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The Design of an Online Social Network Site for Emergency Management: A One-Stop Shop

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ABSTRACT

Web 2.0 is rapidly creating new opportunities for communication and collaboration. Part of this explosion is the increase in popularity and use of Social Network Sites (SNSs) for general and domain-specific use. In the emergency domain there are a number of websites including wikis and SNSs, but they stand as silos in the field, unable to allow for cross-site collaboration. In this paper we describe ongoing design science research to develop and refine guiding principles for the design of an SNS that will bring together emergency domain professionals in a “one-stop-shop.” We surveyed emergency professionals who study crisis information systems, to ascertain potential functionalities of such an SNS. Preliminary results suggest that there is a need for the envisioned SNS. Future research will continue to explore possible solutions to issues addressed in this paper.

Keywords

Social Network Sites, SNS, emergency, collaboration, Web 2.0

INTRODUCTION

Web 2.0 is creating opportunities for mass collaboration and has great potential for more effective and efficient communication in extreme emergencies (Benbunan-Fich and Koufaris, 2007; Turoff, Hiltz, White, Plotnick, Hendela, and Yao, 2008; White, Plotnick, Adams-Moring, Turoff and Hiltz, 2008b). It allows for the synergy of emergency professionals who otherwise might not have opportunities for knowledge exchange and collaboration. Web 2.0 applications, including wikis and social network sites, are changing how we communicate, collaborate, and develop social networks.

Social network sites (SNSs) are quickly increasing in numbers and usage (Vieweg, Palen, Liuk, Hughes, and Sutton, 2007). They provide “simple, inexpensive ways to organize members, arrange meetings, spread information, and gauge opinion” (Ellison, Lampe, and Steinfield, 2009, p. 8). They can be general purpose (e.g., Facebook), or dedicated to a specific purpose or domain (e.g., LinkedIn for business professionals and Xpedite for the emergency tracking). Even the general purpose SNSs may have groups that are dedicated to a specific purpose or domain. Facebook has many groups that focus on the emergency domain (e.g., ISCRAM, Emergency Awareness at the University of Maryland). But, each of these emergency focused SNS groups is like silos in the field. That is, they do not provide for collaboration between social networks. In this paper we report on ongoing research to develop guidelines for the design of an SNS that will bring together emergency domain professionals for collaboration and knowledge exchange in a “one stop shop.”

A social networking site is a web-based service that allows individuals to:

- 1) “Construct a public or semi-private profile within a bounded system,
- 2) Articulate a list of other users with whom they share a connection, and
- 3) View and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site” (boyd and Ellison, 2008, p, 211).

This paper reports on an exploration of design issues for building a SNS that would serve as a common meeting place, integrating extant sites, organizations and people to come together and share information, find experts, and collaborate with

others across organizational boundaries. We use a form of design science, described in the Methodology section that serves as a guide to construct, evaluate and design principles using a set of guidelines proposed in design and natural science for information systems research. We do this to ascertain the current state of SNSs, the needs of the emergency domain, and to develop possible solutions for the design of the proposed system (March and Smith, 1995). White, Plotnick, Kushma, Hiltz, and Turoff (2009), describe the beginnings of this nascent research in which students in the emergency domain, many of whom were also emergency domain professionals, were surveyed to obtain data about the perceived needs of potential users. The results of that study suggested that the proposed SNS dedicated to the emergency domain would be a valued asset to emergency domain professionals. Key capabilities suggested were expert identification; resource aggregation and availability status; and collaboration (White et al., 2009). However, the majority of student respondents were young (under 30) which may have biased the results. Younger people, who have grown up with computers and computer applications such as social networks, may have a more favorable view of SNSs. Therefore, as this paper reports, we then surveyed emergency professionals who belonged to the ISCRAM (Information Systems for Response and Management) community.

This paper is organized as follows: First we provide background from the literature on social networks and review current groups using SNSs for emergency management both at the public and government level. We then present our research questions and methodology. We discuss the results of the survey of ISCRAM professionals and implications of the results. Finally we present our conclusions, limitations, and future research.

