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Social Media Use During Disasters: How Information Form and Source Influence Intended Behavioral Responses — Source link

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START

Social Media Use during Disasters

A Review of the Knowledge Base and Gaps

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National Consortium for the Study of Terrorism and Responses to Terrorism
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About This Report

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Executive Summary

In 2009, for the first time, a majority of American adults reported the Internet was their preferred source for information and the most reliable source for news (Zogby Interactive, 2009). During disasters, the public is even more active online, increasingly turning to social media for the most up-to-date information. For example, after the 2011 Japanese tsunami there were more than 5,500 tweets per second about the disaster (Crisis Communication Management, 2012). Social media, however, are used for more than information seeking or sharing during disasters; the public increasingly expects emergency managers to monitor and respond to their social media posts. A 2010 American Red Cross survey found an alarming 75% of 1,058 respondents expected help to arrive within an hour if they posted a request on a social media site (American Red Cross, 2010).

Given the increasingly important information role social media play during disasters, it is essential to understand what is known about social media use during disasters and what remains to be tested. Otherwise, policy makers and emergency managers risk making disaster communication decisions based on intuition or inaccurate information. To that end, this report summarizes what is empirically known and yet to be determined about social media use pertaining to disasters.

Disaster Communication and Social Media. Disaster communication deals with disaster information disseminated to the public by governments, emergency management organizations, and disaster responders as well as disaster information created and shared by journalists and the public. Disaster communication increasingly occurs via social media in addition to more conventional communication modes such as traditional media (e.g., newspaper, TV, radio) and word-of-mouth (e.g., phone call, face-to-face, group). Timely, interactive communication and user-generated content are hallmarks of social media, which include a diverse array of web- and mobile-based tools.

Why the Public Uses Social Media. Research outlined in this report collectively reveals multiple reasons the public uses social media during disasters:

- Because of convenience
- Based on social norms
- Based on personal recommendations
- For humor & levity
- For information seeking
- For timely information
- For unfiltered information
- To determine disaster magnitude
- To check in with family & friends
- To self-mobilize
- To maintain a sense of community
- To seek emotional support & healing

Conversely, the research also reveals chief reasons the public might not use social media for disaster communication: (1) privacy and security fears, (2) accuracy concerns, (3) access issues, and (4) knowledge deficiencies.

Active vs. Passive Social Media Users. This report discusses research that is beginning to determine factors that predict whether members of the public will become active social media users and even content producers during disasters. Such research identifies three segments of the public that emerge during disasters*: influential social media creators*, *social media followers,* and *social media inactives*.

Influential Social Media Creators. These users recognize the gravity of the disaster and are able and motivated to talk about it online. Nagar, Seth, and Joshi (2012) noted that influential social media creators quickly become leaders in creating and sharing information. In analysis of tweets from three disasters, they found more than 90% of users tweeting about these disasters were part of a connected group of influencers that emerged quickly after each disaster.

Social Media Followers. Social media followers are those who receive disaster information from influential social media creators either directly or indirectly. Initial research points to the possibility that the majority of those active on social media during disasters may be followers given that the public primarily seems to use social media to share, rather than create, disaster information (Hughes & Palen, 2009; Reynolds & Seeger, 2012).

Social Media Inactives. For social media inactives, traditional mass media tend to be the main source of disaster information (Littlefield & Quenette, 2007; Seeger, Sellnow, & Ulmer, 2003), but interpersonal communication is also an important source (Jin & Liu, 2010; Lazarsfeld & Menzel, 1963). Further, disasters may cause social media inactives to use social media for the first time, as was the case for the 2011 Joplin Tornado (William, Williams, & Burton, 2012).

Unanswered Questions. Finally, understanding what is not known about social media use during disasters is important when crafting communication policy. This report concludes with important unanswered questions including:

(1) What, if any, unique roles do various social media play for communication during disasters?
(2) Are some functions that social media perform during disasters more important than others?
(3) To what extent can the current body of research be generalized to the U.S. population?
(4)To what extent can the research on social media use during a specific disaster type, such as hurricanes, be generalized to another disaster type, such as terrorism?

Overview

Given the increasingly important role social media play in facilitating information dissemination during disasters, it is vital to know the insights research reveals about this process. The following report provides information about the public's use of social media, both generally and during disasters, and addresses what prompts the public to use social media during disasters as well as what deters such consumption.

The report then discusses factors that might lead to active versus passive social media use during disasters and summarizes the relatively modest research regarding how to evaluate the influence of social media and, importantly, segment active versus passive social media users during disasters. The report ends with a discussion of areas warranting further research to contribute to this growing body of knowledge.

Scattered throughout the report are examples of social media consumption during key catastrophic events such as the September 11, 2001 attacks, the 2005 Hurricane Katrina, and the 2010 Haitian earthquake. These case spotlights provide insights into how the public used social media and other media, including some preliminary lessons learned from these notable events.

Disasters

Disasters and Disaster Communication Defined

A disaster is a "serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (National Science and Technology Council, 2005, p. 21). Disasters are sometimes equated with crises, but crises have been singled out as organization-based while disasters are community-based (Seeger, Sellnow, & Ulmer, 1998). Disasters, however, can spawn crises for organizations when the public becomes concerned not only about the disaster itself, but also about how well organizations managed the disaster (Coombs, 2010).

Given the relationship between disasters and crises, this report includes research that examines social media use during disasters and crises. In doing so, we use the general term *disasters* for all studies except in the case where the research exclusively examined adverse events that impacted organizations and not communities. In these cases, we use the term *crises*.

Disaster communication deals with (1) disaster information disseminated to the public by governments, emergency management organizations, and disaster responders often via traditional and social media; as well as (2) disaster information created and shared by

journalists and affected members of the public often through word-of-mouth communication and social media.

Social Media

Social Media Defined

Social media are interactive digital tools that feature content users may generate, manipulate, or influence. Social media are conducive to timely, interactive communication and foster dialogue and content exchange among message consumers and creators (Seltzer & Mitrook, 2007; Taylor & Perry, 2005; Wright & Hinson, 2009). While many traditional media (such as newspapers and television) remain important disaster communication channels, traditional media primarily facilitate one-way information dissemination. Social media can create opportunities for two-way dialogue and interaction among organizations, the public, and individuals (Bortree & Seltzer, 2009).

Although Facebook or Twitter might come to mind, the social media realm includes a multitude of web- and mobile-based technologies ranging from photo and video sharing sites to rating and review forums. Figure 1 (below) outlines a variety of social media types and some popular examples of each.

