Twittering Tennessee: Distributed Networks and Collaboration Following a Technological Disaster

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ABSTRACT

Informal communication channels are often the primary means by which time-sensitive hazard information first reaches members of the public. The capacity for informal communications has been recently transformed by the widespread adoption of social media technologies, such as the micro-blogging service Twitter, which allows individuals to interact with a broad audience over great distances. During a disaster or crisis event, this networked communication mechanism provides a means to communicate information and facilitate collaboration both locally and among distributed networks. This paper examines the use of Twitter following a technological disaster, showing how geographically dispersed individuals broadcast information about the impact of the disaster and its long-term effects, in contrast with the dearth of participation among public officials and industry representatives. Non-local users challenged authoritative accounts of the disaster and corrected misinformation. Conclusions are provided for policy makers and suggestions are offered for further research.

Keywords

Twitter, technological disaster, networks, collaboration, resilience

INTRODUCTION

The nearly continuous, informal exchange of information -- including such mundane activities as gossip, rumor, and casual conversation -- is a characteristic of human behavior, found across societies and throughout recorded history (Dunbar, 1997). While often taken for granted, these natural patterns of information exchange become an important "soft infrastructure" for decentralized resource mobilization and response during emergencies, disasters, and other extreme events. Indeed, past research has shown that informal communication channels are often the primary means by which time-sensitive hazard information first reaches members of the public. This capacity of informal communication has been further transformed by the widespread adoption of mobile devices (such as "smart-phones") and social media technologies (e.g., micro-blogging services such as Twitter[1]), which allow individuals to reach much larger numbers of contacts over greater distances than was possible in previous eras. Although the potential to exploit this capacity for emergency warnings, notifications, and response is increasingly recognized by practitioners, relatively little is known about the dynamics of informal online communication in response to extreme events. The results presented from this small case study seek to fill this gap.

This paper explores the joint concepts of social networking, collaboration, and the virtual convergence of distributed individuals using social media technology during a technological disaster in December 2008. Using data collected from the mocroblogging service Twitter, we explore the geographic space of participation, the online identities of networked participations, and their collaborative activities in the early days following the disaster. We will show that online participation was geographically distributed among a select group of users and that they used Twitter as a mechanism to broadcast the disaster, talk about its toxic effects, correct misinformation, and quell rumor. We also discuss the lack of presence among public officials, industry representatives, and local users. We provide conclusions about policy design and development, as well as implications for further research.

TECHNOLOGICAL FAILURE AND ENVIRONMENTAL DESTRUCTION

In the early morning hours of December 22, 2008, a 40-acre, 50-foot-high coal waste containment pond spilled

[1]Twitter.com is an on-line social network used by millions of people around the world to stay connected to their friends, family members and coworkers through their computers and mobile phones. The interface allows users to post short messages (up to 140 characteristics) that can be read by any other Twitter user.

more than 5.4 million cubic yards of coal fly ash into an adjacent valley and tributaries of the Tennessee River. This release of coal fly ash from a retention pond at the Tennessee Valley Authority's (TVA) Kingston Fossil Plant in Roane County, Tennessee covered more than 300 acres, and damaged or destroyed more than 40 residential properties (Greenpeace, 2009). Individuals in the vicinity of the spill have reported a variety of health problems, possibly linked to problems of air quality, and elevated levels of arsenic, barium cadmium, lead, mercury, nickel, and thallium in the soil and water (Knoxnews, 2009).

In the first 72 hours following the spill, media attention was limited to reports from local news sources such as Knoxnews, Knoxville News, the Tennesseean, and local syndicated media affiliates, such as NBC. Environmentalist organizations, such as the Environmental News Network and the Sierra Club, posted articles through their websites and news networks while bloggers generated content on personal blogs. Three days after the spill, on Christmas morning, the New York Times ran its first story on the coal ash disaster.

In the current system of 24-hour news cycles, where multiple forms of media enable rapid, worldwide coverage of local events, what was most surprising in these early hours was the lack of attention by major news media. Given that the TVA spill had been identified as being 40-50 times worse than the Exxon Valdez disaster of 1989 (Greenpeace, 2009), and given the normal media frenzy surrounding breaking news (Fischer, 2008), the seeming dismissal of this event became a rallying point for online activists and individuals networked through new media technologies.