BACKGROUND

In this research, we have adopted a definition from White et al. (2009, p. 2) which characterizes “a social network as links from and to people with other people, groups or information objects. Such objects might be messages, photos, videos, wall postings, notifications, current activities, events, widgets, etc. Such links are either at one extreme created by intelligent agents or at the other extreme by the people themselves.”

In their early existence, SNSs were characterized as being useful mainly for recreational purposes. They are now increasingly becoming an integral part of the work environment. In an InformationWeek survey conducted in early 2007, 48% of responding companies indicated that they used social network sites for viral marketing, employee recruitment, peer networking, collaboration, emergency coordination and communication (Hoover, 2007).

Social networks lower transaction costs for finding and making contact with those who share interests (Ellison et al., 2009). An emergency domain social network then can lower the cost and make more likely the finding of other professionals who have needed expertise. In addition, once contact is made with others who share interests, SNS can facilitate the maintenance of the connections (Ellison et al., 2009). This would be a great advantage for small organizations or nations who lack sufficient access to resources and emergency personnel.

For use in emergency planning and response, an SNS needs to be able to link dynamically emergency professionals to the information objects that are relevant to their current involvement in order to manage information overload more effectively (White et al., 2009).

Online Social Networks in the Emergency Domain

Technology is changing the way people communicate and should be considered when planning for emergency communications in times of crisis, as well as when there is calm and energies are focused on planning. Emergency managers should incorporate social media technologies (e.g. blogs and IM) that are now an integral part of SNSs so that they reach the desired target audience (CDC Risk Communicator, 2008). Software development should not just focus on message broadcasting but also integrate message distribution, information management and interaction: “Push, pull and interactive communication are all managed in a highly efficient and tightly integrated manner. Communications and extended teams can work together from anywhere at a time to fully complete and manage a wide range of critical communication tasks” (Baron, 2007).

SNSs have great potential for managing emergency communications. SNSs are growing in popularity as seen by the increasingly large numbers of users. For example, Facebook has an average of 600,000 new users per day. Sixty-six percent more people read blogs this year as opposed to last year. SNSs are fast, free or inexpensive, versatile, and social (Brantner, 2009). They can be developed quickly and often are hosted for free by groups such as Ning (www.ning.com). For example, a SNS was quickly created to support the needs of hurricane Gustav’s victims “specifically to aggregate news reports, hurricane alerts, blog posts, tweets, videos, and images tagged as a Gustav-related item” (Heussner, 2008).

Laura Howe, senior director for public affairs of the Red Cross stated that they are tapping into the potential of social media by using YouTube, Flickr, an online newsroom and Twitter to share information. She said, “The great thing about [Twitter]

is that your message really grows exponentially” (Heussner, 2008). Although the initial Red Cross subscriber list is small, people ‘re-tweet’ forwarding the important information to many other people.

First responders are also using SNSs to provide support for each other. For example, “Emergency and Disaster Responder Support” created a site to provide a place of support for first responders suffering ill effects from the stress of their work. On this site, the following is written, “when the bad call comes, we are here, come, vent debrief, seek confidential help from trained CISM peers, and if necessary, we even have some friends that are professional counselors and clinicians...there will be someone who can listen and help you make sense out of what is going on in your life” (disasterresponders.ning.com). Responders have found ways to use SNSs to address and mitigate other problems in the emergency domain. Erik Endress of XpediteNetwork.com is a firefighter of 20 years, recently retired. He said, “I created Xpedite in an effort to enable communities to communicate before, during and after emergencies of all kinds. From experience in the field I knew that communication is the key to mitigating virtually any kind of situation and through social networking, we can enable that” (Endress, 2009).