Figure 1: Social Media Types & Examples

Social Media Type	Examples
Blogs	Blogger, WordPress
Discussion Forums	LiveJournal, ProBoards
Micro-blogs	Tumblr, Twitter
Photo/Video Sharing & Podcasting	Flickr, iTunes Podcasts, Youtube, Pinterest
Social Bookmarking	Del.icio.us, Diigo
Social Discovery Engines & News Sources	Reddit, StumbleUpon, Slashdot
Social/Professional Networking	Facebook, Google+, LinkedIn, MySpace
Social Rating/Reviews	AngiesList, Yelp
Video/Text Chatting	Skype, AIM, mobile texting
Wikis	Wikipedia, Wikispaces

Further, Edwards (2011) used a business lens to delineate social media into five groups:

> **Group 1:** Media that allow the public to **interact with each other and share information**. This group is subdivided into: (1) *networks*, such as Facebook, MySpace, and LinkedIn; (2) *wikis*, such as Wikipedia; (3) *multimedia sharing sites*, such as YouTube and Flickr; (4) *bookmarking sites*, such as Del.icio.us. and Digg; (5) *virtual worlds*, such as Second Life; and 6) *rating sites*, such as Yelp. These tools can facilitate exchange of information about products and brands.

Group 2: Media that provide ways to **keep updated about news and activities**, such as tagging, RSS, and, Twitter. These tools can encourage buzz and facilitate viral campaigns.

Group 3: Media that deliver **location-based services**, such as Foursquare, Gowalla, and HotSpot. These tools allow for constant tracking and opportunities for immediate sales.

Group 4: Media that foster **social gaming**, such as Zynga, Words with Friends, and Farmville.

Group 5: Media that support **social couponing**, such as Groupon, LivingSocial, and deals.com. These tools allow businesses to view consumers' influence on each other while simultaneously selling products.

The multitude of social media technologies combined with yearly growth in the number of individuals using them make evident that social media are not merely fads, but instead a notable yet evolving presence for the foreseeable future (PEW Internet, 2011). It is thus no surprise that corporations, government institutions, and nonprofits increasingly engage social media to build relationships with their stakeholders, both routinely and during disasters.

Social Media Use

Social Media Use during Routine Times

Consumption motivations. Americans primarily use social media to maintain connections with family and friends, with approximately two-thirds reporting this as a main reason for use (Austin, Liu, & Jin, 2012; Pew Internet, 2011). Other reported social media uses are: to learn more about consumer products (60%), read consumer feedback (66%), connect with others who share a hobby or interest (14%), meet new people (9%), read famous people's comments (5%), and seek new romance (3%) (NM Incite, 2011; Pew Internet, 2011). In addition, interview and survey research reveals that young adults also use social media for professional networking and education (Austin et al., 2012; ECAR, 2008).

However, the public's motivations for social media consumption somewhat vary, dependent on the medium. For instance, people primarily use discussion forums to contribute to the online community, benefit from others' comments and opinions, feel fulfillment from praise, assist others with complaints, and facilitate overall life balance (Goldsmith & Horowitz, 2006; Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004). The public reports turning to blogs for information seeking and media checking, personal fulfillment, convenience, monitoring what is going on in political forums and social networks, and expression and affiliation (Kaye, 2005).

Uses and gratifications theory (Katz, Gurevitch, & Haas, 1973) provides a framework for understanding media consumption motivations. The theory asserts individuals are acutely aware of their particular desires and thus actively seek the media forms they believe are suited to fulfill them – that is, the public *uses* specific media to *gratify* certain needs. The theory was originally focused on traditional mass media, but researchers are beginning to apply it to social media (e.g., Flanagin, 2005; Lev-On, 2011). For example, Quan-Haase and Young (2010) identified that individuals use instant messaging to gratify the desire for relationship maintenance and development, whereas they choose Facebook for fun-seeking and being knowledgeable about social activities. In fact, research contends that the social networking sites MySpace and Facebook are used to gratify one of the most basic human needs: to be social (Raacke & Bonds-Raacke, 2008).

Initial uses and gratifications research identified four foundational categories of human needs: emotional, cognitive, social, and habitual (Katz et al., 1973), and recent research has shown that social media use as a whole is significantly motivated by all four need categories (Wang, Tchernev, & Solloway, 2012). Yet, as these authors note, more "research is needed to compare specific types of [social media] in daily uses and gratifications" (Wang et al., 2012, p. 1837).

Consumption habits. Among all social media, social networking sites may boast the largest share of users and use. In 2011, nearly a quarter of the time Americans spent online was devoted to social networks and blogs, with social networking soaking up an additional 40% more time compared to the prior year (Nielsen, 2011). Facebook stands out in the social networking category; this medium alone reported an average of 552 million daily users and 955 million monthly users globally in June 2012 (Facebook, n.d.). Nielsen (2011) data showed that Americans expended more time on Facebook than any other U.S. website. Academic research supports these data; for example, Austin et al. (2012) found experiment participants reported using Facebook more often than other social media, with Twitter registering the least use among media studied. However, micro-blogs are a quickly growing and noteworthy social medium. In 2011, Tumblr almost tripled its user base from the previous year (Nielsen, 2011), and industry analysts estimate that Twitter surpassed 500 million account holders in June 2012 (Lunden, 2012).

Consumption habits by age. Once perhaps considered the exclusive domain of youth, this is no longer the case for social media. In fact:

- Of all adults online in the U.S., **two-thirds use social media** (PEW Internet, 2011).
- Across 24 popular U.S. social media sites in 2012, the **average user age was approximately 37**, and people **35 and older comprised more than half of all users** (Pingdom, 2012).

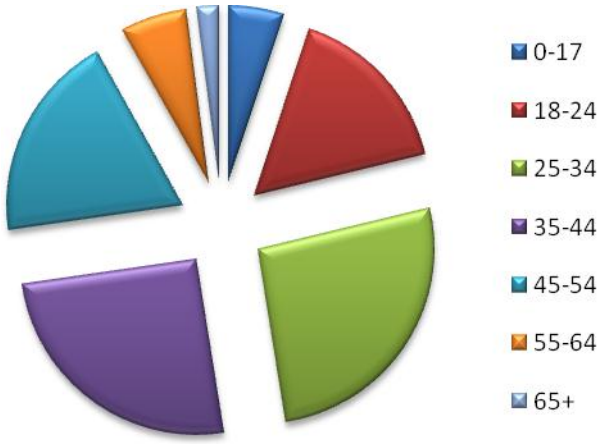
- Overall, there has been a **consistent increase in older Americans' use of social networking sites** such as Facebook and LinkedIn, with numbers increasing exponentially in recent years (PEW Internet, 2010, 2011, 2012).

- By February 2012, **more than half of the nation's seniors were Internet users**, at which time **about a third of online Americans age 65 and older reported using social networking sites**, many daily (PEW Internet, 2012).

- When it comes to mobile-based social networking, the most growth of use is among those **age 55 and older** (Nielsen, 2011).

Researchers estimated the age and gender distributions of 24 popular online social media communities in the United States (Pingdom, 2012). Regarding age, results revealed slightly more than half of users (51%) fall between the ages 25 and 44. Of the remainder, 21% are age 24 and younger, and 27% are age 45 and older. According to the same research, the average social media user across all 24 sites is almost 37 years in age. Users' average ages are highest on LinkedIn (*M* = 44.2 years), followed by Facebook (*M* = 40.5 years), and Twitter (*M* = 37.3 years). Figure 2 below displays age distributions of users of all examined sites.

Figure 2: Percentage of social media users by age*.



