

## Preface

### IMPLEMENTING SOCIAL MEDIA IN CRISIS RESPONSE USING KNOWLEDGE MANAGEMENT

Welcome to *Crisis Response and Management and Emerging Information Systems: Critical Applications!* This book expands upon articles presented in the first volume of the International Journal of Information Systems for Crisis Response and Management, IJISCRAM, and is the first volume in an annual series of books that I expect to become an invaluable resource for crisis response and management researchers, practitioners, and students. The journal and this volume are focused on providing cutting edge research and advances in the crisis response discipline. Authors are a mix of established senior researchers, those beginning their academic careers, and some in between.

To introduce the book, this first chapter will explore two technical innovations that made headlines in disasters and crises, starting with Hurricane Katrina. The first innovation is social media, and individuals have been using it with great success to save themselves or others. The second is cloud computing, which is a fairly recent name for the innovation trend that has included open source, software as a service, and service oriented architecture. The chapter proposes that for organizations to use these innovations successfully they should use knowledge management to guide their implementation.

### OVERVIEW

Organizations need to be prepared to respond to crises. Traditionally, organizations prepare themselves for crisis response through planning, preparing response procedures and a crisis response system, and performing at least basic overview training to expected crisis responders. Crisis planning involves identifying potential crisis scenarios and determining what resources and actions will be needed to mitigate them (Raman, et al., 2010). Crisis response procedures provide direction to responders on how to recognize the crisis, what immediate actions to take, what communications to make, what long term actions are to be taken, and how to end the crisis (Jennex, 2004, 2008). Crisis response systems support communications, data gathering and analysis, and decision-making. Crisis response systems are rarely used but when needed, must function well and without fail. Designing and building these systems requires designers to anticipate what will be needed, what resources will be available, and how conditions will differ from normal. A standard model for a crisis response system is from Bellardo, Karwan, and Wallace (1984) and identifies the components as including:

- Database
- Data analysis capability
- Normative models
- User interface.

This model has been modified by Jennex (2004, 2008) using experience with the Year 2000, Y2K, response, Hurricane Katrina, the Strong Angel III and Golden Phoenix exercises, and the 2007 San Diego Wildfires to add:

- Trained users (where users are personnel using the system to respond to or communicate about the emergency)
- Dynamic and integrated (yet possibly physically distributed) methods to communicate between users (responders, concerned citizens, and victims) and between users and data sources
- Protocols/ontology to facilitate communication
- Geographical information systems
- Processes and procedures used to guide the response to and improve decision making during the crisis.

The goals of the expanded crisis response system model are to:

- Facilitate clear communications
- Improve data, information, and knowledge transfer
- Improve the efficiency and effectiveness of decision-making
- Manage data, information, and knowledge to prevent or at least mitigate information overload.

Finally, crisis response training prepares expected responders to use the crisis response system and respond effectively to the crisis. Training can take several forms, from table top exercises to full blown dress rehearsals. Also, it can be done once, annually, or at some other interval as determined by the organization (Patton & Flin, 1999; Turoff, 2002; Andersen, Garde, & Andersen, 1998; Lee & Bui, 2000; Fischer, 1998; Renaud & Phillips, 2003).

Unfortunately, crises can happen at any time making it difficult for organizations to have appropriate resources (responders, expertise, and material) where and when they are needed. Additionally, most organizations have little to no experience with real emergencies. These organizations need to take advantage of all available experience and technologies to support the decision making needed in fast paced and high stress/tension circumstances. Finally, the complexity of communicating, collaborating, and decision making processes in the context of crisis response efforts should not be underestimated or trivialized.

To mitigate the unpredictability of crises and the complexity of crisis response, affected individuals and first responders are using new technologies, particularly social media, to help themselves. Examples include:

- Concerned citizens used a wiki after Hurricane Katrina to organize, collaborate, and rapidly create the PeopleFinder and ShelterFinder systems (Murphy & Jennex, 2006).
- Citizens affected by the 2007 San Diego Wildfires used a wiki to pool knowledge on which homes burned and which survived when the local media failed to support their needs (this has not been

previously reported in the literature but was an activity performed by my students during the event).

