emergency Management Agency. (2012, October 15). *Integrated Public Alert & Warning System*. Retrieved December 2, 2012, from FEMA:
<http://www.fema.gov/integrated-public-alert-warning-system>
- American Red Cross. (2009). *Social Media Handbook for Red Cross Field Units*. Retrieved December 4, 2012, from
<http://www.slideshare.net/PingElizabeth/american-red-cross-social-media-guidelines>
- American Red Cross. (2012, August 31). *More Americans Using Mobile Apps in Emergencies*. Retrieved December 2, 2012, from News and Events:
<http://www.redcross.org/news/press-release/More-Americans-Using-Mobile-Apps-in-Emergencies>
- American Red Cross. (2012, August 31). *More Americans Using Mobile Apps in Emergencies*. Retrieved December 3, 2012, from American Red Cross:
<http://www.redcross.org/news/press-release/More-Americans-Using-Mobile-Apps-in-Emergencies>
- American Red Cross. (2012). *Red Cross Social Engagement*. Retrieved December 2, 2012, from Connect With Us: <http://www.redcross.org/connect-with-us>
- Austin, L., & Liu, B. F. (2012, February 9). *How Audiences Seek Out Crisis Information: Exploring the Social-Mediated Crisis Communication Model*. Retrieved December 1, 2012, from Routledge:
<http://www.tandfonline.com/doi/pdf/10.1080/00909882.2012.654498>
- Bosker, B. (2012, November 3). *Behind @ConEdison: The 27 Year-Old Preventing Panic, One Tweet At A Time*. Retrieved December 2, 2012, from HuffPost:
http://www.huffingtonpost.com/2012/11/03/conedison-twitter_n_2069744.html

- Botan, C. H. (2006). Grand Strategy, Strategy and Tactics in Public Relations. In C. H. Botan, *Public Relations II* (pp. 223-247). New York City. Routledge Custom Publishing.
- Briones, R. L., Kuch, B., Liu, B. F., & Jin, Y. (2011). Keeping up with the digital age: How the American Red Cross uses social media to build relationships. *Public Relations Review*, 37-43.
- Centers for Disease Control and Prevention. (2012, November 19). *CDC Emergency*. Retrieved December 5, 2012, from @CDC Emergency: <http://emergency.cdc.gov/disasters/mold/reenter.asp>
- Cohen, H. (2011, May 9). *30 Social Media Definitions*. Retrieved December 2, 2012, from Heidi Cohen Actionable Marketing Expert: <http://heidicohen.com/social-media-definition/>
- Colmer, V. (2012, November 19). *Lessons from Sandy: Using Social Media in Future Disasters*. Retrieved December 4, 2012, from The Network for Public Health Law: http://www.networkforphl.org/the_network_blog/2012/11/19/145/lessons_from_sandy_using_social_media_in_future_disasters
- Coombs, W. T. (1998). An analytic framework for crisis situations. *Journal of Public Relations Research*, 177-191.
- Coombs, W. T. (2008, April 2). *Crisis Communication and Social Media*. Retrieved December 2, 2012, from Institute for Public Relations: <http://www.instituteforpr.org/topics/crisis-communication-and-social-media/>
- Copeland, L. (2014, January 29). *Atlanta's ability to handle winter storms questioned*. Retrieved October 7, 2014, from USA Today: <http://www.usatoday.com/story/news/nation/2014/01/29/atlanta-winter-storm-response/5029489/>