**Note:* Sites included in analysis were Facebook, Twitter, LinkedIn, Pinterest, Tumblr, Reddit, Hacker News, Slashdot, Github, Stack Overflow, Orkut, Quora, WordPress, Blogger, Flickr, Myspace, Tagged, Hi5, LiveJournal, Yelp, deviantART, StumbleUpon, Goodreads, and Last.fm.
Source: Pingdom.com (Pingdom, 2012)

Consumption habits by gender, race, income, education, geography.

Similarly, gender distributions indicate that social media users across platforms are primarily female (Pingdom, 2012). However, gender differences somewhat vary across sites. For example, males constitute the overwhelming majority of users on Slashdot (87%) and Hacker News (77%). Conversely, females are the dominant users of Pinterest (79%)

and Goodreads (70%). This complements Nielsen (2011) findings from the previous year, which showed that more women than men watched videos on social networks and blogs, although men streamed more videos and watched them for longer periods of time outside of social networks and blogs.

Additional research shows that about three-quarters of U.S. adults are online, with about 66% of them using social networking sites (Brenner, 2012). **Among all adult Internet users**:

- Substantially more than half of White, non-Hispanic (64%); Black, non-Hispanic (68%); and English- and Spanish-speaking Hispanic (72%) individuals use social networking sites.
- A similarly large portion of those with an annual household income less than $30,000 (71%); $30,000 - $49,999 (69%); $50,000 - $74,999 (60%); and $75,000 and higher (69%) use social networking sites.
- Nearly a three-quarters of those with some college education (71%), and more than half of those with no high school diploma (63%), those who are high school graduates (62%), and those who have obtained some education beyond college (67%) use social networking sites.
- Far more than half of urban dwellers (69%), suburban inhabitants (65%), and rural residents (64%) use social networking sites.

Considered collectively, demographic information about social media users demonstrates that although not everybody uses social media, on the typical day people of nearly all ages, genders, and backgrounds are plugged into the interactive audience of hundreds of millions.

Social Media Use during Disasters

Consumption behaviors. Social media use rises during disasters as people seek immediate and in-depth information (Bates & Callison, 2008; Pew Internet & American Life Project, 2006; Sweetser & Metzgar, 2007). Research points to the rapt and sustained attention the public may give social media during disasters. For instance, researchers examined communication during the initial month of an organizational crisis at a large public university[1], finding individuals responded almost immediately to posts made by university spokespersons on the school's official Facebook page (Formentin, Bortree, & Fraustino, 2012). Some of the university's individual posts received more than 2,000

[1] In November 2011, following a grand jury investigation, former Penn State Assistant Football Coach Jerry Sandusky was arrested and charged with 48 counts of child sexual abuse. The nationally spotlighted report alleged Sandusky abused several boys, some on Penn State grounds, throughout more than a decade.

comments in response, more than 5,000 "likes" (i.e., "thumbs up" approvals of the post), and more than 1,500 "shares" (i.e., distributions of the post to others). Showcasing social media's immediacy and revealing stakeholders' responsiveness, nearly 80% of public comments studied were made within just one hour of the university's post and half were expressed within the first fifteen minutes.

This virtually instantaneous spike in social media use in response to disasters is reported in a variety of industry and academic research. For example, researchers found that in the half hour leading up to a potential fatal storm hitting a festival in Belgium, the public published more than 2,000 related tweets (Perng et al., 2012). That number soared to more than 80,000 tweets during the first four hours of the disaster. Also, the first reports of the 2008 earthquake in China came from Twitter, not the government (Mills, Chen, Lee, & Ro, 2009). Further examples relating to how the U.S. public responded to key disasters such as the September 11, 2011 terrorist attacks and 2012 tornados in Alabama and Missouri are included throughout this report (e.g., "Case Spotlight: Hurricane Katrina," right).

Research points to the fruitfulness of monitoring social media in general and during disasters in particular, which can help determine the public's real-time sentiments and reactions to organizations' disaster responses (Coombs & Holladay, 2012). Such "online reactions can provide markers of crisis communication success or failure" as perceived by key audiences (Coombs & Holladay, 2012, p. 286).

Knowing that when disasters strike, social media audiences are poised to create, consume, and respond to information, researchers are beginning to uncover more information about the public's social media use. Research suggests that the particular medium used to obtain disaster information can be as important as the information itself (Jin & Liu, 2010; Schultz, Utz, & Goritz, 2011). Further, factors such as information form and source can impact the public's acceptance of disaster

Case Spotlight: 2005 Hurricane Katrina

(Horrigan & Morris, 2005; Liu, 2007; Procopio & Procopio, 2007)

BACKGROUND: Hurricane Katrina landed in Southeast Louisiana on August 29, 2005, displacing more than 500,000 families and flooding 80% of New Orleans.

MEDIA USE FINDINGS:

- **Disaster survivors used location-specific media.** For example, 75% of New Orleans residents responding to one survey visited online sites specific to their neighborhoods after Katrina.
- For the American public, **mainstream media sites dominated**, with 73% of online Hurricane Katrina news consumers turning to websites of major news organizations.
- **Disaster survivors used the Internet to activate other social networks** such as familial, social, geographic, and school-related. One survey of New Orleans residents found that close to half of the respondents used the Internet to contact people they had not contacted in more than a year.
- **Disaster survivors also used the Internet for obtaining information** about likely property damage, updating friends and family, and gathering information on friends and family.
- The Internet was **an important outlet for relief donations** with 13 million Americans (9% of Internet users) going online to donate.

messages (Liu, Austin, & Jin, 2011) and can impact which media form the public selects to seek additional disaster information (Austin, Liu, & Jin, 2012).

For example, Schultz et al. (2011) assert the "medium matters more than the message" (p. 20), based on findings from an experiment that looked at the effects of crisis information medium (newspaper, blog, Twitter) and message content (informational, apologetic, sympathetic) on organizational reputation, secondary crisis communication (e.g., willingness to post or share a message), and secondary crisis reactions (e.g., intentions to boycott). In the context of a major international automotive product failure crisis, this research found that the medium through which crisis information was communicated had an effect on organizational reputation and secondary crisis communication, whereas the message content only had an effect on secondary crisis reactions. The researchers emphasized the importance of Twitter in particular as an important and influential crisis response tool.

As another example, experiment participants responding to several University-based crises ranging from severe weather to a bomb threat were most likely to seek additional crisis information from traditional media if they first learned about the crisis via traditional media. Participants were also most likely to seek additional crisis information via social media if they initially received crisis information from a third party (e.g., journalists or friends) via social media than from the organization in crisis, and this also increased offline word-of-mouth communication. If the crisis information came from the organization in crisis, the participants were less likely to look for additional information (Austin et al., 2012 & Liu et al., 2011). However, more research is needed

Case Spotlight: September 11, 2001 Terrorist Attacks
(Carey, 2003; Dutta-Bergman, 2004, 2006)

BACKGROUND: On Sept. 11, 2001, terrorists hijacked four plans, flying two into the World Trade Center in New York City and one into the Pentagon. The fourth plane crashed in Shanksville, Pa. Nearly 3,000 people were killed.