The Government's Use of SNS

Local, regional, and state governments are creating or using SNSs for the purposes of emergency management in their communities (CDC Risk Communicator, 2008). On the state level, the Virginia Department of Emergency Management teamed with Google to create a YouTube channel through which the Governor can broadcast emergency related information and public service announcements (CDC Risk Communicator, 2008). At the county level, a grassroots effort by the Community Emergency Response Network has been undertaken by a strong public stakeholder group of community members consisting of health care personnel, first responders and community officials. They have coordinated their efforts and goals to support the “County government’s disaster planning through the coordination of the emergency plans and resources of our participating members” (www.bepreparedbeready.org).

The Federal government also makes use of SNSs. The Federal Web Managers Council (FWMC) is a group that provides guidelines and requirements with which government websites should comply. FWMC has three strategic goals: 1) to stay up to date on technology and its uses; 2) to evaluate new technologies online and determine if the government is managing the best use the web; and 3) to develop a national network of web managers from across the government sector. All three goals can be achieved through the use of SNSs. Another benefit is that the ‘wisdom of crowds’ or ‘collective intelligence’ can emerge from the interactions (www.usa.gov; Hiltz and Turoff, 1978).

The FWMC offers a simple definition for social networking: ‘connecting people globally’ (Godwin, 2008). Governmental use of Web 2.0 technology includes: EPA Facebook group, NASA Colab, USAgov Facebook page, MySpace, Delicious, Technorati, Government blogs, Digg, LinkedIn. The Central Intelligence Agency (CIA) uses Facebook to recruit agents providing a specific example of how government agencies are using technology to help reach goals which in this case is to “Bring the best talent to work for the CIA” (FWMC, 2008).

The Department of Homeland Security is working with MySpace now to disseminate hurricane alerts. MySpace chief security officer Hemanshu Nigam told the American Free Press that these efforts are predicted to grow in scope. “What you are seeing us doing with DHS (Department of Homeland Security) and FEMA (the Federal Emergency Management Agency) is the beginning of bigger things to come in the future” (Chapman, 2008).

RESEARCH QUESTIONS

As noted in (White et al, 2009), the overarching research question is “Can a social networking site (SNS), be developed specifically to meet the needs of the emergency domain and be useful and effective for large groups of collaborating emergency professionals and volunteers?”

A useful SNS is one that meets the needs of its users. Therefore, our research focuses on recognizing those needs and developing guidelines for the design of a SNS that will, without replacing extant systems, bring together emergency professionals from diverse organizations for cross-organizational knowledge exchange and collaboration. Therefore, we ask the following research questions:

1. Given a tool that allows for ascertaining group skills and availability, would emergency groups use such a tool to form a social network dynamically for the purposes of collaboration?
2. Would emergency groups participate in such a tool on a regular basis as well so as to reach out and build a larger network or build a specialized network of experts for emergency planning and response (Turoff et al, 2004)?

3. Are there impediments to emergency groups using such tools such as policies preventing participation or the fear of raiding of human resources by other groups?
4. What measures can be implemented to attract users to an emergency domain social network and retain them?

METHODOLOGY

Overview

March and Smith (1995) propose a framework for research in information technology that combines design science and natural science. The activities of design science are to build and evaluate, while those of natural science are to theorize (discover) and to justify (March and Smith, 1995). The outputs of design science are constructs, models, methods, and instantiations (March and Smith 1995). Thus, the current research activities fall within the framework cell of “building a model.” As part of the effort we are investigating and discovering what potential users want and need which falls into the realm of natural science’s discovery activity. Thus an approach that combines design science and natural science has been taken for this research.

Our SNS design research has been divided into five iterative phases. Prior work in Phases I and II is reported in White et al. (2009). This paper reports on ongoing research in Phase III. The five phases are illustrated in Figure 1. In the first phase the problem was defined and goals clarified. The second phase was to refine research questions and developed a survey. The survey is widely distributed in Phase III and the data are analyzed to guide development of initial guiding principles in Phase IV. Finally, the guiding principles developed can be used to develop a prototype that should meet the needs uncovered during this search.