- Dempsey, J. (2013, November 4). *Tweeting up a storm: The centers for disease control and prevention's (CDC) social media messaging and Hurricane Sandy*. Retrieved October 14, 2013, from American Public Health Association 141st APHA Annual Meeting:
<https://apha.confex.com/apha/141am/webprogramadapt/Paper278446.html>
- Duggan, M., Ellison, N. B., Lampe, C., Lenhart, A., & Madden, M. (2015, January 9). *Social Media Update 2014*. Retrieved March 10, 2015, from Pew Research Center Internet, Science & Tech: <http://www.pewinternet.org/2015/01/09/social-media-update-2014/>
- Facebook. (2014). *Desktop Help*. Retrieved October 1, 2014, from
<https://www.facebook.com/help>
- Facebook. (2014). *Newsroom*. Retrieved October 1, 2014, from Company Info:
<http://newsroom.fb.com/company-info>
- Facebook. (2014, October 15). *Newsroom*. Retrieved October 16, 2014, from Introducing Safety Check: <http://newsroom.fb.com/news/2014/10/introducing-safety-check/>
- Federal Emergency Management Agency. (2012, July 23). *Commercial Mobile Alert System*. Retrieved December 2, 2012, from FEMA:
<http://www.fema.gov/commercial-mobile-alert-system>
- Federal Emergency Management Agency. (2012, August 8). *Future Alerting Technology Developers*. Retrieved December 2, 2012, from FEMA:
<http://www.fema.gov/future-alerting-technology-developers>
- Federal Emergency Management Agency. (2012). *Helping the Survivors of Hurricane Sandy*. Retrieved December 5, 2012, from YouTube:
http://www.youtube.com/playlist?list=PL720Kw_OoJlJMk-_Hk1T_gbcOgYJf7jGW

Garner, M. K. (2014, January 29). *In Atlanta snow storm, it's social media to the rescue*. Retrieved October 10, 2014, from ajc.com: <http://www.ajc.com/news/news/in-snow-storm-its-social-media-to-the-rescue/nc6Kc/>

Google. (n.d.). *Google Analytics*. Retrieved December 8, 2012, from Google: http://www.google.com/analytics/features/social.html?gclid=CJ-TgYWni7QCFQSg4AodFXsAyg#utm_campaign=en_us&utm_source=bk-social&utm_medium=ha&utm_term=how%20to%20measure%20social%20media

Heverin, T., & Zach, L. (2011). Use of Microblogging for Collective Sense-Making During Violent Crises: A Study of Three Campus Shootings. *Journal of the American Society for Information Science and Technology*, 34-47.

International Federation of Red Cross and Red Crescent Societies. (n.d.). *What is a Disaster?* Retrieved October 14, 2013, from International Federation of Red Cross and Red Crescent Societies: <http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/what-is-a-disaster/>

Jeffries-Fox, B. (2004). *A Primer in Internet Audience Measurement*. Retrieved December 8, 2012, from Institute for Public Relations: <http://www.instituteforpr.org/topics/internet-audience-measurement/>

Jin, Y., & Liu, B. F. (2011, October 11). *Examining the Role of Social Media in Effective Crisis Management: The Effects of Crisis Origin, Information Form and Source on Publics' Crisis Responses*. Retrieved December 2, 2012, from Sage Publications: <http://crx.sagepub.com/content/early/2011/09/16/0093650211423918.abstract>

Jung, J.-Y. (2012, August 6). *Social media and goals after the Great East Japan Earthquake*. Retrieved December 3, 2012, from First Monday: <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/4071/3285>

- Ki, E.-J. a. (2014). Situational crisis communication and interactivity: Usage and effectiveness of Facebook for crisis management. *Computers in Human Behavior*, 140-147.
- Ledford, C. J., & Anderson, L. N. (2013). Online social networking in discussions of risk: applying the CAUSE model in a content analysis of Facebook. *Health, Risk & Society*, 251-264.
- Lee, M., King, H., & Forde, B. (2014, August 4). *More than 1,500 people participate in the White House Innovation for Disaster Response and Recovery Demo Day*. Retrieved February 1, 2015, from Office of Science and Technology Policy: <http://www.whitehouse.gov/blog/2014/08/04/more-1500-people-participate-white-house-innovation-disaster-response-and-recovery-d>
- Liu, B. F., & Austin, L. &. (2011). How publics respond to crisis communication strategies: The interplay of form and source. *Public Relations Review*, 345-353.
- Liu, S. B. (2014). Crisis Crowdsourcing Framework: Designing Strategic Configurations of Crowdsourcing for the Emergency Management Domain. *Computer Supported Cooperative Work*, 23, 389-443.
- Lovejoy, K. &. (2012, April). Information, Community, and Action: How Nonprofit Organizations Use Social Media. *Journal of Computer-Mediated Communication*, 337-353.
- McPhee, R. D. (2000). *The Communicative Constitution of Organizations: A Framework for Explanation*. Retrieved October 21, 2014, from <http://www.cios.org/EJCPUBLIC/010/1/01017.html>
- Merriam-Webster. (n.d.). *Deep South*. Retrieved January 17, 2015, from Merriam-Webster.com: [http://www.merriam-webster.com/dictionary/Deep South](http://www.merriam-webster.com/dictionary/Deep%20South)
- Merriam-Webster. (n.d.). *The Free Merriam-Webster Dictionary*. Retrieved October 15, 2013, from m-w.com: <http://www.merriam-webster.com/dictionary/blog>