MEDIA USE FINDINGS:

- **Television was the dominant source of news:** More than half of Americans learned about the terrorist attacks from television; 1 in 4 from another person; 1 in 6 from radio, and only 1% from the Internet. After first learning about the crisis, 4 out of 5 Americans turned to TV to learn more.
- **New media co-existed with traditional media.** For example, individuals who communicated with family and friends about the attacks via phone were also more likely to communicate with family and friends about them on the Internet.
- Many **Americans used multiple sources of information at the same time** such as making a telephone call or writing an email while watching TV.
- **Traffic to government websites spiked**. For example the Port Authority of New York and New Jersey website had a 7,000% increase in traffic on Sept. 11, 2001. Some were not prepared for this heavy traffic. For example, on the day of the attacks the official federal government website, Firstgov, did not have any information about the attacks or which agencies to contact for assistance.
- **The public used the Internet extensively for donations**. Americans donated more than $100 million online for disaster relief within the month following the attacks.
- **Online community participation was related to offline community participation**. Americans who posted about the attacks in online communities were also more likely to attend a meeting to discuss the attacks and to volunteer.

to parse out the individual effects of various social media platforms on the public's information consumption, sharing, and responses during disasters.

Functions and motivations. Some research shows that individuals use social media differently during disasters than they do routinely. The research synthesized below indicates that the public often uses social media to meet specific informational and emotional needs stemming from disasters; conversely the research synthesized above indicates the public often uses social media during routine times for more general online browsing.

Research has begun to uncover that certain types of social media perform characteristic functions during disasters. For example, when an earthquake and tsunami hit Japan in 2011, causing concern about damaged nuclear reactors, social media users made the story the number one topic across blogs, Twitter, and YouTube (PEJ New Media Index, 2011). But analysis revealed each medium was used for different purposes, such that people:

- Turned to **blogs** for **emotional release** and **support**,
- Logged onto **Twitter** to **find and distribute breaking news**, and
- Watched and posted **YouTube** videos specifically to **view and share shocking disaster visuals**.

Scholars have called for more research on how the public makes meaning during disasters given that the majority of research focuses on how organizations manage information during disasters (Heath, 2010; Kim & Dutta, 2009). Researchers have just begun to answer this call, identifying why the public uses and does not use social media during disasters. This research concludes that the public uses social media during disasters:

- **Because of convenience.** As discussed above, social media provide nearly immediate access to up-to-date information, community interaction, and support for the public during disasters. These features are convenient (Liu, Jin, & Austin, in press). Nearly half of all Americans are now smartphone owners (Smith, 2012), carrying with them in their pockets the capability to log on to any desired social media application with the tap of a finger. Further, free public library computers, personal computers, laptops, tablets, and mobile phones provide previously unparalleled access to information and support through social media for a large number of the public in a large number of places at almost any time.

- **Based on social norms.** Social norms impact social media use in general, dictating that individuals are more likely to use a particular medium if (1) their friends and family frequently use it and/or (2) if they trust and ascribe a high level of credibility to social media (Liu et al., in press). A consistent research finding is that people turn to existing social networks during disasters, including social media networks created before disasters (Spiro et al., 2012).

- **Based on personal recommendations.** As just mentioned, individuals are more likely to use social media if their friends and family are also users. During disasters, those who have positive experiences with social media might recommend them to others. In Liu et al.'s (in press) interviews with young adults, participants explained that they might join Facebook groups to support disaster efforts if they see their friends are doing the same. Further, when individuals receive recommendations to take up new social media during disasters and they do so, it is likely they will remain users even after the disaster ebbs (Hughes & Palen, 2009).

- **For humor and levity.** Humor, along with desire to share or obtain insider information, can motivate online communication (Choudhary, Hendrix, Lee, & Lia, 2012; Liu et al., 2012). For example, an analysis of tweets posted during three days of the 2011 Egyptian revolution found that the most frequently shared tweets fit into three categories: updates on major events; human interest stories, and humor (Choudhary et al., 2012). Although using humor during disasters at first might seem discordant with disasters' gravity, positive emotions such as those elicited by humor can be important coping mechanisms during disasters. Indeed, researchers found that after the September 11 terrorist attacks, those who were characteristically positive prior to the attacks experienced more positive emotions afterward and were less likely to experience disaster-related depression (Fredrickson, Tugade, Waugh, & Larkin, 2003). In this light, it makes sense that a notable motivation for social media use during disasters is humor. However, from a communication management standpoint, it is important to note that some individuals consider humor inappropriate during disasters, to the extent that humor can become a reason some people *do not* use social media during disasters (Liu et al., in press). Also, humor might be more appropriate at different points of a disaster. For example, Chew and Eysenbach (2010) found that the public posted fewer humorous comments about the 2009 H1N1 pandemic as the seriousness of the situation increased.

- **For information seeking.** Disasters often breed high levels of uncertainty among the public (Mitroff, 2004), which prompts them to engage in heightened information seeking, (Boyle, Schmierbach, Armstrong, & McLeod, 2004; Procopio & Procopio, 2007). As expected, information seeking is a primary driver of social media use during routine times and during disasters (Liu et al., in press; PEW Internet, 2011). Research further notes that, although social media allow for feedback and relationship building, oftentimes when disasters occur individuals might aim solely to find information, not to discuss it (Hughes & Palen, 2009; Merrifield & Palenchar, 2012). For example, examining Twitter communication related to the 2011 Las Conchas wildfire threat to Los Alamos National Laboratory, researchers found some Twitter users were passive, not tweeting or re-tweeting, only filtering information via Twitter hashtags and searching for information to help mitigate risk and reduce uncertainty (Merrifield & Palenchar, 2012).

- **For timely information**. Social media provide real-time disaster information, which no other media can provide (Kavanaugh et al., 2011; Kodrich & Laituri, 2011). Social media can become the primary source of time-sensitive disaster information, especially when official sources provide information too slowly or are unavailable (Spiro et al., 2012). For example, during the 2007 California wildfires, the public turned to social media because they thought journalists and public officials were too slow to provide relevant information about their communities (Sutton, Palen, & Shklovski, 2008). Time-sensitive information provided by social media during disasters is also useful for officials. For example, in an analysis of more than 500 million tweets, Culotta (2010) found Twitter data forecasted future influenza rates with high accuracy during the 2009 pandemic, obtaining a 95% correlation with national health statistics. Notably, the national statistics came from hospital survey reports, which typically had a lag time of one to two weeks for influenza reporting.

- **For unique information.** One of the primary reasons the public uses social media during disaster is to obtain unique information (Caplan, Perse, & Gennaria, 2007). Applied to a disaster setting, which is inherently unpredictable and evolving, it follows that individuals turn to whatever source will provide the newest details. Oftentimes, individuals experiencing the event first-hand are on the scene of the disaster and can provide updates more quickly than traditional news sources and disaster response organization. For instance, in the Mumbai terrorist attacks that included multiple coordinated shootings and bombings across two days, laypersons were first to break the news on Twitter (Merrifield & Palenchar, 2012). Research participants report using social media to satisfy their need to have the latest information available during disasters and for information gathering and sharing during disasters (Palen, Starbird, Vieweg, & Hughes, 2010; Vieweg, Hughes, Starbird, & Palen, 2010).

