Crisis Communication and Social Media: The changing environment for natural disaster response

Tom Hart[1], Christopher Brewster[1], Duncan Shaw[2]

[1]OIM Group, Aston Business School, Aston University

[2]Warwick Business School, University of Warwick

Abstract

Over the past two years there have been several large-scale disasters (Haitian earthquake, Australian floods, UK riots, and the Japanese earthquake) that have seen wide use of social media for disaster response, often in innovative ways. This paper provides an analysis of the ways in which social media has been used in public-to-public communication and public-to-government organisation communication. It discusses four ways in which disaster response has been changed by social media:

1. Social media appears to be displacing the traditional media as a means of communication with the public during a crisis. In particular social media influences the way traditional media communication is received and distributed.

2. We propose that user-generated content may provide a new source of information for emergency management agencies during a disaster, but there is uncertainty with regards to the reliability and usefulness of this information.

3. There are also indications that social media provides a means for the public to self-organise in ways that were not previously possible. However, the type and usefulness of self-organisation sometimes works against efforts to mitigate the outcome of the disaster.

4. Social media seems to influence information flow during a disaster. In the past most information flowed in a single direction from government organisation to public, but social media negates this model. The public can diffuse information with ease, but also expect interaction with Government Organisations rather than a simple one-way information flow.

These changes have implications for the way government organisations communicate with the public during a disaster. The predominant model for explaining this form of communication, the Crisis and Emergency Risk Communication (CERC), was developed in 2005 before social media achieved widespread popularity. We will present a modified form of the CERC model that integrates social media into the disaster communication cycle, and addresses the ways in which social media has changed communication between the public and government organisations during disasters.

Introduction

Over the past three years there have been several large-scale disasters where social media has played a significant role in the response to the event. In this paper we examine the ways in which social media has been used to respond to particular disasters and discuss the implications for disaster management. We also suggest revisions to the Crisis and Emergency Risk Communication (CERC) model which accounts for the changes in crisis communication originating in social media.

A good example of the use of social media is the case of the Haitian earthquake in 2010. This event killed an estimated 100,000 people and left the nation's capital in ruins. The country has a long history of political instability, and this meant that organising the relief effort was a difficult task that required external assistance from other countries and international organisations. Due to the weakness of local organisation and infrastructure, many aspects that are usually taken for granted in a rescue operation were absent.

This absence was particularly apparent in the lack of detailed, up-to-date maps, while existing mapping was made more unreliable due to mass population movement occuring as a result of the earthquake, and also the large amount of informal housing already existing in the area. For those arriving from overseas the situation was particularly confusing. Crisis Commons, an organisation devoted the improvement of data-sharing during disasters encouraged its volunteers to update the OpenStreetMap of Haiti, which was not well-populated when the disaster struck (Goodchild & Gennon, 2010). The task was undertaken from outside Haiti and received input from across the world. The map was then used by organisations on the ground to coordinate their activities and enabled them to use GPS navigation (Meier, 2011). The task was completed within an extremely short time frame of about two days, and reflected the principle attributes of crowdsourcing : open call, collaboration with peers, and user generated content. Although this work was coordinated by an NGO, it also required collaboration with government to be a success. The Open Street Map depended upon satellite photographs provided by the United States Government to make an accurate representation possible. The availability of these images allowed the maps to reflect actual hazards and population distribution on the ground, rather than being tied to a simple static map of the pre-disaster situation.

Another example from the Haitian earthquake was the deployment of the Ushahidi platform during the earthquake. Ushahidi, which is a collaborative mapping system that relies on SMS and social media for information, enabled the collation of reports on people trapped in buildings and those requiring healthcare and humanitarian supplies. These were then mapped on the Ushahidi Haiti incident map for organisations to be able to respond.

Ushahidi relied on the contribution of volunteers to vet messages entered into the system, and also used social media, such as Twitter to locate speakers of Haitian Creole, which was required to translate the communications arriving from Haiti. Despite the massive damage caused in the earthquake, the country's mobile phone system remained relatively undamaged and allowed people to communicate with the site via text messages. Haiti has a large diaspora, and this group

proved important for translating messages, but also represented an important group who required information on relatives inside the country, information that was not forthcoming as the government had ceased to operate. This provided another source of volunteers to drive the project forward.