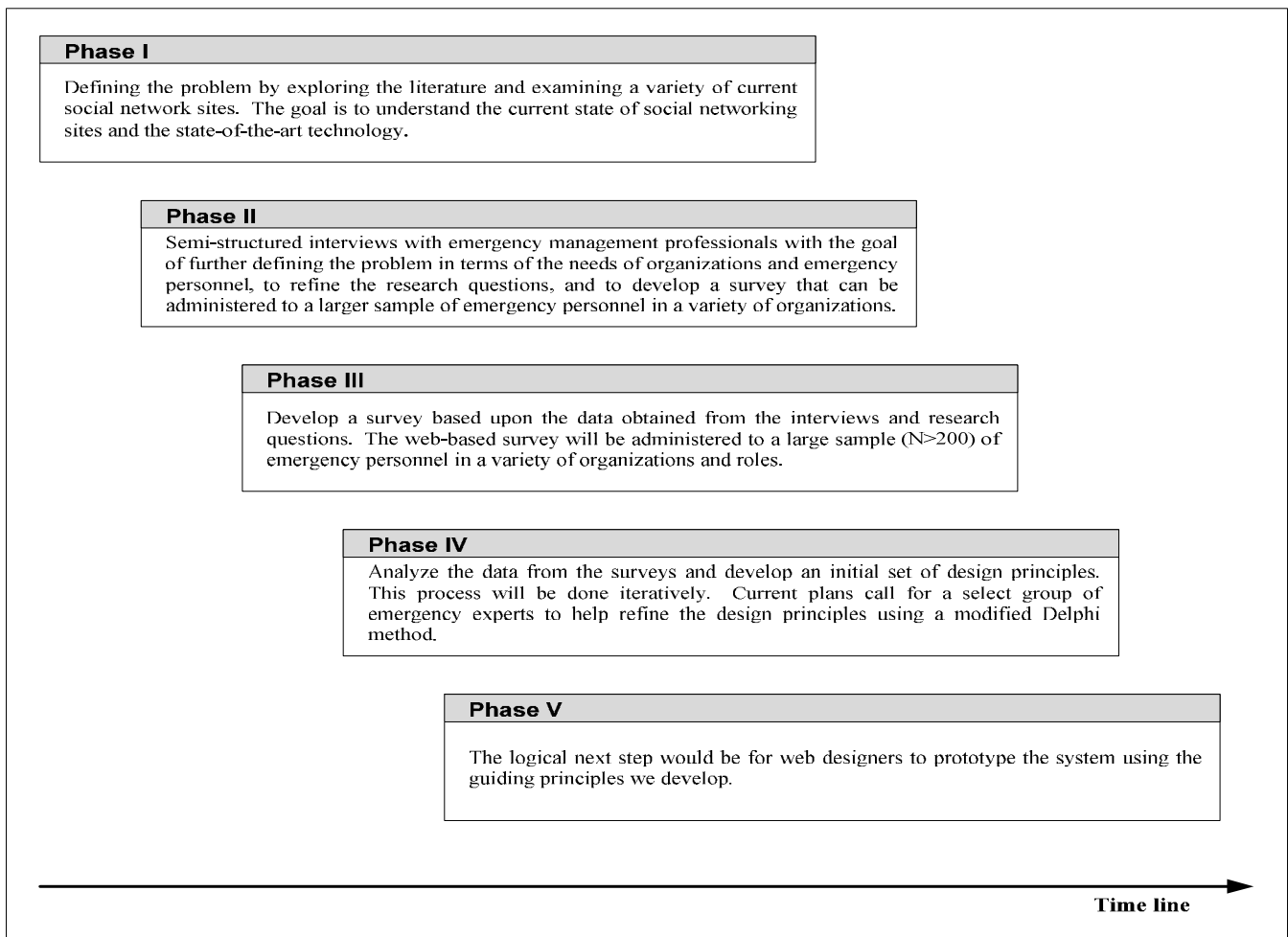


Figure 1. Phases of Research Process

Subjects

Survey respondents were members of ISCRAM (International Community on Information Systems for Crisis Response and Management) which is a worldwide community of researchers, practitioners and policy makers in the domain of information systems for crisis response and management. As professionals who study emergency management information systems from a variety of perspectives, these subjects are well-suited to provide insights into what is needed in a comprehensive SNS.