- Mumbai citizens used Twitter to report their status, let others know where to find friends, relatives, etc., and to solicit blood donations following the 2008 Mumbai terrorist attacks (Beaumont, 2008).
- Victims trapped by falling debris during the 2010 Haiti earthquake used texting and/or Facebook to alert their friends/family to their location and condition (Boodhoo, 2010).

These anecdotes provide evidence of the value of social media to individuals in responding to crisis. However they do not indicate that organizations can benefit from the use of social media during crisis response. This paper provides a process and reason for incorporating social media into organizational crisis response planning and systems. The process is based on using knowledge management, KM, as the guiding approach to implementing social media as a technology for improving connectivity and knowledge transfer among crisis response teams.

The inspiration for this comes from the disputed 2009 Iranian elections. Plotnick and White (2010) and the Wikipedia summaries on this election include several references discussing how protesters used social media such as Twitter and Facebook to organize and manage the protests. This is interesting, but not the inspiration for the paper. The inspiration comes from the possible use of KM by the protest organizers to create a coordinated protest. The author knows of this from his role as editor in chief of the International Journal of Knowledge Management. Approximately nine months prior to the election protests, the author received a request for a copy of his knowledge management success model paper from an Iranian academic colleague. I queried the colleague on why they wanted the paper and the response was that they were researching how to create autonomous, self-organizing youth teams. I found this an odd application at the time but sent them the paper. It wasn't till the election protests nine months later that it became apparent what the possible use of the autonomous, self-organizing youth teams was. While I cannot verify that this is what the research was for, it did get me thinking on the problem of finding applications for social media and initiated my research into using KM as the process for creating the strategy and process for incorporating social media into organizations for their crisis response.

## **SOCIAL MEDIA AND KNOWLEDGE MANAGEMENT**

Plotnick and White (2010) describe social media as generally being attributed to the collaborative applications supported by Web 2.0 technologies. These include, but are not limited to, Twitter, Facebook, MySpace, wikis, and blogs. Blogs, wikis, and MySpace were the first applications becoming popular in the early 2000s, while Facebook and Twitter are more recent creations. While popular with the public, organizations have struggled to find business uses for social media. Wikis have been the first social media adapted by organizations as they have been found to be very useful in supporting collaboration within teams and work groups. Facebook, Twitter, and blogs are not always looked at favorably by organizations. Many consider them information leaks and venues for dissatisfied employees and/or customers to vent their complaints.

Jennex (2010) summarized KM as being about using knowledge and experience gained from past events and activities as an aid in making current and future decision making. Knowledge management

systems, KMS, provide tools and repositories for acquiring, storing, searching, manipulating, displaying, and transferring knowledge. KM/KMS focuses on two issues:

- Leveraging what the organization “knows” so that it can better utilize its knowledge assets, and
- Connecting knowledge generators, holders, and users to facilitate the flow of knowledge through the organization

Jennex and Raman (2009) (appearing later in this book) have discussed how KM can be used to support crisis response. They consider a crisis response system as a form of a KMS. This chapter expands on Jennex and Raman (2009) by applying KM to the specific issue of how organizations can incorporate social media into their crisis response plans. This is done using Jennex and Olfman’s (2006) investigation of what was necessary for KM/KMS success and the identification of twelve critical success factors, CSFs. Among these are having a knowledge strategy and an integrated technical infrastructure. These two CSFs can be used to align social media with organizational based crisis response.

An integrated KM technical infrastructure includes networks, databases/repositories, computers, software, KMS experts (Alavi & Leidner, 1999; Cross & Baird, 2000; Davenport, et al., 1998; Ginsberg & Kambil, 1999; Jennex & Olfman, 2000, 1998; Sage & Rouse, 1999; Yu, et al., 2004). Social media assists in several ways. As it is Web 2.0 based, social media operates over a global integrated network. Wikis, blogs, You Tube, and social networking sites all provide repositories that can be harnessed for crisis response. Additionally, these same applications provide methods of connecting to experts. Overall, social media provides a good solution to the need for an integrated technical infrastructure.