Twitter is one such channel that enabled distributed communication and rapid-fire updates about the ongoing developments, or lack thereof, about the TVA spill. Twitter users converged online as digital activists and became heralds sharing news of the devastation and destruction when the major media would not. While some Twitter users suggested at the time that they had "scooped" major media on the TVA story, the legacy of this networked communication may be that citizen activists used a powerful mode of communication that joined together networks of individuals who could sound the alert and raise the attention of concerned individuals and organizations across the United States and around the world. Together, these distributed Twitter users converged online and used their network connections to raise awareness, document the destruction, and organize a geographically distributed response to a local technological disaster.

ONLINE SOCIAL NETWORKING

Research on the uses of Web 2.0 and social media in disaster events has shown that collective behaviors online parallel those emergent activities (Palen and Liu, 2007; Palen, Vieweg, Sutton, Liu, and Hughes, 2007) and group formation (Shklovksi, Palen andSutton, 2008) that routinely occur in the aftermath of disaster (Drabek and McEntire, 2003; Quarantelli, 1996). When crises occur, available social media are "appropriated" for the purpose of collecting and disseminating disaster-relevant information, and new disaster-related content is rapidly created and shared (Sutton, Palen and Shklovski, 2008). The same collective behavior processes that have been observed in the physical space of a disaster, including mass convergence, rumoring, and the formation of emergent groups, now occur in the virtual space provided by Web 2.0. What differs is the use of new technology to enable communication and information sharing and the distributed nature of networked collaboration.

While crisis events regularly result in increased information seeking and sharing, much of this communication takes place through existing (conventional) channels: a consistent finding in the above studies is that existing (and frequently used) network ties were overwhelmingly employed for passing on crisis information (Drabek, 1969; Perry and Greene, 1982). Thus, the first source of notification for many (if not most) individuals in crisis situations is information diffused through existing social ties and familiar modes of communication. In the online context then, those seeking and disseminating hazard information are likely to turn first to everyday tools that enable interpersonal communication. How online tools were used in the immediate aftermath of the TVA disaster is the focus of this study.

RESEARCH METHODS

Strategies for on-line data collection are commonly referred to as "virtual" methods (Hine, 2005). These methods include online interviewing (Kivits, 2005), ethnographic observations (Rutter and Smith, 2005; Mackay, 2005), website content analysis (Schneider and Foot 2004, 2005; Guth and Alloway 2008) and structural analysis (Benoit and Benoit, 2000), as well as network analysis (Park and Thelwall, 2005). Recent research on Twitter has focused mainly on network analysis of large-scale public datasets, collected over specified periods of time. Data analysis has included an examination of network properties and directed links between followers and followees (Huberman, Romero, and Wu, 2008), content analysis to determine user intention (Java, Son, Finin, and Tseng, 2007), and Twitter adoption and use in mass convergence events (Hughes and Palen, 2009).

This study takes into account Twitter contributors and their posted content comprising multi-actor, cross-site

action on Twitter as a form of virtual sociocultural analysis (Schneider and Foot, 2004). Here the focus is on networked participants and content analysis linked to a specific incident that garnered attention from an emergent group of geographically distributed actors. Unlike previous Twitter studies, this research is bounded by the start of a technological disaster event and examines a sample of users who identify their interest in the TVA spill by virtue of their public comments through the microblogging site. Data collection and analysis activities were completed manually and involved multiple steps where data streams were collected and analyzed, informing the need for additional data collection activities.

All searches and data retrievals were based on publicly available data without log-in requirements. Publicly accessible data within Twitter includes searches on keywords, including those organized by hashtags (#)[2], and searches for posts made by individual users. Twitter also allows access to user profiles which contain information such as name, location, occupation, number of persons they follow, and number of followers, as well as number of updates a user has posted over the lifetime of their account. Additional information about an individual user can be obtained by manually accessing websites that are linked to their profile.

At the time of this data collection activity, each user profile page could host up to 3200 tweets (160 pages, 20 tweets per page) for an indefinite search period. Twitter keyword feeds are hosted on Twitter's servers for approximately seven days, depending upon their server capacity[3]. Once these feeds are no longer available, researchers can manually search and collect individual user updates and status messages.