Case Spotlight: 2010 Haitian Earthquake

(Livingston, 21010; McKenna, 2010; PEJ, 2010)

BACKGROUND: On January 13, 2010, a 7.0 earthquake devastated Haiti, killing more than 200,000 and displacing 1.7 million people.

MEDIA USE FINDINGS:

- **Twitter was the primary place people turned** to interact with others regarding the earthquake. 2.3 million tweets included "Haiti" or the number to text message a donation to the Red Cross between January 12 and 14.
- **Twitter, however, primarily was not used to obtain news about the disaster**. Instead, the public turned to traditional media for disaster information.
- **Disaster survivors used social media to tell their story**, which in turn drove traditional media coverage. For example, the *Wall Street Journal* created slide shows of pictures from Haiti taken and shared by disaster survivors via social media.
- **Many members of the public participated in "CrisisCamps"** across the U.S. in which volunteers organized widespread relief efforts through harnessing their technology skills and social media networks. For example, volunteers created accurate maps of devastated areas in Haiti and directed relief efforts to those areas.

- **For unfiltered information.** To obtain crisis information, individuals often communicate with one another via social media rather than seeking a traditional news source or organizational website (Stephens & Malone, 2009). The public check in with social media not only to obtain up-to-date, timely information unavailable elsewhere, but also because they appreciate that information may be unfiltered by traditional media, organizations, or politicians (Liu et al., in press).

- **To determine disaster magnitude.** The public uses social media to stay apprised of the extent of a disaster (Liu et al., in press). They may turn to governmental or organizational sources for this information, but research has shown that if the public do not receive the information they desire when they desire it, they, along with others, will fill in the blanks (Stephens & Malone, 2009), which can create rumors and misinformation. On the flipside, when the public believed that officials were not disseminating enough information regarding the size and trajectory of the 2007 California wildfires, they took matters into their own hands, using social media to track fire locations in real-time and notify residents who were potentially in danger (Sutton, Palen, & Shklovski, 2008).

- **To check in with family and friends.** While Americans predominately use social media to connect with family and friends (PEW Internet, 2011), during disasters those connections may shift. For those with family or friends directly involved with the disaster, social media can provide a way to ensure safety, offer support, and receive timely status updates (Procopio & Procopio, 2007; Stephens & Malone, 2009). In a survey of 1,058 Americans, the American Red Cross (2010) found that nearly half of their respondents would use social media to let loved ones know they are safe during disasters. After the 2011 earthquake and tsunami in Japan, the public turned to Twitter, Facebook, Skype, and local Japanese social networks to keep in touch with loved ones while mobile networks were down (Gao, Barbier, & Goolsby, 2011). Researchers also note that disasters may enhance feelings of affection toward family members, and indeed survey participants reported expressing more positive emotions toward their loved ones than usual as a result of the September 11 terrorist attacks, even if they were not directly impacted by the disaster (Fredrickson et al., 2003). Finally, disasters can motivate the public to reconnect with family and friends via social media (Procopio & Procopio, 2009; Semaan & Mark, 2012).

- **To self-mobilize**. During disasters, the public may use social media to organize emergency relief and ongoing assistance efforts from both near and afar. In fact, one research group dubbed those who surge to the forefront of digital and in-person disaster relief efforts as "voluntweeters" (Starbird & Palen, 2011). Other research documents the role of Facebook and Twitter in disaster relief fundraising (Horrigan & Morris, 2005; PEJ, 2010). Research also reveals how social media can help identify and respond to urgent needs after disasters. For example, just two hours after the 2010 Haitian earthquake Tufts University volunteers created Ushahidi-Haiti, a crisis map

where disaster survivors and volunteers could send incident reports via text messages and tweets. In less than two weeks, 2,500 incident reports were sent to the map (Gao, Barbier, & Gollsby, 2011).

- **To maintain a sense of community**. During disasters the media in general and social media in particular may provide a unique gratification: sense of community. That is, as the public logs in online to share their feelings and thoughts, they assist each other in creating a sense of security and community, even when scattered across a vast geographical area (Lev-On, 2011; Procopio & Procopio, 2007). As Reynolds and Seeger (2012) observed, social media create communities during disasters that may be temporary or may continue well into the future.

- **To seek emotional support and healing.** Finally, disasters are often inherently tragic, prompting individuals to seek not only information but also human contact, conversation, and emotional care (Sutton et al., 2008). Social media are positioned to facilitate emotional support, allowing individuals to foster virtual communities and relationships, share information and feelings, and even demand resolution (Choi & Lin, 2009; Stephens & Malone, 2009). Indeed, social media in general and blogs in particular are instrumental for providing emotional support during and after disasters (Macias, Hilyard, & Freimuth, 2009; PEJ New Media Index, 2011). Additionally, social media in general and Twitter in particular can aid healing, as research finds during both natural disasters, such as Hurricane Katrina (Procopio & Procopio, 2007), and man-made disasters, such as the July 2011 attacks in Oslo, Norway (Perng et al., 2012).

Case Spotlight: 2011 Tuscaloosa and Joplin Tornados

(Bransetter, 2011; Stephens, 2011; Poynter, 2012; Singer, n.d.; Williams, Williams, & Burton, 2012; "2011 equals," 2011)

BACKGROUND: In Spring 2011, more than 1,665 tornados swept across the United States, marking 2011 as the deadliest U.S. tornado year on record. Tuscaloosa, AL and Joplin, MO were especially hard hit.

MEDIA USE FINDINGS:

- **Social media were the public's first source of disaster information**. For example, Twitter played a key role generating the first photos of the Tuscaloosa tornado devastation.
- **The public used social media to help find loved ones and offer support.** For example, a Facebook page named "Joplin, Mo. Tornado Recovery" gained 123,000 members in the days after the tornado and was used to mobilize support for survivors and help locate family members.
- **The public contributed to recovery through social media.** For example, Tuscaloosa created a social media website, Tuscaloosa Forward, for residents to share ideas for rebuilding; in less than six weeks, more than 4,000 visitors provided more than 300 ideas.
- **The public monitored social media for volunteer opportunities.** For example, the first Sunday after the storm in Tuscaloosa one school system posted a request for volunteers to help clean up schools, and within 30 minutes almost 80 people showed up. Similarly, on Craigslist the "Joplin Tornado Volunteers List" aggregated volunteer opportunities.