KM strategy identifies users, user experience level needs, sources, where knowledge needs to flow, knowledge processes, storage strategy, knowledge, and links to knowledge for the KMS (Ginsberg & Kambil, 1999; Holsapple & Joshi, 2000; Jennex, Olfman, & Addo, 2003; Koskinen, 2001; Sage & Rouse, 1999; Yu et al., 2004). This CSF is critical for assessing how to use social media in the organizational setting. KM strategy drives the organization to plan the use of social media. KM strategy guides the organization in finding/identifying crisis response knowledge sources as well as those needing this knowledge to assist in their crisis response. KM strategy also drives the organization to plan the storage of knowledge by driving the organization to taxonomy and ontology as well as storage formats. Social media provides methods for storing and organizing unstructured knowledge such as video, audio, victim stories, lessons learned, et cetera. Social networking applications such as Facebook provide methods for creating and communicating networks of links to expertise, as well as methods for connecting experts. Overall, preparing a crisis response KM strategy guides the organization into planning the adoption and implementation of social media into their crisis response plans.

To summarize, these two CSFs (KM Strategy and Integrated Technical Infrastructure) and the focus on connecting knowledge generators, holders, and users drive the adoption of social media as a KM technology. Social media provides technology that links KM participants and KM strategy is what helps the organization determine how to use social media.

However, social media suffer from three significant weaknesses. The first is managerial control. Organizations found it very difficult to control how members used social media and what they posted online. This lack of controls has resulted in reluctance in implementing social media applications. Second, social media also has had reliability issues. This relates to the control issue as organizations found that since they did not control the social media infrastructure they could not control version releases, reliability of accessibility, overall access to the application, and security of data, information, and knowledge placed

in social media repositories. Thirdly, social media has a trust issue with respect to postings and content. Due to the aforementioned lack of control, postings and content could be posted by anyone with no quality or truthfulness control being applied. This was an initial concern with Wikipedia as the initial thought that the power of crowds would monitor content, and postings did not work as well or as quickly as expected. The issue has been mitigated by the use of expert editorial review boards reviewing and approving content updates prior to their posting.

The advent of cloud computing is mitigating some of the reliability concerns. Wikipedia describes Cloud computing as Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on-demand, like the electricity grid. Highly reliable server farms hosted by companies providing cloud services provide reliable data, information, and knowledge storage as well as reliable Web and Web application hosting. Other benefits include the abundance of open source software. Crisis response software is available to organizations at little to no charge. Of course, the issue of control is not mitigated by the cloud or open source software.

Can and should organizations be concerned with control and truthfulness/accuracy of data, information, and knowledge? Of course they should be concerned. Data, information, and knowledge are critical resources that need to be protected. Access and/or misinformation by unauthorized persons during a crisis can cause confusion and intentional interference affecting the organization's ability to respond. Can KM assist organizations in addressing these issues? Again, of course, Jennex and Zyngier (2007) addressed incorporating security into KM. Jennex and Zyngier (2007) utilized the National Security Telecommunications and Information System Security Committee model (NSTISSC 1994), commonly known as the CIA (confidentiality, integrity, availability) model, to incorporate security into KM. Security in KM involves incorporating security processes into KM strategy. KM strategy should incorporate the use of risk management to identify threats with corresponding risks (consequence and probability) to crisis response data, information, and knowledge and includes the identification of security policies for mitigating these threats and risks. These security policies should address access control, technologies for storing, transmitting, and processing data, information, and knowledge, and processes regulating the update, use, and ultimate archiving of crisis response data, information, and knowledge.

To summarize, social media provides a rapid response and collaboration tool set that can be utilized by organizations for crisis response. It is proposed that a KM strategy for crisis response can be used to guide the adoption of social media for crisis response in organizations. Jennex (2004a) outlines the critical issues that an organization faces in creating a KM strategy. These are summarized for crisis response as follows:

- Identifying users of the KMS: Without knowing who is expected to use the KMS and for what purpose, designers do not know what knowledge or level of context needs to be captured.
- Having an overall organizational KM strategy: Without an overall organizational KM strategy many organizations tend to fail in implementing a crisis response specific KM initiative.
- Identifying a representation strategy: Crisis responders tend to be a transient workforce with a regular rate of turnover, this generally drives the organization to codify into computerized knowledge repositories as much data, information, and knowledge as possible. Also, new workers tend to need to talk to knowledge holders providing a driver to capturing as many links to knowledge as possible. Additionally, given the variety of formats that knowledge is created and used in organizations must specify how they will manage long term storage of data, information, and knowledge.