Data collection activities commenced approximately three weeks following the TVA coal ash spill. Initial search and archiving activities centered on the keyword combination "coal+ash." We collected and archived more than 1,000 tweets using this keyword combination from December 22, 2008 – Jan 22, 2009. The highest traffic was recorded on January 9 (171 "coal+ash" tweets) when a second TVA settling pond located in northeast Alabama failed. By mid-January, posts had diminished to fewer than ten per day on average. Each archived tweet included the following data: user name, post content, and link to additional data (URL)[4] and was manually entered into a spreadsheet for analysis purposes.

Initial analyses indicated the existence of a population subset that had a higher contribution rate to this conversation and routinely used the hashtagged keyword "#coalash" in their posts. In light of this finding, researchers returned to Twitter and conducted two additional data retrieval activities. First, we collected and archived all of the available posts with the keyword "#coalash." Due to the time limits on Twitter archives, we were only able to obtain updates from January 5-February 1. As a result, a second follow-up activity centered on visiting the user pages of each individual who included "#coalash" as well as "coal+ash" in a single post. We archived all of their posts that were perceived to be relevant to the TVA disaster from December 22 – Jan 22, 2009[5].

To learn more about the high frequency Twitter users (those using #coalash), we manually collected their profile data. In total, profile data was collected for 37 users and entered into a spreadsheet using the following categories: user name, biographical information, geographical location, link to listed website, organizational affiliation, and occupation.

Posted content was analyzed inductively, paying attention to themes that emerged in the first eight days post ash spill. To provide greater detail about who participated in the online conversation about the disaster, Twitter users who posted using "#coalash" were mapped based upon their given geographical location.

NETWORKED PARTICIPATION

This study began as an investigation of place-based use of a social networking technology. It was driven by assumptions that the local, disaster affected public and public officials would utilize emerging technologies in crisis situations, and through their use, local networks would be strengthened, facilitating community resiliency. This was especially so because of the local population demographics; Roane County, Tennessee is home to Oak Ridge National Laboratory (a Department of Energy Laboratory) and boasts more Ph.D.s per square mile than

[2] Hashtags, denoted by the placement of "#" before a keyword, has become a mechanism to organize commentary around a specified topic.

[3] At the time of this data collection activity (January 2009) Twitter keywords were hosted for up to 30 days.

[4] Twitter archives up to 3200 individual user posts. When capacity is exceeded by frequent posters, earliest posts become non-retrievable.

[5] Posts that were perceived to be relevant included content regarding the disaster that may not have included a key word. For instance, one activist posted updates during a water-sampling expedition on the Roane river but did not include key words during these updates.

any other place in the country. The Roane County/Oak Ridge/Knoxville area employs more than 5000 engineers, 2400 scientists, and 2000 Ph.D.s[6] signifying a highly technical workforce. Contrary to expectations, participants who shared information through this social networking platform were not primarily locals, but instead were distributed across the United States and comprised mainly those who were not directly affected by the disaster. Individuals who posted information about the coal ash disaster did so in an effort to share information through their broader networks, link followers to major media and social media accounts of the disaster, and to increase awareness about the devastation in the Tennessee Valley. In result, these participants provided support to the local community by sharing information through distributed networks, reaching a broader audience, and sounding the alarm about the extent of the destruction in this small Tennessee community.

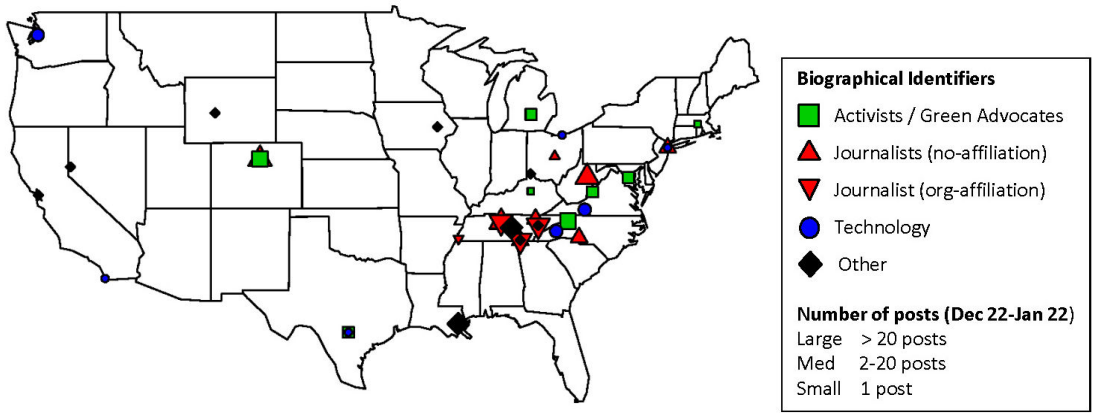

Figure 1. Mapped locations of "#coalash" Twitter posters, from December 22, 2008 to January 22, 2009, by number of posts and profile information.

