Association for Information Systems
AIS Electronic Library (AISeL)

MWAIS 2009 Proceedings | Midwest (MWAIS)

5-2009

Improving Emergency Response Decisions by Using Web 2.0

Janea Triplett
Iowa State University, rdtrip@iastate.edu

Erin Holliday
Iowa State University, eeh@iastate.edu

Patrick Kreymborg
Iowa State University, patjk@iastate.edu

Samuel Ramos
Iowa State University, samramos@iastate.edu

Improving Emergency Response Decisions by Using Web 2.0

Janea Triplett
Iowa State University
rdtrip@iastate.edu

Erin Holliday
Iowa State University
eeh@iastate.edu

Patrick Kreymborg
Iowa State University
patjk@iastate.edu

Samuel Ramos
Iowa State University
samramos@iastate.edu

ABSTRACT

Emergency response organizations such as the American Red Cross are delving into Web 2.0 applications. Although, social media has flattened the communication hierarchy, large organizations continue to use traditional top-down modes of communication. There is an opportunity to use social media to document the events of an emergency as it happens. The knowledge of a crisis could be captured first-hand by the victims of that emergency and then fed up the communication channel in a bottom-up approach through Web 2.0 applications.

Keywords

Web 2.0, social media, emergency response, communication concept

INTRODUCTION

For almost 130 years the American Red Cross has helped communities in crisis (redcross.org). Their Emergency Response Organization concentrates on five service areas: 1) helping the poor, 2) supporting military members and their families, 3) collecting and distributing blood, 4) creating health and safety education programs, and more recently 5) delivering international relief (redcross.org/aboutus). The organization has a physical presence in most communities through its 700 local chapters. The Red Cross, like many organizations and businesses, is now working to expand its presence to the online world specifically to social-networking sites.

SOCIAL MEDIA AND THE RED CROSS

The American Red Cross has a link on their main homepage that allows its users to "Access SOCIAL MEDIA sites" (redcross.org/general). This link can be found in a 'Find it Fast' box along with other important links on how to prepare for disasters, a place to register as safe and well, and on donor information. The American Red Cross is placing a level of importance on social media with its prominent place on the homepage.

The site visitor, after clicking the link to enter the Social Media site, arrives at a page which explains why adopting social media is important to the Red Cross. This page is written in first person with a conversational tone: "We're hoping to stay in tune with you by meeting you where you're already spending your time. We want to join your conversation."

The organization's official stance (redcross.org/general) is that the American Red Cross "loves the Internet" and that they were one of the first nonprofits to "accept online donations." The organization wants to become a "leader in adopting social media." When justifying their move into Web 2.0 activities, the Red Cross stated the social web was where people were interacting with one another and that they wanted to be part of that conversation. By adopting and using these tools the organization acknowledged the importance of making individual connections. The American Red Cross has an official presence in the blogosphere, Flickr, YouTube, LinkedIn, Facebook, Twitter, and Podcasts.

MODES OF COMMUNICATION

With the invention of the telephone one-to-one communication was extended beyond face-to-face communication. Distance was no longer a barrier to conversation. Email then created the ability to multicast or to engage in one-to-many communication. Social media such as blogs, Wikis, and tagging allows many-to-many communication.

One-to-Many Communication

The American Red Cross has an extensive Web site. The site directory includes 322 links to pages covering the topics of disaster services, international services, youth services, community services, nursing, blood services, diversity, government, preparedness, military, health and safety, and facility usage. The Web site allows visitors to search a database for volunteer opportunities, sign up for news feeds, access educational materials, make purchases at the store (radio, first aid kits, t-shirts), give donations, and explore job opportunities. This type of communication could be conceptualized as an official, top-down channel. The Web site is a multicast medium where the American Red Cross distributes messages to the masses.

Many-to-Many Communication

The many-to-many mode of communication might be conceptualized as the efforts by individuals and organizations who share information with each other. The sharing of information might be purposeful as in the case of an organization like the Red Cross which broadcasts alerts to get the word out about disasters for the purpose of raising funds to help the victims of those disasters. The sharing of information might be less purposeful as in the case of individuals who write and post their own stories about how the Red Cross was involved in assisting them recover from a fire, flood, or tornado. The Red Cross has a presence on Flickr and YouTube. These visual mediums graphically illustrate the personal story about wildfires in California and floods in Iowa. The individuals uploading photos and videos were both official Red Cross staff as well as volunteers.