- Morris, S., & Horrigan, J. (2005, November 24). *13 million Americans made donations online after hurricanes Katrina and Rita*. Retrieved December 2, 2012, from Pew Internet & American Life Project: <http://www.pewinternet.org/Reports/2005/13-million-Americans-made-donations-online-after-Hurricanes-Katrina-and-Rita/Data-Memo.aspx>
- National Oceanic and Atmospheric Administration. (2014, February 3). *North and Central Georgia Winter Storm*. Retrieved October 7, 2014, from National Weather Service Weather Forecast Office, Peachtree, GA: <http://www.srh.noaa.gov/ffc/?n=20140128winterstorm>
- NBC News. (2014, January 29). *Thousands still stranded on Atlanta highways after snow catches South unprepared*. Retrieved October 7, 2014, from U.S. News: http://usnews.nbcnews.com/_news/2014/01/29/22492664-thousands-still-stranded-on-atlanta-highways-after-snow-catches-south-unprepared?lite
- Ng, K.-H., & Lean, M.-L. (2012, September). The Fukushima Nuclear Crisis Reemphasizes the Need for Improved Risk Communication and Better Use of Social Media. *Health Physics*, 307–310.
- Oreskovic, A. (2013, October 20). *Twitter quitters dog IPO*. Retrieved October 22, 2013, from Thomson Reuters: <http://www.reuters.com/article/2013/10/20/net-us-twitter-users-idUSBRE99J03920131020>
- Oxford Dictionaries. (2014). *Social Network*. Retrieved October 1, 2014, from Oxford Dictionaries: http://www.oxforddictionaries.com/us/definition/american_english/social-network
- Peña, G. (2013, September 25). *Twitter Alerts: Critical information when you need it most*. Retrieved October 14, 2013, from The Twitter Blog Network: <https://blog.twitter.com/2013/twitter-alerts-critical-information-when-you-need-it-most>
- Petty, R. E. (1986). The Elaboration Likelihood Model of Persuasion. *Advances in Experimental Social Psychology*, 123-161.

Pew Internet & American Life Project. (2001, October 10). *The Commons of the Tragedy: How the Internet was used by millions after the terror attacks*. Retrieved December 2, 2012, from <http://www.pewinternet.org/Reports/2001/The-Commons-of-the-Tragedy-How-the-Internet-was-used-by-millions-after-the-terror-attacks.aspx>

Pew Internet and American Life Project. (2012, September). *Who's Who Online: Internet User Demographics*. Retrieved December 2, 2012, from Pew Internet and American Life Project: <http://pewinternet.org/Static-Pages/Trend-Data-%28Adults%29/Device-Ownership.aspx>

Pew Research Center's Internet and American Life Project. (2014). *Three Technology Revolutions*. Retrieved October 1, 2014, from Pew Research Internet Project: <http://www.pewinternet.org/three-technology-revolutions/>

Pew Research Center's Project for Excellence in Journalism. (2012, October 31). *Hurricane Sandy and Twitter*. Retrieved December 2, 2012, from http://www.journalism.org/index_report/hurricane_sandy_and_twitter

Putnam, L. L., & Nicotera, A. M. (2009). Introduction: Communication Constitutes Organization. In L. L. Putnam, *Building Theories of Organization: The Constitutive Role of Communication* (pp. 1-20). New York City: Routledge.

Quarantelli, E., & Dynes, R. (1972). When disaster strikes (it isn't much like what you have heard and read). *Psychology Today*, 5, pp. 66-70.