Participants were solicited by email, through the administration of ISCRAM, to all members of the community who have registered on the ISCRAM website (about 200 members) inviting them to take the survey. The prospects were given a URL address that led to the online survey posted on QuestionPro®, a survey tool provider. There were 15 usable responses. Respondents could skip questions they felt unprepared to answer. Although the response rate was low, the diversity of respondents was high. The demographic responses revealed that subjects came from such diverse locales as Belgium, Great Britain, U.S.A., Japan, and Africa.

RESULTS AND DISCUSSION

On a scale from 1 (most important) to at most 10 (least important), subjects were asked to rank which emergency management applications would be important for an SNS for emergency to have. The respondents were asked to rank as many of the listed application as they felt were suitable for the proposed SNS. The results are shown below in Table 1:

APPLICABILITY	N	MEAN SCORE
Damage assessment and disaster intelligence	14	3.57
Citizen engagement or citizen input	14	4.29
Collaborative exercise design and development	13	4.46
Collaborative problem solving	12	4.67
Training or exchange of training material	13	5.00
Consultation for real-time decision making	12	5.42
Best practices exchange	13	5.69
Planning or exchange of planning material	13	5.92
Peer exchanges among and with CERT members	13	6.69
New document evaluation and review	13	7.08

Table 1 Ranking of Applicability of a SNS in Emergency Management

It can be noted that the responses are mixed in terms of whether the proposed SNS would be most useful during an emergency or during non-urgent times. For example, one subject exclaimed, “Imagine having a real time think-tank to brainstorm an idea or a forum to run your idea by when time is very critical; a price could not be placed on this tool!” Yet, other subjects felt that non-emergent times were when an SNS for emergencies would be most helpful. One respondent wrote, “Online social networks are most useful in the context of preparedness and training. During acute emergencies their usefulness is limited by their inherent multiple vulnerabilities, including disruptions of communications, overload, lack of security, questionable quality of information from unknown sources.” Clearly, more professionals need to be surveyed to determine with more certainty, what the focus of an emergency SNS should be, so that the proper applications are developed

Current Social Network Sites

Subjects were asked to consider existing SNSs for emergency management with which they were familiar and identify a primary benefit and/or problem with each. Most of the respondents are familiar with SNS for emergency use. One problem noted is “They do not allow for the integration of other services such as regular mail a person is using, real conference discussions, attachments, and voting.” Understanding that those functions are seen as lacking gives impetus to try to include them in the design of the proposed SNS. Another problem noted is not easily solved: “A big problem ...is the cultural and language (including jargon and abbreviations) differences between members from different disciplines, organizations, and

nations.” This issue is likely to be a problem in any social network that attracts a diverse membership. More research is needed to explore how to ameliorate this concern. Perhaps a cross-referencing tool could be added to give, when a word is unfamiliar, multiple synonyms if the user requests it. One respondent noted that some of the SNSs “have too small populations; they have not “taken off.” Some disappear from the Internet completely. Some seem too commercial or too fun-oriented to feel reliable in a crisis.” One can understand from these comments, the need for a stable SNS that can be a rallying point for the emergency community. However, as another respondent noted, “A custom design really is needed.” That is the ultimate goal of this research; to design a system that has structure but allows for flexibility and agility (Harrald, 2009).