Of the 37 Twitter users who posted using "#coalash," 31 included biographical information in their user profile. The top contributors (those who posted 20 or more times over the 30 day period) identified themselves as green activists/advocates, journalists, or technology/social media experts. Six Twitter users were organizations (mainly representing local/regional news). Thirty-six #coalash posters provided information about their physical location that could be mapped (these included variations of city, city/state, or state). The greatest number of contributors to the coal ash conversation resided in the Eastern half of the U.S. The Twitter user with the highest rate of participation was an activist residing in Appalachia (Boone, North Carolina) whose most notable posts were made during an unlawful entry of the disaster-impacted area to gather water samples from the river.

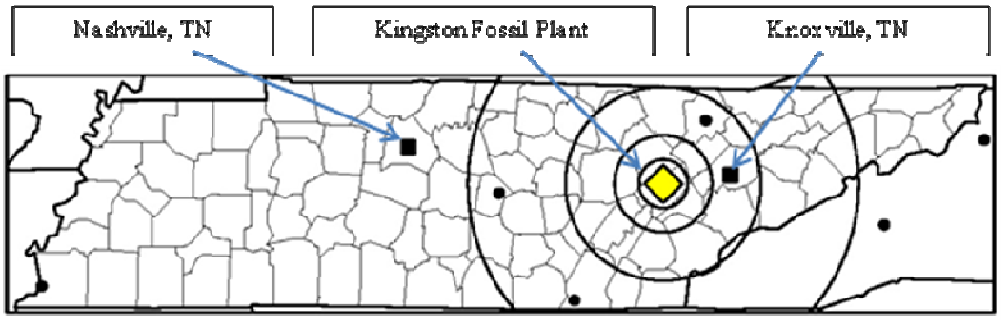

Figure 2. Location of TVA Kingston Fossil Plant and major neighboring cities. Concentric circles represent distances of 15, 30, 60, and 120 miles from the spill; dots represent local #coalash posters.

Of those who included a mappable location, 13 worked or resided in the state of Tennessee and are considered "local users" for this analysis[7]. Local users were predominantly journalists affiliated with a local news organization (N=4), or unaffiliated journalists (N=2). One Twitter user with a high rate of participation, located

[6] http://www.roanealliance.org/workforce/

[7]The majority of the #coalash posters identified their geographical location as Nashville or Knoxville (represented by the squares in Figure 2).

in Nashville, was coded as "other" and self-identified as a "Kierkegaardian Ironist." Nevertheless, he posted to the #coalash Twitter stream more than 40 times over the month-long period.

Notably, there was a lack of #coalash posts from both the community members most directly affected by the ash spill and local authorities or TVA representatives. The concentric circles on the map above (Figure 2) mark distances of 15, 30, 60, and 120 miles away from the Kingston Fossil Plant, where the coal retainment ponds were located. The closest Twitter posters were located in Knoxville, TN (between 30 and 60 miles away from the spill). Nashville, is more than 160 miles from the spill.

These mapped locations provide a snapshot of the distributed nature of #coalash contributors who participated in the networked conversation. Twitter made possible the ability of people with common interests to find one another online and collaborate with each other in the aftermath of the disaster. Furthermore, the publicly accessible nature of the communications channel made possible the broadcasting of the disaster through broad networks as well as the observations of a backchannel conversation occurring among concerned individuals.