The Haitian earthquake is an extreme example. Given the lack of an established infrastructure to respond to a natural disaster there was a wide scope for social media to be used in new ways. In some cases this meant that social media was replicating tasks that would have been undertaken by the government in a country with a more developed infrastructure. Ushahidi's work replicated the Geographic Information Systems that are quite standard for countries with developed disaster response infrastructure. At the same time the impact of social media was more limited because the population did not have widespread access to computers or smartphones. User-generated information often originated from text messages, or phone calls. A large component of the social media response came from outside the country with volunteers coordinating their efforts by social media and also undertaking tasks that would not have been accomplished through voluntary action in the past, and certainly not through international collaboration.

A contrasting case from a country with a more developed disaster response infrastructure comes from the Australian floods in 2011. Queensland, Australia suffered severe flooding throughout late 2010 and early 2011. These floods cost thirty-five lives and caused an estimated A$30 billion in damages. These events also forced thousands of people to leave their homes, and inundated the city of Brisbane. As opposed to Haiti,the web response came from the state rather than from volunteer organisations. In particular, the police took the initiative in organising a social media presence across three popular platforms: Twitter, YouTube, and Facebook.

The police was response had three objectives:

‘• Claim our social media presence

• Engage in a two-way conversation between the QPS and the public

• Develop an online community of followers before a disaster occurred, in light of international examples such as the Mumbai terrorist attacks where social media dominated mainstream media coverage but authorities were not able to contribute or manage it with their own social media presence.’ (Queensland Police, 2011)

The police had been designated as the lead agency in responding to a disaster. Their chief concerns in using social media were around communication to the public about the extreme weather situation and also updating members of the traditional media. During the disaster the police saw a steady in increase in the number of people following their social media accounts. Numbers doubled within two weeks. During the disaster the police simplified their usual process for dealing with the press and released information at a much faster rate than usual. This simplified process

was based on existing systems for releasing information to the public and press .

The decision to use social media was not grounded in one policy decision, but represented the consensus among the staff in the police that using social media would be useful. The uptake was high and information from the police's social media account circulated on traditional media as well as through the new social networks (Queensland Police, 2011).

Notably the communication undertaken by the police focussed on pushing messages to the public rather than using social media to gather information about the disaster. In this case social media is an addition to traditional media, a new way of doing what had been done before, and often a way of doing it with more detail. For example, the police could post their news bulletins on YouTube. This allowed them to update the public in their own time without having to adjust their schedules to the requirements of traditional broadcast media. Anecdotal accounts often highlight the problems associated with false information being transmitted over social networks. Some emergency services have been deployed in response to deliberate false information posted on social media site. In addition, non-malicious errors can quickly be communicated over social media.

Furthermore, the role of social media during disasters will increase due to the growing financial crisis within traditional media. Although the development of the World Wide Web and associated technologies has influenced many different aspects of society and business the effect has been especially pronounced in the media. Traditional media, newspapers in particular, have encountered severe challenges to profitability due to the migration of advertising to the web, and also in finding effective ways to make users pay for the content the papers produce. Between 1998 and 2008 physical circulation declined by 10 million copies per day in the United States (Starkman, 2010). Several large American newspapers have been forced to close, and even long-established companies like the New York Times have faced difficulties (Starkman, 2011). This coincided with advertising moving from newspapers to the web. Although less pronounced, similar effects have been recorded in television and radio following with the 15-24 age range experiencing the largest drop (OECD, 2007).

The difficulties encountered in the newspaper and traditional media industries can in part be attributed to the rise in platforms with Web 2.0 characteristics that compete with traditional media. The dilemma is aptly summarised by Shirky:

'The question that mass amateurization poses to traditional media is 'What happens when the costs of

reproduction and distribution go away? What happens when there is nothing unique about publishing

anymore because users can do it for themselves?' We are now starting to see that question being

answered' (Shirky, 2009)

Collaborative activity, user-generated content, and continual updates allow certain sites to

mimic the traditional media, and carry out certain functions in a new way. Furthermore, the web allows media to do more than just an online newspaper, it allows maps, videos, audio, pictures, games, animations andso on to be combined in ways that are not possible in traditional media, and, perhaps most important of all it allows a user to shape and interact with the medium itself.