On the other hand, **reasons the public does not use social media during disasters** include:

- **Privacy and security fears.** A major reason for not using social media during disasters is concern about privacy and security violations (Mills, Chen, Lee, & Rao, 2009; Yates & Paquette, 2011). Online privacy and security in general is a global concern, and just as in some cases the public will avoid the Internet to evade the possibility of being computer hacked, having their location recorded, activities tracked, or information given away (Bandyopadhyay, 2009), privacy fears may also drive them away from social media. In Liu et al.'s (in press) research, interviewees discussed the fear of having comments taken out of context and dispersed in the social media sphere. No participants reported having tweeted or blogged during disasters, a finding attributed to privacy concerns. While social media provide benefits such as the ability to send important information across the globe with the press of a button, the flip side is that personal communication can be spread just as quickly and broadly. In addition, given the public nature of social media, some fear that criminals could mine social media to steal identities and take advantage of at-risk populations after disasters (Yates & Paquette, 2011). Consequently, some members of the public likely will not use social media during disasters to avoid privacy and security invasions.

- **Accuracy concerns.** Some members of the public have concerns about the accuracy of disaster information provided by social media, which may lead them to avoid social media (Stephens & Malone, 2009; Veil, Buehner, & Palenchar, 2011). Accuracy concerns are reasonable, especially considering existing research provides conflicting data. Arguing for the accuracy of social media content, Chew and Eysenbach (2010) found only 4.5% of the 5,395 tweets

Case Spotlight: 2012 Hurricane Sandy

(Fitzgerald, 2012; Kurtz & Look, 2012; Prakash, 2012)

BACKGROUND: From October 29-30, 2012 a category one hurricane swept across the U.S. East Coast causing eight states to declare states of emergency and resulting in up to $50 billion in damage.

MEDIA USE FINDINGS:

- **The public flocked to the Internet** with the East Coast's Internet usage increasing 114% the first day of the storm.
- **Twitter was a key venue for information sharing** with 1.1 million people mentioning the word "hurricane" on Twitter within a 21-hour time period.
- **Twitter also served as a key venue for misinformation**. For example, photos of soldiers at Arlington Cemetery that went viral were taken in September, not during the storm. Also, another viral photo of clouds over New York City was photoshopped.
- **Facebook was another key venue for information sharing**. Sandy became the number two most talked about topic on Facebook during 2012.
- For the first time the photo-sharing site **Instagram played a major role in information sharing** during a disaster with ten storm-related pictures per second posted on the site.
- **The public turned to Internet-based telephone services to connect** with friends and loved ones after the disaster; Skype alone received a 122% spike in traffic after the storm.

they randomly selected and analyzed contained misinformation or speculation about the 2009 H1N1 pandemic. One explanation for this finding is that the majority of content on Twitter about disasters is not original content, but rather comes from traditional media and other sources that are subject to journalistic standards (Chew & Eysenbach, 2012; Reynolds & Seeger, 2012). However, other researchers provide contradictory data when examining the same disaster. For example, in a content analysis of 1,000 randomly selected H1N1 tweets, researchers found that 345 of these tweets included misinformation about using antibiotics to combat H1N1 and this misinformation reached 172,571 followers on Twitter (Scanfeld, Scanfeld, & Larson, 2011). Clearly more research is needed to evaluate the accuracy of social media content produced during disasters compared to content produced by other sources.

- **Access issues.** Discussion of social media use is predicated on the assumption that the public has access to the tools, but this is not always so. For example, during disasters that result in power outages, individuals who most need information and support may lose connection to the social media applications able to assist them. But a more systemic barrier to social media access is the 'digital divide,' characterized by the lack of access to the Internet and technology that individuals of low socio-economic status often experience. As Veil and colleagues (2011) point out, although the use of social media is usually free, if the public does not have the means to purchase the technology needed for access, free use is practically useless.

- **Knowledge deficiencies.** Finally, certain segments of the public do not know how to use social media prior to disasters (Williams, Williams, & Burton, 2012). As a consequence, they are less likely to use some or all social media during disasters (Reynolds & Seeger, 2012).

Impact of crisis/disaster type. Although tying specific disaster types to particular social media use is an area ripe for future research, previous research points to the impact crisis type and social media use can have on message acceptance. For example, situational crisis communication theory outlines the process for enhancing the likelihood of effective crisis communication, based on the crisis type.

Situational crisis communication theory (SCCT) dictates that first and foremost organizations must protect their stakeholders (Coombs, 2012). Protection is achieved in two ways: (1) by providing information that helps the affected audiences physically cope ("instructing information"); and (2) by providing information that helps affected audiences psychologically cope ("adjusting information"). Only after the organization has secured the public's protection may it attempt repairing its reputation. Repair begins by selecting a response strategy appropriate to level of crisis responsibility assigned by the public. When the public views the organization as having greater responsibility for a crisis, organizations may need to choose strategies that are more accommodating (Coombs, 2012; Coombs & Holladay, 2002). Strategies include *deny* (attack the accuser, deny responsibility, or fault a

scapegoat), *diminish* (make excuses or justifications), *rebuild* (provide compensation or apologize), or *reinforce* (bolster through past good works, claim being the victim, or ingratiate through praise of stakeholders). Crisis types may fall into one of three categories. The public assigns organizations the least amount of responsibility for *victim-based crises* – natural disasters fall into this category. They assign organizations a low to moderate amount of responsibility for *accident-based crises* and high responsibility for *intentional/preventable crises*.

Also, examining crisis type in the context of social media, Jin, Liu, and Austin (in press) found that crisis origin, that is, whether the crisis is perceived to originate internal or external to organizations, shapes the crisis communication dynamic. External crises communicated via social media increase public acceptance of evasive organizational responses, while internal crises communicated via social media prompt more intense emotional responses.

Active vs. Passive Social Media Use during Disasters

Beyond examining why (and why not) the public uses social media during disasters, some research examines what predicts whether members of the public will become active vs. passive social media users during disasters. This research identifies three segments of the public that emerge during disasters*: influential social media creators, social media followers*, and *social media inactives*. Social media influence is evaluated according to social media outputs, outtakes, and outcomes (See this report's section on "Evaluating Social Media Influence during Disasters" below for more detailed information.)

Influential Social Media Creators

Influential social media creators perceive the importance of disasters and drive talk about disasters online (Liu, Jin, Briones, & Kutch, 2012). Nagar, Seth, and Joshi (2012) noted that influential social media creators quickly become leaders in creating and sharing information. In their analysis of tweets from the 2010 Philippines typhoon, 2011 Brazil flood, and 2011 Japan earthquake, they found that more than 90% of users tweeting about these disasters were part of a connected group of influencers that emerged quickly after each disaster.

Reynolds and Seeger (2012) identified three categories of social media creators who are influential during disasters: *insiders*, *leaders*, and *elders*. *Insiders* are consistently active in dialogue and content creation through social media. Insiders expect organizations responding to disasters to provide quick and accurate information via social media. *Leaders* are "veteran participants" who the public and traditional media follow as primary sources of disaster information (p. 267). Leaders are most likely to self-correct misinformation disseminated during a disaster. *Elders* are people who have stopped using social media for a variety of reasons but may become active again during disasters.

Influential social media creators across these three categories become influential based on their *issue-involvement* and/or *self-involvement* (Jin & Liu, 2010), discussed further below.