- Flooding the KMS with content: Information overload is a real issue in crisis response (Jennex and Raman, 2009). Knowledge strategy has to identify that data, information, and knowledge necessary to support crisis response decision making and focus on capturing, storing, and displaying this data, information, and knowledge.
- Inadequate search capabilities for the KMS: Crisis responders need data, information, and knowledge when they need it and cannot be expected to spend much time searching. Knowledge needs to be stored and organized in a format and with labels/tags that facilitates search and retrieval.
- Senior Management Support: Crisis response needs sensitive data, information, and knowledge that without top management support for encouraging knowledge sharing and for allocating resources, will not be available.
- Security: KM processes need to ensure critical crisis response data, information, and knowledge is secure
- Maintaining currency of knowledge: Crisis response data, information, and knowledge must be accurate and relevant temporally for users to use the KMS
- KM Goals and Purpose: Crisis response KM initiatives need a clearly identified and communicated set of goals and purpose so that the impact of the initiative can be measured.
- An Organizational Learning Culture: Organizations, and specifically the crisis response organization, need a strategy that fosters a learning organization including incentives to share and use knowledge

While addressing the above crisis response KM strategy issues, an additional set of issues need to be addressed before an organization adopts social media for crisis response:

- What technologies should be used?
- Who should use the technologies?
- What data, information, and knowledge should be made available for response?
- What security policies should be implemented?

The following section discusses how to resolve these issues.

## **IMPLEMENTING SOCIAL MEDIA FOR CRISIS RESPONSE**

### **What Technologies Should be Used?**

Technologies should be adapted based on their ability to integrate/interface with the organization's existing technical infrastructure. Additionally, the organization should conduct a crisis response needs analysis and select technologies that meet that analyzed need and assessed capability of the technology to meet that need. Some general guidelines for social media:

Wikis are excellent for collaborative authoring and storage, organization, and dissemination of documents, processes, and solutions. Wikis are appropriate for crisis planning, training, response, and recovery (Raman et al., 2010; Jennex & Raman, 2009). The key advantage is support for distributed expertise to collaborate synchronously or asynchronously. Additionally, secure wiki technology is being made available in organizational applications such as Sharepoint which are useful for internal collaboration



between organizational experts. Non-secure wikis available via open source or as a service are useful for collaboration with external experts, victims, and the general public as well as for dissemination of data, information, and knowledge to the public. External wikis from partner organizations should be identified and vetted before use. Knowledge management should also be used to identify data, information, and knowledge to be collected and made available. Finally, KM should be used to determine the format for storing the collected data, information, and knowledge.

Blogs are an excellent communication tool. As illustrated by the 2010 Gulf oil spill, blogs can be used to get an organization's message out to the public, to affected persons, and to internal members. It should also be noted that blogs are easy to set up and be used by external participants, some of whom may not be sympathetic to the organization's response.

Twitter and instant messaging applications are excellent for keeping responders statused or calling for specific needs or responses. Implementations should have specific users subscribed and the organization should monitor and manage the subscriber list.

Facebook and other social networking sites can be used much like blogs to post public information, updates for internal responders, as an instant messaging system, and to build a sustainable community (Belblidia, 2010). Users should be screened to those on the response team or in the organization for organizational sites. Public sites can be open to all subscribers.

Google map mashups can be used to create custom crisis response maps for responders, crisis management, and victims. Examples include:

- British Blizzard of 2009 where twitter was used to allow users to post snow conditions that were then published on the mashup map (Lang & Benbunan-Fich, 2010)
- The 2007 San Diego wild fires where map mashups were generated to help direct fire response and to alert victims and the public where the fire was, what houses were destroyed, what areas were still under evacuation (Toomey, et al., 2009, appearing later in this book).
- Haiti earthquake of 2010 where a map was generated fusing aerial photography with street maps so that refugee camps could be identified to relief workers so they could deliver emergency food and water supplies (unpublished research from work done in the San Diego State University Visualization Laboratory, article currently under review).