The CERC Model of communication

Communication during a disaster has been described in a developmental fashion through a series of frameworks and models, each recognising that a disaster has different stages that require differing communication responses from the organisation, usually a government organisation (GO), responding to the event (Seeger, 2006). The Crisis and Emergency Risk Communication (CERC) Model, developed by the Centres for Disease Control is an attempt to synthesise these differing models and frameworks into a unified model for understanding disaster communication (Palenchar, 2010).

As with all crisis or disaster communication the model's starting point is, '…the effort by experts to provide information to allow an individual, stakeholder, or an entire community to make the best possible decisions about their well-being within nearly impossible time constraints and help people ultimately to accept the imperfect nature of choices during the crisis.' (Reynolds, 2002).

The CERC model examines crisis and risk communication in terms of a cycle. The process starts in the pre-crisis period during which the main task for a GO is to communicate risk to the public. The cycle then moves into the initial event stage where priorities change from preparedness and behaviour change to reassurance and specific messages. As the initial crisis stabilises the cycle moves on to a stage where GOs offer more detailed responses to the public, and deal with specific rumours related to the disaster. During the resolution stage the focus switches to encouraging the clean-up and starting a public discussion on issues related to why the crisis first emerged and what could be done to prevent similar events occurring again. The final stage concerns consolidation and examination of the steps that can be taken to better prepare the public for similar future events, a process that feeds back into the first stage (Reynolds & Seeger, 2007). For our purposes we examine the two stages where social media is particularly pertinent:

II. Initial Event (Uncertainty Reduction; Self-efficacy; Reassurance)

Rapid communication to the general public and to affected groups seeking to establish:

- Empathy, reassurance, and reduction in emotional turmoil
- Designated crisis/agency spokespersons and formal channels and methods of communication
- General and broad-based understanding of the crisis circumstances, consequences, and anticipated outcomes based on available information

- Reduction of crisis-related uncertainty
- Specific understanding of emergency management and medical community responses
- Understanding of self-efficacy and personal response activities (how/where to get more information)

III. **Maintenance (Ongoing Uncertainty Reduction; Self-efficacy; Reassurance)**

Communication to the general public and to affected groups seeking to facilitate:

- More accurate public understandings of on-going risks
- Understanding of background factors and issues
- Broad-based support and cooperation with response and recovery efforts
- Feedback from affected publics and correction of any misunderstandings/rumors
- Ongoing explanation and reiteration of self-efficacy and personal response activities (how/where to get more information) begun in Stage II.
- Informed decision making by the public based on understanding of risks/benefits

From Reynolds & Seeger (2005)

Factors influencing the CERC Model

Changes to the media environment

Earlier works on crisis communication tend to emphasise the importance of the mass media (Harrison, 1999; Coombs, 1995; Ray, 1999). Failures in communication with the public were characterised as failures to coordinate or in some cases 'manage' the mass media, although, of course, much depended on scale (Harrison, 1999). During the actual event a small flood could be managed most effectively through direct communication with the public (contact from emergency services to evacuate, telephone warning system etc.), and indeed involving the mass media would be too slow a process to succeed in implementing a successful evacuation.

In this respect the impact of social media on the disaster communication cycle is important in as far as the traditional media is facing a decline. Stage I in the CERC concerns preparing the public for a disaster. In previous communication frameworks, media like the press, especially the local press, would play an important role in preparing the public for a disaster. For example, the local press could be used for advertising, or for providing coverage on potential risks to inform the public. As these forms of media become increasingly squeezed and marginal there will be a need for GOs to migrate to social media in order to communicate with the public. This is already the case with certain demographics,

if they've already stopped reading the newspaper then new methods need to be adopted to communicate with these individuals. Although there will still be input from media organisations that straddle traditional and social media, such as the BBC.