***Issue involve*ment** occurs when influential social media creators perceive they can do something about a given issue (Grunig & Hunt, 1984). During disasters, influential social media creators: (1) have more knowledge and/or experience regarding a specific disaster issue than does the general public and/or (2) are more interested in learning about a specific disaster issue than the general public is (Jin & Liu, 2010; Perlmutter, 2008). These characteristics lead to writing, posting, and sharing social media content about disasters.

Initial research points to the possibility of citizens, the media, and disaster response organizations becoming influential social media creators during disasters. For example, researchers identified three Twitter feeds as particularly influential in providing disaster updates in San Diego during the 2007 wildfires: one by a local broadcast news station and two produced by two San Diego residents (Mills et al., 2009). The same researchers also identified an electric utility company that became influential on Twitter during a 2008 severe ice storm in New England. Mills et al. (2009) indicated 10,000 people followed one link about the electric utility's investigation into its storm response, which provided one data point on influence. Other examples of influential social media creators are provided in this report's case spotlights.

When laypeople become influential on social media during disasters it is important to note that they might not actually create original content. Instead, they may repackage and share others' content. For example, Chew and Eysenbach (2010) found that tweets that only provided personal accounts of the 2009 H1N1 pandemic were not retweeted, but tweets that provided links to news sites were retweeted. Interestingly, only 1.5% of the more than two million tweets that Chew and Eysenbach (2011) analyzed included links to public health agencies' information, indicating that social media influence at least in this case did not come directly from these agencies.

Self-involvement is related to social media creators' need for self-confirmation, which includes gaining attention, feeling like a pioneer, knowing an inside story, enhancing self-image, confirming judgment, and/or assuming leadership (Dichter, 1966; Engel, Blackwell, & Miniard, 1993; Sundaram, Mitra, & Webster, 1998). By talking to others about disasters, influential social media creators build up authority and leadership (Li, 2007; Lipsman, Mudd, Rich, & Bruich, 2012; Miura & Yamashita, 2007).

Self-involvement can be further explained by classic marketing communication theories, cautiously transferred to a disaster communication context. Ditcher (1966) identified seven types of influential groups for a consumer's purchase decision: (a) *commercial authority*, (b) *celebrity*, (c) *connoisseur/mavin* (individuals who have knowledge and experience but are not professionally connected with the product), (d) *sharer of interest*, (e) *intimate* (i.e., individuals whose consumption behavior evokes intimate feelings and encourages imitation), (f) *person of good will* (individuals who act out of altruism to

understand consumers' needs and attitudes), and (g) *person carrying tangible product efficiency evidence*.

In disaster communication, self-involvement primarily applies to individuals who have direct disaster experience and knowledge (e.g., disaster survivors and disaster response volunteers) or those with personal connections to disaster areas (e.g., those with family members affected by the disaster). For example, researchers found that personal connections to Haiti motivated digital volunteerism in the wake of the 2010 earthquake (Starbird & Palen, 2011). Through interviews with 19 "voluntweeters" these researchers found that participants were uniquely motivated to help out after the earthquake, and for half of the participants, disaster tweeting extended beyond the earthquake (Starbird & Palen, 2011, p. 1071).

Connection between influential social media and traditional media. News coverage of social media content can further motivate social media creators to generate content about disasters (Jin & Liu, 2010). For example, Reynolds and Seeger (2012) noted that the majority of Twitter content comes from traditional mass media during disasters, which Hughes and Palen (2009) termed "information broadcasting and brokerage" (p. 1). Consequently, during disasters influential social media creators' primary value may be in providing context for and analysis of traditional media (Yates & Paquette, 2011). In addition, traditional media sources can also be influential social media creators. For example, researchers found that the top three most influential Twitter users worldwide during the 2011 Egyptian revolution were news organizations, as determined by their follower relationships and how those followers shared the organizations' tweets (Choudhary et al., 2012).

Social Media Followers

Social media followers are those who receive disaster information from influential social media creators either directly or indirectly. Initial research points to the possibility that the majority of those active on social media during disasters may be followers, given that the public primarily uses social media to share rather than create disaster information (Hughes & Palen, 2009; Reynolds & Seeger, 2012).

Reynolds and Seeger (2012) identified two types of social media followers: *lurkers* and *novices*. *Lurkers* read social media content during disasters, but they do not comment or contribute. *Novices* are new to social media and mostly observe, but they may become more involved in sharing content during disasters.

Social media followers also include those who are not directly plugged into social media but instead indirectly obtain information from social media (Jin & Liu, 2010). For example, these followers may receive disaster information reported by traditional media that was obtained from social media, as was the case in the 2008 Mumbai terrorists attacks

(Merrifield & Palenchar, 2012). Similarly, followers may receive disaster information from friends or family members who first learned this information from social media.

Based on Dichter's (1966) classic opinion leadership research, Jin and Liu (2010) proposed three motivations underpinning why social media followers use certain influential social media during disaster: (1) *issue relevance*: Social media followers are interested in the issue discussed by the influential social media creator; (2) *information seeking and sharing*: Social media followers search for additional information that is not available from other public channels; and (3) *emotional support*: Social media followers seek out social media for emotional support after disasters. Research, however, is needed to confirm these propositions.

Social Media Inactives

As mentioned above, aside from having a direct impact, influential social media can also affect the public indirectly by providing information to traditional media. In addition, social media inactives may also receive disaster information through offline word-of-mouth communication with social media followers and social media creators.

For social media inactives, traditional mass media tend to be the main source of disaster information (Littlefield & Quenette, 2007; Seeger, Sellnow, & Ulmer, 2003), but interpersonal communication is also an important source (Jin & Liu, 2010; Lazarsfeld & Menzel, 1963). Social media inactives' opinions about disasters may also be disseminated online by influential social media creators and followers.

Further, disasters may cause social media inactives to use social media for the first time, as was the case for the 2011 Joplin Tornado (William, Williams, & Burton, 2012). Finally, it is important to consider what causes social media inactives not to go online for disaster information. As previously discussed, one reason for not using social media might be economic constraints, making it potentially especially important to reach these inactives through other channels.

Evaluating Social Media Influence during Disasters

Outputs, Outtakes, and Outcomes

Ever-changing new communication technology makes monitoring and evaluating disaster information challenging. Social media influence occurs at multiple levels due to large audience sizes, high degrees of connectedness, and the amplified power of influencers' voices (Sterne, 2011). Three measurement categories help evaluate the relative influence of social media during disasters: *outputs*, *outtakes*, and *outcomes*. Specific measurement examples for each category follow and are further fleshed out in Appendix I.

Outputs measure how many people pay attention to influential social media during disasters (Jin & Liu, 2010; Lindenmann, 2003). Examples include number of posts or comments, relative reach by number of followers, and number of links from other sites. As a specific example, the U.S. Centers for Disease Control and Prevention created a social media campaign that provided a humorous education guide focused on how to prepare for a zombie apocalypse. The blog post received more than two million page views within one week of its May 2011 launch (Reynolds & Seeger, 2012).