Many-to-One Communication

The American Red Cross is currently using social media in many-to-many communication efforts such as story sharing with Flickr photos and blogging activities. The organization is also using social media in a top-down or one-to-many approach such as RSS feeds to news organizations, Facebook for official fund raising activities, and YouTube educational videos.

There is a need for a bottom-up or grassroots approach in the communication channel. One in which the American Red Cross leverages the knowledge of an emergency held first-hand by the victims of that emergency. This communication mode might be conceptualized as a many-to-one communication channel. There is an opportunity to use social media to document and report the events of an emergency. The American Red Cross needs timely and accurate information from the field in order to respond to community disaster. Who better to collect the needed information then the individuals who are directly affected by the disaster?

912 SYSTEM DESCRIPTION

Previous research on improving emergency response systems has examined using open source web-based application (Abed et al, 2008; Bahora et al., 2003; Singh 2008), mobile devices (Chaoudhury et al., 2008; daSilva et al., 2008), or geographic information systems (Hanson 2000; Hu et al., 2007; Yao et al., 2006). The collaborative application we propose will combine web, mobile devices and geographic information systems into one decision support technology to assist the American Red Cross in their emergency response activities. Cell phones with text, photo, and video capabilities will be used by lightly-trained community volunteers, emergency personnel, and even the general public to collect data from the disaster field. The Web 2.0 application will be named the 912 system.

The 912 system utilizes social media to send useful information to consumers in a variety of disasters, floods, hurricanes, tornados and earthquakes so that it can be viewed by those who may need it. The system leverages existing technology to send pictures, text messages, or videos via cell phones. Data can also be sent using the web. The system's unique quality to transmit data including geographical location makes it very useful. The primary social media used by this system is Brightkite (brightkite.com). Brightkite is a geographic-based social networking media that allows you to track your friends and meet people around you. It can show the real-world location of its registered users.

Using application programming interfaces (APIs), 912 servers pull submitted disaster information from Brightkite (Figure 1). Data from various sources and locations are overlaid with google maps. Therefore, anyone who views information from the 912 system can easily determine the geographical location of the source and can decide if it is an area of concern. The created map application can then be used as a simple triage system by decision makers who must determine when and where

to set up shelters and provide resources to affected communities. It can also serve as a community website for knowledge on the extent of a specific disaster site. The uses for the data collected are limitless.