The situation is further complicated by the ways in which social media facilitates communication between the public. Whereas before it was possible to think about managing the media through influence on publishers and journalists, this is not an option within social media where individual users act as their own publishers. In addition, the public are now capable of organising themselves much more quickly and in much more sophisticated ways than were previously possible. The use of Twitter to organise clean-up activities after 2011 riots in the UK provides a good example, but as early as 2007 Facebook was used during the Virginia Tech shootings for classmates to collect to collect information on casualties and to organise memorials for the victims (Palen & Liu, 2009). Even assuming that there will be a prolonged transition period between traditional media and social media the latter can influence the formers agenda in new and unexpected ways, such as the collaboration between the Guardian in crowd sourcing the analysis of MPs expenses, or appeals in the traditional media for readers to use information gathered over social media to report criminals.

Two-way information flow between public and GO via social media

Social media changes the way in which information flows through the CERC model. The CERC model tends to assume that communication with the public will occur in one direction during the initial event, the GO will be informing the public about what is happening during the event and will offer reassurance and advice. Public interaction with the GO occurs instead during the subsequent phases, especially the maintenance, resolution, and evaluation phase. The expectation is that communication with the public will occur either through the traditional media, or through relevant organisations (e.g. charities, 'community leaders') that are involved with the public during the disaster (Thomas & Quinn, 2008). The expectation is that communication from the public will be manifested in specific forms (e.g. calls to emergency services, face-to-face requests for help).

Social media often manifests itself in the form of an on-going conversation. A platform like Twitter, for example, is both used to push information from other sources, almost like a news source, but also serves as a means for conversations between users, and often as way for users to pose and have questions answered (Castillo *et al*, 2010). The conversation on Twitter, and other social media, does not stop, short of a technical outage. This is pertinent because the CERC model assumes that rumour, and understanding of an event will occur at a later phase of a crisis. However, social media allows users immediate post-disaster access to speculation, rumours, and information about the crisis. Castillo observed an immediate surge in communication about the 2010 Chilean earthquake on Twitter minutes after the tremor (Castillo *et al*, 2010), and similar patterns have been noted in other crisis events.

However, there does seem to be some convergence with the CERC model in actual cases of social media use. In the first twelve

hours after a crisis event communication over Twitter about the event was found to be predominantly informational, and a third was derived from websites linked to the traditional media (Heverin, 2010). This on-going conversation also offers potential information for GOs on the crisis that they are attempting to resolve, both in the form of direct requests for help and also useful information. The predominant approach amongst some GOs has been to use social media in the way they used the traditional media, the focus being on pushing a particular message out to the public and not engaging with an on-going conversation or using social media to gather further information about a crisis event (Schmidt, 2010; Palen, 2009). The key elements in the CERC model then are II-IV. Phase II is affected because the public are much more able than before to make observations and collect information from their fellows, and so are potentially less amenable to the unified message conveyed by the traditional media, if they follow it. They may receive information about the event at second-hand and already editorialised by other users. In Phase III GOs are presented with new ways for the public to feed information to the GO, and also a new way to spread rumours. Phase IV is influenced because social media offers new ways to discuss possible failures and for people to voice their opinions on how the GOs functioned during the crisis.

Rumours, validity and accuracy in social media

A concern for the application of social media to the CERC model is the question of rumours, validity and accuracy. Phase III, which occurs when the most acute moment of the crisis has passed, addresses the issue of rumours amongst the public. The expectation is that the traditional mass media in conjunction with contact with the GO will dispel rumours and provide accurate information to the public. Although this does not always work, the traditional media, after all, can distort news about events either through sensationalism, time constraints or miscommunication. GOs and the literature on crisis communications has long been concerned with the possibility that the web could be used to communicate rumours or other false information during a crisis (Fjeld & Molesworth, 2006; Bucher, 2002). However, these do not address the particular challenges posed by social media, going only so far as to argue that GOs tend to see information on the web as less important than traditional media, and not something they should be using to make interventions during a crisis (Fjeld & Molesworth, 2006). Several cases have been reported where false social media reporting has contributed to GO resources being deployed due to a hoax or misinformation (Meier, 2011).

Platform-specific material is available from an ICT/Computer Science approach, but what is lacking is an understanding of the extent to which rumour propagation through social media is a problem. There is currently no understanding whether the proportion of erroneous or malicious information available via social media is the same as that provided to GOs via traditional conduits (e.g. calls to emergency numbers) which have all had a certain proportion of false alarms. Nor is there understanding of how social media could be integrated into existing processes in GOs. Both these are areas in need of further research.