Rainee, L. &. (2006, April 3). *Americans and their cell phones*. Retrieved December 2, 2012, from Pew Internet & American Life Project: <http://www.pewinternet.org/Reports/2006/Americans-and-their-cell-phones/1-Data-Memo-Findings.aspx>

Renn, O., & Levine, D. (1991). Credibility and trust in risk communication. In R. &. Kasperson, *Communicating Risks to the Public: International Perspectives* (pp. 175-218). Dordrecht, The Netherlands: Kluwer Academic Publishers.

- Petty, R.E. & Cappocio, J. T. (1986). *The Elaboration Likelihood Model of Persuasion*. New York City, NY, USA: Springer-Verlag New York Inc.
- Rowan, K. E. (1991, November). Goals, Obstacles, and Strategies in Risk Communication: A Problem-Solving Approach to Improving Communication About Risks. *Journal of Applied Communication*, 300-329.
- Rowan, K. E., Botan, C. H., Kreps, G., Samoilenko, S., & Farnsworth, K. (2009). Risk Communication Education for Local Emergency Managers: Using the CAUSE Model for Research, Education and Outreach. In R. L. Heath, *Handbook of Risk and Crisis Communication* (pp. 168-273). New York City. Routledge.
- Schultze, F., Utz, S., & Goritz, A. (2011). Is the medium the message? Perceptions of and reaction to crisis communication via twitter, blogs and traditional media. *Public Relations Review*, 20-27.
- Seeger, M. W., & Sellnow, T. L. (1998). Communication, organization and crisis. In *Communication Yearbook* (pp. 231-275). Thousand Oaks, California: Sage.
- Sellnow, T. L., & Seeger, M. W. (2013). *Theorizing Crisis Communication*. Chichester, West Sussex, United Kingdom: John Wiley & Sons.
- Sibona, S., & Walczak, C. (2012). Puposive Sampling on Twitter: A Case Study. *2012 Hawaii International Conference on System Sciences*, 3510-3519.
- Signorini, A., Segre, A. M., & Polgreen, P. M. (2011, May 4). *The Use of Twitter to Track Levels of Disease Activity and Public Concern in the U.S. during the Influenza A H1N1 Pandemic*. Retrieved March 10, 2015, from PLOS One: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087759>
- Smith, J. B. (2013, August). *72% of Online Adults are Social Networking Site Users*. Retrieved October 14, 2013, from Pew Research Center:

http://www.pewinternet.org/~media/Files/Reports/2013/PIP_Social_networking_sites_update.pdf

Sollicito, M. J. (2014). *Snowed Out Atlanta: The Inside Story of the Fastest-Growing Facebook Group in history*. Marietta, GA: Self-published using Lulu at <http://www.lulu.com>.

Sollicito, M. J. (2015, March 5). (I. Dreyfuss, Interviewer)

Starbird, K., & Palen, L. (2011). "Voluntweeters": Self-Organizing by Digital Volunteers in Times of Crisis. *CHI '11 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, (pp. 1071-1080).

Starbird, K., Palen, L., Hughes, A. L., & Vieweg, S. (2010). Chatter on the Red: what hazards threat reveals about the social life of microblogged information. *Proceedings of the 2010 ACM conference on Computer supported cooperative work*, 241-250.

Sterbenz, C. (2014, January 29). *13 Examples Of People Being Awesome In The Middle Of The Atlanta Traffic Jam*. Retrieved October 10, 2014, from Business Insider: <http://www.businessinsider.com/snowedoutatlanta-facebook-page-2014-1>

Sutton, J., & Palen, L. &. (2008). Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires. *Proceedings of the 5th International ISCRAM Conference*, 624-632.

Taaffe, K., Garrett, S., & Yuan-Han Huang, &. I. (2013, August). *Natural Hazards Review*, 182-190.

Taylor, K., Priest, S., Fussell Sisco, H., & Banning, S. &. (2009, December 23). Reading Hurricane Katrina: Information Sources and Decision-making in Response to a Natural Disaster. *Social Epistemology: A Journal of Knowledge, Culture and Policy*, pp. 361-380.