Broadcasting the Disaster

During the first two days post-disaster, Twitter users used their online networks as a sort of grassroots mechanism (van de Donk, 2004) to raise awareness of the environmental destruction and to hold major media accountable for their lack of attention to the disaster. While local media reported on the destruction and the response efforts underway, the scope and impact of the disaster was virtually ignored by the country's largest news organizations. Many posted tweets that questioned why major media was failing to cover the disaster. On December 23, one day following the ashspill, one environmental journalist and blogger wrote:

> *"Tennessee #coalash disaster 50X worse than Exxon/Valdez; ignored by mainstream media…"*[8]

Similar posts highlighting the scope of the destruction and the lack of attention from mainstream media followed. Soon thereafter, Twitter users began to post comments directly to mainstream news reporters, such as those at CNN:

> *"@andersoncooper When is CNN going to cover the coal sludge disaster in TN?" (6:52 PM Dec 23rd, 2008)*

> *"@ricksanchezcnn please show the hypocrisy of the clean coal commercials playing during this sludge dam!" (12:45 PM Dec 24th, 2008)*

When mainstream media outlets, such as the New York Times and CBS, began to cover the disaster two days following the event onset, Twitter users gave praise, but also commented on the timing of the national news release; Christmas Eve and Christmas day.

> *"Finally a national news outlet has covered the TN #coalash story – CBS. But on Christmas eve, who saw it? …" (7:40PM Dec 24th, 2008)*

> *"NYT thankfully making coal ash spill front pg news. Finally hitting national TV. Prayers for families of E TN." (6:25 AM Dec 25th, 2008".*

One Twitterer suggested that this coverage was a result of the awareness-raising campaign that had been conducted online.

> *"#coalash is the top story, pg1 in this morning's NY Times! They'll never admit it but we shamed them into covering it…"(9:48AM Dec 25th, 2008*)

Those who participated in this grassroots broadcasting activity were not locals, but were nevertheless able to demonstrate helping behaviors (Fritz and Mathewson, 1957) online. Such activities can be perceived as responding to a dearth of information (Sutton et al., 2008) as well as providing a type of remedy (Palen et al., 2008) in the immediate aftermath of the destruction. Here an online community came to the aid of locals who were directly affected by a toxic disaster and served as their allies to spread the news of the devastation.

Talking "Toxic" in a Technological Disaster

Disaster researchers have argued that the effects of technological disasters differ in nature from other types of hazardous events due to the uncertainty or ambiguity of harm which surrounds the event (Edelstein, 1988). Contrary to the therapeutic community that commonly emerges in the immediate aftermath of disaster, where individuals join together in a spirit of mutual solidarity (Fritz, 1961), the distributed effects and the competing

[8]User names, while publicly accessible, have been deleted from these posts for purposes of maintaining some privacy. The names of public figures, such as @andersoncooper and @ricksanchez, both of CNN, have been included.

claims following a technological disaster event tend to produce a non-therapeutic community (Cutherbertson and Nigg, 1987). A non-therapeutic community might also emerge following a natural disaster, as individuals struggle to access resources and navigate complicated government programs as part of local recovery. However, the immediate emergence of fears about one's physical environment and the resultant emotional toll serves to highlight the toxicity of both the environment and the affected community following an event such as the coalash spill. Lack of understanding about the harmful substances to which victims are exposed and their long term effects, suspicions about the truthfulness of authoritative reports, and conflict among community residents regarding attributions of blame regularly result in an atmosphere described as a "corrosive community" (Freudenberg, 1997). This corrosive environment was also exhibited online as talk turned away from the grassroots goal of broadcasting the event nationally to talking toxic.

Once the major media began to report on the devastation of the event in the Tennessee Valley on December 25, three days after the spill, online chatter shifted to commentary about the long term environmental and health effects, and the organization held responsible for the disaster, the Tennessee Valley Authority. This "toxic talk" was most evident in the posts that followed a series of news conferences, press releases, and health advisories by the TVA and Environmental Protection Agency (EPA). Twitter users posted comments and critiques about the advisories made by public officials, challenging their credibility by pointing to the lack of information shared about the nature of the contaminating materials and relaying a sense of frustration and outrage about the level of destruction that was wrought on the local community.

> *"(@) #coalash Local residents being told to boil their water – that will do NOTHING to remove heavy metals…errrr!" (9:54 AM Dec 25th, 2008)*
>
> *"(@) #coalash man vomiting for 12 hours after drinking a few pots of coffee made from tainted water – on the ground report" (10:00 AM Dec 25th, 2008.)*
>
> *"TVA on #coalash disaster: "You're not going to be endangered by touching the ash material. "You'd have to eat it" Yum! url" (1:34 AM Dec 28th)*
>
> *"EPA press release re Tenn #coalash contamination: No harm to health unless you drink river water directly. No kidding. url" (10:57 PM Dec 28th, 2008)*