Open source software and software as a service are good choices if from established crisis response support organizations. Two such organizations are Sahana (<http://sahanafoundation.org/>) and InRelief ([www.inrelief.org](http://www.inrelief.org)). Sahana is an open source initiative that provides a full service crisis response system free to users. Users are allowed to tailor the software as needed and can provide changes back to Sahana. InRelief is a data, information, and knowledge service based on Google technology, provided by a registered non-government organization, NGO, and managed by San Diego State University. Both recognize the need for security and access control and provide those features while also allowing for open collaboration between organizations. Both also have a track record of success. Sahana has been used in major crises since 2005 and InRelief has been used to support earthquake response in Haiti and Mexico, the 2010 Gulf oil spill, and was tested by the United States military and other civilian organizations during Exercise 24 conducted at San Diego State University in September, 2010. Finally, both are KM repositories as both provide lessons learned and history from previous crises.

A concluding consideration is what computer/communication technology to utilize. Experience is showing that dedicated crisis response equipment becomes obsolete very quickly (Jennex, 2004, 2008).

It is better to utilize the computer/communication tools used by responders and other crisis response personnel on a daily basis. While wireless enabled laptop computers have been the technology of choice for the last few years, the trend is towards the use of Internet enabled cell phones with large built in memories and using data services and away from wireless laptops. This suggests that organizations should move towards hand held mobile computer/communication as it is what the responders will be accustomed to using.

## **Who Should Use the Technologies?**

Knowledge management processes should be used to identify knowledge sources and users. Social network analysis tools can be used with KM to identify data, information, and knowledge flows. It should be noted that KM analysis usually finds that data, information, and knowledge flows usually do not follow organizational hierarchies. While crisis leadership can be appointed as the organization requires, data, information, and knowledge flows work best if they are designed to fit the actual organizational social networks, including the identified knowledge gate keepers.

## **What Data, Information, and Knowledge Should be Made Available for Response?**

Knowledge management success is defined as capturing the right knowledge, getting the right knowledge to the right user, and using this knowledge to improve organizational and/or individual performance. KM success is measured by using the dimensions: impact on business processes, impact on strategy, leadership, and knowledge content (Jennex, Smolnik, & Croasdell, 2009). As previously discussed, KM strategy is the process for determining the right data, information, and knowledge to capture and store, where this data, information, and knowledge is located, who needs it, and how to get it to them. Organizations need to appoint a KM leader for this strategic effort. Jennex and Olfman (2006) caution that not all data, information, and knowledge can be captured in a computer based repository. Linkages to data, information, and knowledge also need to be identified and captured for that which cannot be extracted from a source and captured in a repository. Typical data, information, and knowledge needed to be capture includes:

- Resource data and information (type, amount, location of resources)
- Expertise needed for response such as process, equipment, risk, and personnel knowledge as well as specialized skills and capabilities knowledge
- Response procedures and processes
- Lessons learned from previous events
- Environmental, geographical, and demographic data and information
- Industry data and information
- Regulatory data and information

Useful tools for identifying critical data, information, and knowledge includes table top exercises and scenario walkthroughs, analysis of previous events, and participation in and analysis of large scale crisis response exercises.



## What Security Policies Should be Implemented?

The previous discussions provide the analysis for this activity. The organization needs to identify the response team and expert sources as well as organization sensitive data, information, and knowledge. Access control is applied by selecting the appropriate technology, secure wikis for collaboration and social networking tools/sites that allow the tool/site owner to manage access control lists. Organizations then need to implement a process for vetting and authorizing membership to the social media source. This is fairly simple prior to a crisis, but organizations need to include this process during the crisis to manage adding membership under crisis pressure and where it may need to be done very quickly. A short list of recommended security policies for crisis response follows:

- Access Control (internal and external personnel)
- Initial Hiring including Background Investigation
- Termination
- Communication/Encryption
- Acceptable Use
- Data, Information, and Knowledge Storage and Maintenance
- Software Vendor Qualification
- Application Development and Maintenance
- Data, Information, and Knowledge Validation (internal and external sources)

## CONCLUSION

Social media are being implemented by individuals during a crisis. Usually, this is a self organizing activity without any organizational control or management. However, organizations can also take advantage of social media for their crisis response as long as they take precautions to maintain the integrity of their proprietary data, information, and knowledge and manage access to these resources to those vetted appropriate. This book proposes the use of knowledge management strategy incorporating security to assist in this analysis and specifically warns against just adopting social media for crisis response without first considering its impact on and risk to the organization and its members.

The remaining chapters will support readers in determining these impacts and risks. It is my hope that readers will get sufficient knowledge and tools from these chapters to support their crisis response management researches and/or initiatives.

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