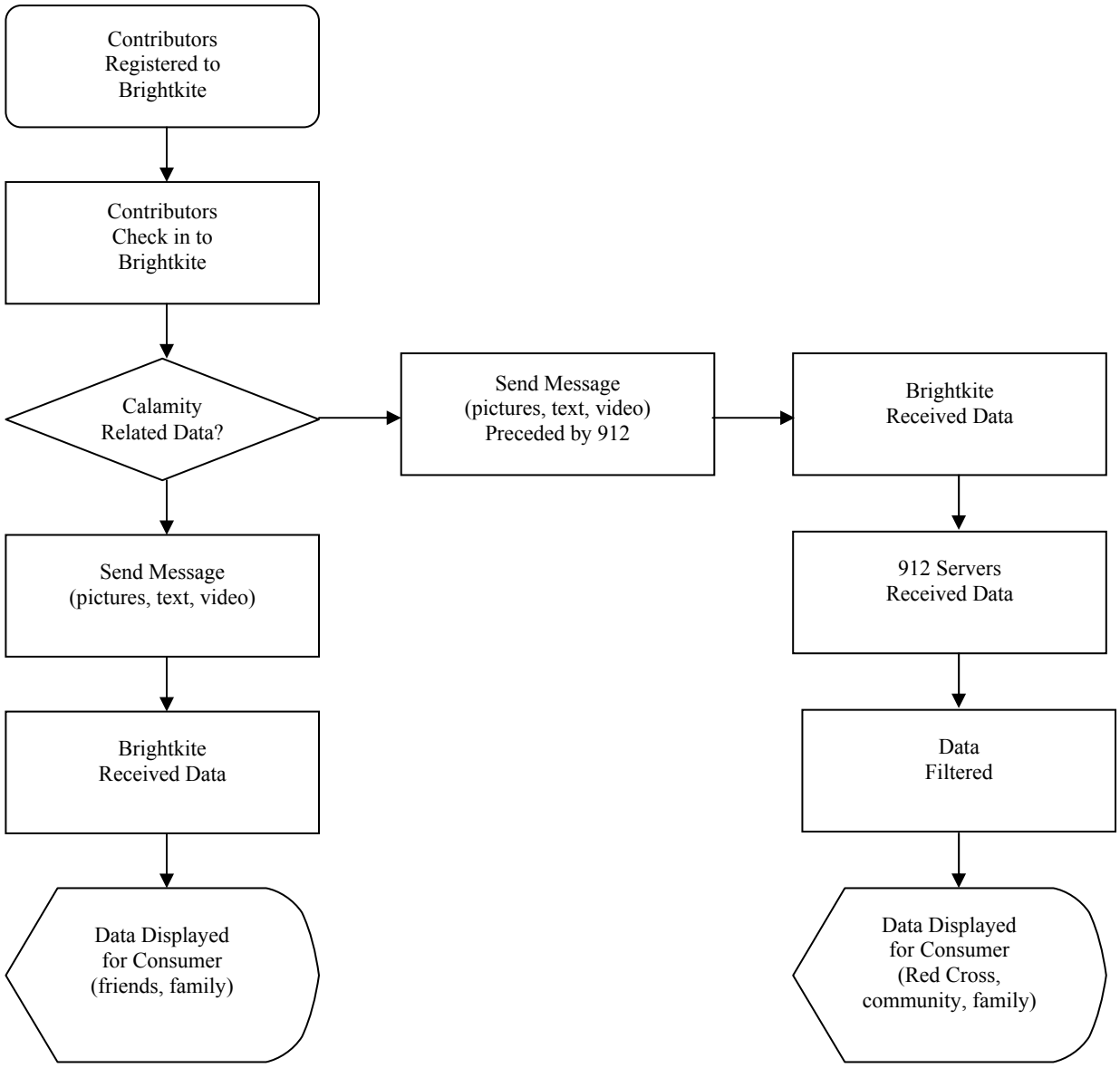

Figure 1. High Level Process Flow for 912 System

SYSTEM DIAGRAM / PROCESS FLOW DIAGRAM

Like most Social Media, users of Brightkite need to register and get an account to take advantage of its functionalities. Contributors login to Brightkite to tell the system of their location. This can be done via web, text message, or through a geographic positioning system (GPS) using SPOT (Satellite Personal Tracker). Various types of data can be sent through Brightkite. However, contributors need to decide if the data is disaster related. This could include information regarding floods, earthquakes, fires, tornados, hurricanes or other sources.

If the data is disaster related, the message sent to Brightkite is preceded by 912. Messages in the form of pictures, text, or video can be sent by using a cell phone or a computer. Brightkite receives data from its contributors. The 912 servers pull calamity related data from Brightkite. This is done by a custom application utilizing APIs provided by Brightkite.

Volunteers filter data and discard any unwanted information. Pictures, text messages or videos are categorized and tagged by the type of disaster. The 912 system displays and mashes data with google maps. Consumers can view data by different categories. The information can be viewed by location or the type of disaster.

If the data is not related to calamity, contributors send the data the same way a normal user would send data to Brightkite and instead of the information being uploaded to the 912 server, it would simply be uploaded and displayed in BrightKite. The data can be viewed by family members, friends or anyone allowed by the contributor.

FEASIBILITY

The system architecture described previously is based upon the proven BrightKite platform, thus the implementation of a 912 system prototype is quite feasible. However, the keys to its long-term success lie in collecting a significant amount of data from participants in the field and displaying in a manner that is useful to the Red Cross or other disaster response personnel, as well as the general public.