Contributors to the #coalash content stream appeared to have considered themselves subject matter experts due to their self-professed interest about environmental issues and green advocacy work. This expertise was exhibited in their tongue-in-cheek comments which also served as a critique of the TVA and the EPA. As later commentary demonstrated, the blame for the event was focused on these two organizations, their neglect to maintain the safety of the retainment ponds, and their seeming alliance to withhold information about the health effects of the event. Such withholding of information following a disaster is not uncommon[9] and litigation against the polluting organization routinely becomes a central focus for those directly affected (Marshall, Picou, and Schlictman, 2004). Indeed, just weeks after the spill, a number of lawsuits were brought against the Tennessee Valley Authority and one well known public advocate, Erin Brockovich, visited the site to meet with local community members. Contributors' claims of expertise, however, also manifested in a secondary way: in accordance with their self-defined interests, participants demonstrated a commitment to sharing information that was relevant as well as accurate as they challenged authorities and attempted to correct public misperceptions.

Public Editors: Correcting the Crowd

Misinformation and rumor have the potential to spread very quickly through online social networks (Fisher 2008) due to the Internet's informal structure and capabilities for unverified publication. At the same time, the collective "wisdom of the crowd" has been shown in some cases to have the capacity for self-correction (Surowiecki, 2004) as those invested in a particular topic or subject matter monitor online behaviors (Vieweg et al., 2008) and content (Sutton et a., 2008), posting corrections as necessary.

During the coalash disaster, one specific incident of misinformation sharing occurred and was corrected by citizen editors. On December 24, a Twitter user posted a link to a Scientific American article with the headline "Coal Ash is More Radioactive than Nuclear Waste"[10] prompting re-tweets across many Twitter networks. Several Twitter users commented that Scientific American misrepresented the facts about coal ash and nuclear waste, potentially causing alarm for those who live and work in the disaster zone. While arguing that the coal ash was indeed toxic, they launched a public campaign addressed to the editors of Scientific American, asking

[9] See for instance the failures of the EPA to inform residents about the air quality in lower Manhattan following the collapse of the World Trade Center buildings (OIG 2003).

[10] http://www.scientificamerican.com/article.cfm?id=coal-ash-is-more-radioactive-than-nuclear-waste

for a redaction of the headline[11] While the content of the article in question was not incorrect, the subtle nuances about the comparison between the two toxic substances were miscommunicated due to the eye-catching headline. In response, several of the Twitter participants who were also environmental journalists posted messages to Twitter with links to web pages that explained the comparisons between the two toxic substances and the potential harm that might follow. One environmentalist, the most consistent #coalash poster in the early days of the disaster posted this Tweet on January 1st:

> *"in case you've been duped by the headlines: coal ash, while less than wonderful, is NOT more radioactive than radioactive waste. (url)"*

DISCUSSION

Past disaster research has generally focused on networks that develop within specific geographically based spaces and places such as schools, workplaces, extended families, and community based groups as well as official organizations and agencies. With the increase in Web 2.0 technologies, however, networks are no longer limited to specific places, and the "space" in which they exist is a virtual one. Convergence is now facilitated online (Hughes, Palen, Sutton, Liu, and Vieweg, 2008) just as easily as on the ground, and new technologies make it possible for people from around the world to participate in activities that aid the local community. Findings about the convergence space online, which has proven in some cases to be beneficial to the community on the ground, gives rise to questions about notions of community resilience and the implications of virtual networks.

The coalash research commenced as an examination of the benefits derived from an online technology by a geographically based network. While there was little indication that the local community interacted with the virtual Twitter #coalash network, the interplay between their two worlds poses a challenge to the place-based concepts of community resilience. Virtual communities have a role to play before, during and after disaster. Indeed, virtual networks and online communities, which are by definition distributed and decentralized, may be particularly well-suited for bringing about connectivity, both physical and social, during disasters. This virtual extension of social capital may thus serve as an important means of increasing the resiliency of disaster-affected communities and groups

During the Tennessee Valley coalash disaster, Twitter served as a means for distributed individuals to share information about a local disaster that was virtually unrecognized by most of society. The small network of self-professed activists and green advocates, "tehno-geeks", and environmental journalists, found one another as an online affinity group whose self-organizing helped to sound the alarm about a devastating technological failure in Tennessee. Individual participants focused their online commentary around "toxic talk," the environmental and health related consequences of this disaster, and organizations which were the targets of blame. They also policed the accuracy of posted content, corrected misinformation and dispelled rumors.