Merely counting numbers, however, could be meaningless or misleading unless organizations also rate valence to gauge sentiment (e.g., whether a comment is positive, neutral, or negative). To address this challenge, Paine (2008a, 2008b) recommended dividing comments into three categories:

1. *Comment primo*: A comment that launches a discussion on another social media site;

2. *Comment grande*: A comment posted on a peer social media site, which is advertised via a cross-social media posting; and

3. *Comment informative*: A comment that expands on a general or incomplete statement made in a peer's social media site.

This categorization enables researchers to further code, tally, and summarize the number of positive versus negative comments as well as the amount of supportive opinions expressed and discussed regarding an organization. Also, research shows that using hazard-related words in social media content during disasters can increase outputs, particularly how likely the public is to share social media content on Twitter (Spiro et al., 2012). Counting and even increasing outputs, however, have important limitations. Most importantly, outputs do not measure social capital and social networking (as do outtakes) or attitude and behavioral changes (as do outcomes).

Outtakes measure social capital and social networking (Lindenmann, 2003; Jin & Liu, 2010). As Procopio and Procopio (2007) found, the Internet helped maintain a sense of a community when Hurricane Katrina survivors were geographically dispersed. Outtakes examples include a social media site's ranking, endorsements from traditional media of a social media site, and percentage of people who believe the disaster perspective presented on a social media site (Jin & Liu, 2010; Paine, 2007; Sterne, 2011). For example, after 2011 Hurricane Sandy, Fairfax County, VA received 10,175 "likes" on their Facebook page, and more than 127,254 people shared Fairfax County's Sandy content on their own Facebook pages (Fairfax County, n.d.).

Outcomes measure how social media affect the public's behaviors and relationships (Jin & Liu, 2010; Lindenmann, 2003). For example, the public's pre- and post-disaster trust of social media, level of engagement with social media during disasters, and behavior and attitude change intentions as a consequence of social media exposure (Jin &

Liu, 2010; Murdogh, 2009). Out of the three measurement types, outcomes are the most difficult to quantify and consequently are infrequently used. However, research has begun to tackle communication outcomes related to disaster information source and form as previously discussed in this report (see pages 12-13). Other research has begun to link social media content to reported engagement in protective behaviors. For example, researchers found that public concerns about and engagement in protective behaviors as expressed on Twitter increased as the 2009 H1N1 outbreak increased (Chew & Eysenbach, 2010).

Research Gaps

Key Unanswered Questions

In sum, the research on social media use during disasters is young but vibrant. Largely throughout the past decade, researchers have identified how the public consumes social media during disasters, the functions social media play during disasters, and what motivates the public to use and not use social media during disasters. As with any other fledgling social science topic, however, there are more gaps than answers regarding the unique roles social media can play during disasters. Below we discuss primary gaps that especially merit additional research.

Social media types and functions. Research is notably silent on whether the public's motivations to use social media during disasters may vary depending upon the social media type. In a non-disaster context, research clearly indicates that different social media perform different functions. Unfortunately, the research on social media use during disasters overwhelmingly examines one social media type such as Twitter and then generalizes the findings from that type to all social media. **As a consequence, more research is needed to understand what, if any, unique roles various social media platforms play in the public's communication activities during disasters.**

Primary functions. To date, research has identified several reasons why the public uses social media during disasters (e.g., convenience, social norms, to self mobilize) and several reasons why the public does not use social media during disasters (e.g., privacy fears, accuracy concerns, access issues). **Missing from the literature is research on whether some of the functions social media play during disasters are more important than others**. Intuitively, it makes sense that different social media functions vary in different situations, likely by disaster type and social media type as well as by demographic groups. Yet, existing research does not provide evidence-based guidance for identifying these likely differences.

Disaster type. The research linking disaster type to certain social media use is non-existent. **To date research has not tested how specific disaster types such as severe weather events, health epidemics, and terrorist attacks may result in different social media use patterns.** Instead, research tends to examine one catastrophic

event such as the September 11 attacks or Hurricane Katrina and then imply that the findings are generalizable to other disasters.

Moving from description to cause-effect explanation. The existing research largely describes how the public uses (and does not use) social media during disasters but cannot provide evidence-based guidelines on how to effectively use social media to facilitate disaster recovery. Compounding the problem is an over-reliance on convenient samples, namely students, for the limited experimental work that does allow cause-effect explanations among key variables. Experiments using student samples are valuable for establishing relationships among variables such as information seeking and offline actions, but findings cannot be generalized to a larger population, particularly in the social media realm. **Thus, a massive gap in the research is the lack of studies using national samples, especially field experiments and surveys, which allow for generalization.** Another major gap is the lack of longitudinal studies that capture social media use during the immediate disaster response as well as into the recovery phase.

Developing influence. Beyond identifying why the general public uses (and does not use) social media during disasters, more research is needed on what motivates specific individuals to become influential in creating and distributing disaster information. **Additional empirical research is needed to develop an understanding of how an individual or groups of individuals become influential and to map the information flow among these influential social media creators and social media followers and inactives.** Such mapping also would allow researchers to evaluate which social media message features are most effective in convincing the public to take desired protective actions during disasters.

Classifying media types. **Finally, as new communication technologies emerge, what constitutes social media vs. traditional media vs. word-of-mouth communication will increasingly become blurred**. Such blurring underscores the importance of not only examining social media use during disasters but also in the context of other media types. The co-existence and interactions among different media and the multiple communication channels, if planned and managed strategically, may be able exert stronger and more effective synergetic disaster communication effects. In studying this process, the information flow among various media needs to be better captured, and the current tendency to artificially segment and bundle certain media as social media overcome. In addition, this blurring points to the importance of constantly re-visiting the knowledge base about social media use during disasters.

Ultimately, understanding what is not known about social media use during disasters is as important as knowing what has been scientifically validated. As Marshall McLuhan (1964) famously noted, the medium is the message. Research on social media use during disasters clearly indicates that social media are a unique information source during disasters. As this young research stream moves forward, more guidance will emerge to explain how various

social media, traditional media, and word-of-mouth communication interact to create disaster messages and, most importantly, to what extent those messages influence disaster recovery and resilience.

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Appendix I: Characteristics of Influential Social Media (adapted and extended from Jin & Liu, 2010)

	Social Media Characteristics						
Measurement Tools							
		Credibility	**Consistency w/ key publics' attitudes**	**Frequency of updates**	**Consistency w/ organization's crisis response**	**Dialogical self-portrayal***	**Interactivity**
Outputs	Number of posts about disaster by valence		X	X	X		
	Number of comments about disaster by valence		X	X	X		X
	Number of unique visitors	X					
	Number of RSS subscribers	X					
	Number of disaster-related links to and from other sites	X					X
	Relative reach measured by number of followers						
Outtakes	Search engine rank	X					
	Third-party endorsements	X					
	Business/media affiliation of the social media creator	X					
	Number of times social media content mentioned by others						
	Number of times social media content is shared						
	Percent of people who believe disaster information						
Outcomes							
	Public's awareness of social media channel	X				X	X
	Public's post-disaster trust	X					
	Public's behavior						

*Note: Dialogic self-portrayal is a social media writing style that uses self-disclosure to increase readership and candid conversations.