Based partially on techniques borrowed from social network analysis, some general

pointers have been developed to identify the reliability of a contributor to social media. Some of these have been used to create automatic means for sorting social media contributions.

- The number of contacts a contributor has on a social network (Castillo *et al*, 2010).

- Length of membership on social media site (Qu *et al*, 2011)

- Additional geographic information (GPS/manual location entry) (Schmierbach & Oeldorf-Hirsch, 2010).

- Density of messages on the social media (Mendoza *et al*, 2010).

- Prevalence of dialect that matches the geographic area where the contributor reports being located (Mendoza *et al*, 2010; Hurlock & Wilson, 2011).

- Number of times a statement is questioned on social media (Mendoza *et al*, 2010),

These provide a starting point for an automated approach to evaluating communication via social media during a crisis, and offer the possibility to both monitor the informational content spread through social media and also to gather information on an unfolding crisis.

Types of communication between the public during a disaster

Aside from the truthfulness found in social media communications, a further question is the types of communication that occur via social media during a disaster. Research tends to focus on the most popular social media sites, Facebook and Twitter, with occasional insights into other platforms like YouTube and Wikipedia. The indications are that people use social media in different ways depending upon the nature of the disaster (Vieweg *et al*, 2010). In a comparison between the uses of Twitter during a grassfire and flooding, it was found that users tended to describe their location more often during the grassfire (Vieweg *et al*, 2010). This was presumed to be because the flood has a long time lag before the event where people were aware that the flood would happen and knew that they had to move (Vieweg *et al*, 2010). Thus they concentrated their communications on sharing practical information (e.g. sandbags) on preparing for the flood and voicing their feelings about the flood (Vieweg *et al*, 2010). The grassfire by contrast was a sudden event that followed an unpredictable path, and so people were much more concerned in following the location of the fire and informing friends and relatives that they were safe (Vieweg *et al*, 2010). A similar usage pattern was found during wildfires in California (Starbird, 2010). In both cases communication for conveying location often made use of local knowledge (e.g. colloquial names for landmarks) that would not be immediately meaningful for an observer outside those communities (Vieweg *et al*, 2010).

The typical types of communication over social media during a disaster can be summarised in the following categories:

1. Link to other sources of information (other social media, institutions, news websites) (Heverin & Zach, 2010; Heverin, 2010; Vieweg *et al*, 2010; Starbird *et al*, 2010).

2. User observations describing the location, progression and severity of the event either from what they are seeing or what people are telling them (Heverin & Zach, 2010; Heverin, 2010; Vieweg *et al*, 2010; Starbird *et al*, 2010).

3. Opinions, views, emotional content relating to the event (Takazawa, 2010)

These behaviours and types of information have implications for different phases within the CERC model. The passing on of relevant information and user observations has more immediate relevance during phases II-III, whereas opinions and emotional content are more related to the later phases in the model, and, as has been noted, tend to manifest later on social media in line with the CERC model. It also indicates that for the social media platforms included in these studies (Facebook, Twitter, YouTube, Wikipedia) there is a strong reliance on external content for information. Little original informational content is produced, but much secondary content is passed on, although this is often editorialised. Less clear is usefulness of the original content produced; the type, relevance and diffusion of secondary information; and the influence organisations or influential users have on the way information is distributed.

Returning to the earlier division between types of social media, which divided social media between high/low self-presentation and media richness, it would be interesting to know how self-presentation and richness influence the quality and type of information produced.

Modifications to the CERC Model

Based on the above observations we propose the following three modifications to the CERC model to integrate social media into crisis communications:

1. Understand that previous designated lines of communication may now operate in a different way. News bulletins, for example, can be distributed via social media and quickly editorialised by people on the ground. This could influence the way certain messages are received and interpreted by the general public.

2. Crisis-related uncertainty can be generated via social media through false reports, or editorialising from the public. Such an uncertainty can be contained, but may require active use of social media to quash false information. However, social media can also self-correct.

3. These responses from the public through social media will occur as soon as the disaster occurs. There is a shorter lag time between the event and

people communicating information between each other.

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