A brief study of the history of the implementation of the 911 system indicates that the general adoption of that system was facilitated by federal legislation in cooperation with major telecommunication providers that standardized phone switching equipment that was not able to handle 3-digit numbers. As an aside, some people suggested that dialing "0" for operator should be used, but since that system was also used for directory assistance and other non-emergency matters, a separate, exclusive system was sought. Several factors drove the project forward including civil disobedience riots in the late 1960's where the public was looking for one number to call for help, regardless of the situation.

The proposed 912 system could move forward without some of these barriers to implementation. Given the proliferation of mobile phone users and the recent legislation requiring that GPS data be collected from all phones, the number of potential participants that could collect relevant data is potentially large. Furthermore, the public's need for reliable mobile communication has motivated mobile telecommunication firms to implement several layers of redundancy in their infrastructure and provide quick resolution to loss of cell towers even in wide scale disasters. Thus, sizable amounts of reliable data could be collected both during and after such disasters.

Likewise, systems used to display the collected data would be redundant and co-located in areas not affected by the disaster, thus ensuring optimal up-time during emergencies. Similarly, the ability for volunteer taggers to perform their duties from any location in the world also ensures that their services would not be completely hampered by the disaster itself.

Lastly, given the Internet's ability to potentially spread the availability of such a system to both users and contributors, the general public could be notified of the need to collect data during an emergency. Specifically, messages could be sent to all cell phone users within a given area (as indentified by cell phone tower user data) to contribute relevant data during an emergency in a manner similar to Amber Alert broadcasts.

CONCLUSIONS

Given the need for timely and accurate information by the Red Cross and other agencies involved in disaster response, the proposed 912 system would assist in evaluating the needs of disaster victims during and after an emergency.

In addition to the objective of providing information to emergency responders and the general public in times of disaster, this system could also have many other applications. In general, it could provide motivation for the general public to donate needed goods and services during times of disaster as the public would quickly understand the severity of the crisis while reviewing content from the 912 system.

Furthermore, data gathered by the 912 system could be used for historical purposes as all information is both time and location stamped. Conceivably, this data could be kept for decades or even centuries and thus provide a long term record of conditions and trends for a particular area. In one application, potential property buyers could use this information to ascertain past damage to a location. Historians or sociologists might also use it to understand the impact of disasters on communities.

REFERENCES

1. Abed, F. H., H. Zhang, et al. (2008). Open source web-based GIS and database tools for emergency response. Automation and Logistics, 2008. ICAL 2008. IEEE International Conference.
2. Bahora, A. S., T. Collins, et al. (2003). Integrated peer-to-peer applications for advanced emergency response systems. Part II. Technical feasibility. Systems and Information Engineering Design Symposium, 2003 IEEE.
3. Brightkite.com "Brightkite: People, Places and Friends" Online content accessed November 30, 2008 http://brightkite.com/
4. Choudhury, T., S. Consolvo, et al. (2008). "The Mobile Sensing Platform: An Embedded Activity Recognition System." Pervasive Computing, IEEE 7(2): 32-41.
5. da Silva, M. L., V. Kostakos, et al. (2008). Improving Emergency Response to Mass Casualty Incidents. Pervasive Computing and Communications, 2008. PerCom 2008. Sixth Annual IEEE International Conference.
6. Hanson, M. (2000). "Beyond first aid: emergency response teams turn to graphics." Computer Graphics and Applications, IEEE 20(6): 12-18.
7. Hu, Z., X. Li, et al. (2007). Flood disaster response and decision-making support system based on remote sensing and GIS. Geoscience and Remote Sensing Symposium, 2007. IGARSS 2007. IEEE International.
8. redcross.org "The American Red Cross" Online content accessed November 30, 2008. http://www.redcross.org/
9. redcross.org/aboutus "About Us" Online content accessed November 30, 2008.
10. http://www.redcross.org/aboutus
11. redcross.org/general "Social Media" Online content accessed November 30, 2008. http://www.redcross.org/general/0,1082,0_345_,00.html
12. Singh, G. (2008). Information Sharing for Emergency Response. Technologies for Homeland Security, 2008 IEEE Conference.
13. Yao, B., W. Shi, et al. (2006). A WebGIS Based General Framework of Information Management and Aided Decision Making System for Earthquake Disaster Reduction. Geoscience and Remote Sensing Symposium, 2006. IGARSS 2006. IEEE International Conference.