Those Twitter users who participated most heavily in the coal ash disaster appeared to demonstrate a type of cultural competency, both in terms of their technology use as well as their expert knowledge. Early on, a #hashtag was devised and used by those who maintained a consistent presence as part of the ongoing discussion. In contrast with the "coal+ash" search, these participants also relayed more expert commentary and unique contributions; "coal+ash" posters consistently provided re-tweets and links out to popular URLs. Such patterns lead to questions about the sophistication of networked users and the extent to which they can perform as authoritative sources of information in the midst of a disaster event. Standing in direct contrast may be a "paradox of accessibility;" as Twitter popularity evolves over time and it gets easier for anyone to join the conversation, that very fact has the potential to reduce the quality of information conveyed.

Missing from this online conversation were two participant groups: the locals who were directly affected and public authorities. The emergence of information coordinators from among a distributed public (Pretrescu-Prahova and Butts, 2008) , especially those who do not experience direct disaster effects, is not unexpected. However, the near complete lack of local online presence raises questions about the effectiveness of Twitter as a means to communicate information to those most at risk. Any communication channel will be effective only insofar as it is widely adopted or reaches an unreached group. Twitter has the potential to reach individuals who rely on their personal networks to obtain informal informational updates rather than major media outlets or as a secondary means to relay information to networked groups.

The lack of local participation also raises questions about lack of access. While online networked communications have experienced tremendous growth across all demographic groups in the past year[12] , a

[11]The Editor of Scientific American did not redact the headline, but did post an addendum to the bottom of the article in question, pointing out the nuances of the comparison of coal fly ash and radioactive waste.

[12] (http://www.pewinternet.org/Static-Pages/Trend-Data/Whos-Online.aspx.)

digital divide remains an issue for those who lack access to computing hardware, knowledge of social media operations, and high speed internet or broadband (GAO, 2009). Until information is easily accessible through all types of technology, those in need of instantaneous information will be unlikely to use social media as a primary means for risk communication.

Public officials' lack of presence online raises questions about their perceptions of information value, their willingness to tap into public commentary and observe online chatter and organizing during a crisis or disaster event (Sutton, 2009), or to relay information to a public at risk and to protect their own reputation in disaster. While any analysis of Twitter use cannot inform questions about lurking activity, such as following or reading Twitter posts (in contrast with active participants who contribute to a conversation), the absence of officials online became evident as calls for accountability were raised among those who participated in this online conversation, especially as attempts to place blame began.

RECOMMENDATIONS AND CONCLUSIONS

This research has shown that networked communication in disaster supports distributed and coordinated activity that may have direct benefits to the geographically based community. Twitter served as a means to broadcast the disaster, to raise awareness, and to call for accountability following the disaster event. Participants identified themselves as experts and provided commentary on the harmful effects to health and environment while challenging and providing correction to misleading information that came from authoritative sources. While individuals and organizations most directly affected by the disaster, as well as those responsible for the event, showed little indication of participation in the online conversation, the virtual community converged to offer support through their mobilization of information. This online convergence and resultant virtual community has a place in disaster preparedness, response, and recovery activities as a source of support and a social capital resource for community resilience.

The distributed nature of participation and the comparative lack of place-based involvement, especially given the nature and demographics of the local population, gives rise to the need for local practitioners and policy-makers to take into account how best to utilize this new communication medium. Local officials cannot base their risk communication decisions upon assumptions of technology use. Without a clear knowledge of technology penetration in a community, practitioners are likely to develop communication plans and strategies that do not meet the needs of the community – both online and off. Additional research is needed to assess the extent to which new media are being adopted in local communities and how they are utilized in response to crisis events. Furthermore, comparative research should be conducted, looking across hazard type, geographical location, scope of impact, and timing of event in order to identify patterns of information exchange and the effect of official communication inserts into the online dialogue.

Manual data collection and coding made this study extremely labor intensive. Future research efforts focusing on the use of micro-blogging activity in disaster will best be accomplished using automated data alert, retrieval, and capture methods concurrent with the disaster event or in its immediate aftermath. Ideally these same mechanisms used by researchers to identify relevant data streams and to conduct quick response analysis will translate into a means for practitioners to monitor the online chatter relevant to their communities.

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