- Taylor, M., & Botan, C. H. (2006). Global Public Relations: Application of a Cocreational Approach. In Watson (Ed.), *Proceedings of the 9th International Public Relations Research Conference: Changing Roles and Functions in Public Relations*, (pp. 484-491). Miami, Florida.
- The Associated Press. (2013). *Atlanta learns lessons from snow storm*. Retrieved October 7, 2014, from Weather on NBCNews.com:
<http://www.nbcnews.com/id/41053632/ns/weather/t/should-atlanta-have-been-better-prepared-snow/#.VDRVBxYvAWc>
- Tierney, K. J., Lindell, M. K., & Perry, R. W. (2001). *Facing the Unexpected : Disaster Preparedness and Response in the United States*. Washington, DC: Joseph Henry Press.
- Tucker, C. (2011, May/June). *The Nation's Health*. Retrieved October 14, 2013, from American Public Health Association:
<http://thenationshealth.aphapublications.org/content/41/4/1.2.full>
- Twitter Inc. (2013). *Posting @replies and mentions*. Retrieved October 16, 2013, from Twitter Help Center: <https://support.twitter.com/articles/20169871-how-to-post-replies-and-mentions#>
- Twitter Inc. (2013). *The fastest, simplest way to stay close to everything you care about*. Retrieved October 14, 2013, from About Twitter: <https://twitter.com/about>
- Twitter Inc. (2013). *What are @replies and mentions?* Retrieved October 16, 2013, from Twitter Help Center: <https://support.twitter.com/articles/14023-what-are-replies-and-mentions#>
- Tyshchuk, Y., Hui, C., Grabowski, M., & Wallace, W. (2012). Social Media and Warning Response Impacts in Extreme Events: Results from a Naturally Occurring Experiment. *45th Hawaii International Conference on System Science*, 818 - 827.

- Utz, S., Schultze, F., & Glocka, S. (2013). Crisis communication online: How medium, crisis type and emotions affected public reactions in the Fukushima Daiichi nuclear disaster. *Public Relations Review*, V. 19, 41-46.
- Veil, S. R., Littlefield, R. S., & Rowan, K. E. (2009, November). Dissemination as success: Local emergency management communication practices. *Public Relations Review*, 449-451.
- Vieweg, S., Hughes, A. L., & Starbird, K. &. (2010). Microblogging During Two Natural Hazards Events:. *Proceedings of ACM CHI 2010 Conference on Human Factors in Computing Systems*, 1079-1088.
- Weick, K. (1993). The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster. *Administrative Science Quarterly*. V38. 628-652.
- Wikipedia. (2012, November 30). *Disaster*. Retrieved December 2, 2012, from <http://en.wikipedia.org/wiki/Disaster>
- Wikipedia. (2012, December 1). *List of virtual communities with more than 100 million active users*. Retrieved December 2, 2012, from http://en.wikipedia.org/wiki/List_of_virtual_communities_with_more_than_100_million_users
- Wilensky, H. (2012). Disaster symbolism and social media. *Extended Abstracts on Human Factors in Computing Systems*, 801-810.
- Yeung, K. (2013, October 3). *Twitter IPO filing reveals company looks to raise \$1 billion* . Retrieved October 14, 2013, from The Next Web: <http://thenextweb.com/twitter/2013/10/03/twitter-ipo-filing-reveals-company-looks-to-raise-1-billion/>

Biography

Ira Dreyfuss received a Bachelor of Arts degree from Oglethorpe University, Atlanta, GA, in 1975. He worked as a reporter for WROM AM-FM in Rome, GA, served as a broadcast specialist in the U.S. Army at Fort Monmouth, NJ, and worked as a radio reporter for WJLK AM-FM in Asbury Park, NJ, and a newspaper reporter for The Asbury Park Press. He then worked as a broadcast and print reporter for The Associated Press in New York City, NY, and Washington, DC, receiving 13 awards for news, features, and investigation. After retiring from the AP, he worked as a public affairs specialist for the U.S. Department of Health and Human Services in Washington, where he developed messaging and dissemination systems to inform members of the public about actions they could take to protect their health after disasters. The primary focus of his Master of Arts in Interdisciplinary Studies work at George Mason University has been in public health emergency messaging.