Functionality

Respondents also speculated what other characteristics and uses SNSs for emergency might have. Public involvement was one such use. A respondent wrote, “What we have seen with the California wildfires is just a start, i.e., the public helping each other. This can be a force multiplier for emergency services if it can be harnessed correctly.” The respondent went on to speculate how the system could be used in education and remarked, “...even so far as teaching kids in primary schools how to use social networks in emergencies, in the same way as they now receive instruction in how to take part in traffic as pedestrians, cyclists and (when they are older) car-drivers.” Another respondent suggested that there could be “The development of an open international warning symbol glossary....” That, of course, can help mitigate the problems of cultural diversity.

Barriers to Use

Barriers to the use of SNSs for emergency were also noted in the respondents’ answers. The common themes expressed by the respondents were:

- the need to verify and “scrub” the data,
- the need to bridge cultural differences to enable collaboration,
- the need to avoid information overload,
- the need for reliability and accessibility, and
- the need to attract users (in particular emergency managers).

These issues are supported and documented in the emergency management literature (Turoff, Chumer, Van de Walle, and Yao, 2004). For example, one respondent noted, “large volumes of information might theoretically be useful, but during the acute phase of a crisis situation, the emergency managers, particular in the field and those making operational decisions, need to know what is directly relevant to their task. They do not have the time to analyze large volumes of data from sources they may not be familiar with.” The information and communication needs must also be considered to satisfy the phases of comprehensive emergency management: mitigation, preparedness, recovery and response as different challenges are posed by each one (Quarantelli, 2002). Connectivity and accessibility by mobile devices as well as a need to decide how to allocate telecommunication resources were also noted. This highlights the overall need for connectivity, flexibility, and reliability.

Solutions to these problems were proposed. One respondent suggested, “monitoring the individual posts and their validity. Also advertisement to all emergency managers requesting them to participate in the network.” Another respondent, referring to the problem of data aggregation and reliability suggested, “A data mining approach to aggregation might help...The site would have to be included under the Critical Infrastructure Protection program in the US.” Perhaps a flexible approach to ascertaining data validity will need to be used by determining which method is best needed where.

Other Concerns

The most prevalent other concerns were of privacy and trust. A solution for the trust issue was proposed: “...this would require allowing anyone who is willing, to participate as long as they give their real name and upload an identifiable photo. The community members would then provide a semi-formal check-in voucher for service by rating how much they trust information by other members. A certain trust level would be required before new members could start new pages, set new tag names, etc.” However appealing that recommendation is, one must be cognizant of the trust issues that may result if such a plan was implemented (Altschuller and Benbunan-Fich, 2008). Designers of an SNS for emergency must balance the need

for privacy with the need for trust and validity of data. Different levels/areas of information and interaction will need different levels of trust which can be allocated through the implementation of roles and permissions (White et al., 2009).

Another question in the survey dealt with the important concern of how open (or restricted) membership should be. Of course this is a difficult question as a completely open system is vulnerable to unqualified persons participating who may deliver inaccurate information, while a completely restricted membership has the potential to block people who are active in emergency planning and response from membership. Viewig’s work shows that contrary to misconception of this idea, good information comes from an open environment (Viewig et al., 2008). Table 1 below shows the results (14 responses) of asking participants about this issue.

POLICY	PERCENTAGE RESPONSE
Open Membership with roles defining functionality and permissions	57.14%
Closed membership with Guest accessibility to only view, but not edit	28.57%
Restricted membership	14.29%
Open membership	0.0%

Table 2 Restriction Policy for Membership

Not surprisingly, given the concerns about accuracy and validity of data, none of the respondents wanted completely open membership with no restrictions. However, the majority of respondents did suggest that the membership be open with roles defining functionality and permissions. That is, all of the respondents wanted some control over who is active (and how) on the site, with the majority wanting restrictions to be by permissions, not membership. This will promote inclusion of all stakeholders. These preferences are supported by the literature on emergency management information systems needs (Turoff et al., 2004).

Government Sponsorship

In response to a question about whether FEMA sponsorship of the SNS should be sought, the majority (7) of the 13 respondents who answered the question agreed that government sponsorship is a good idea. One respondent noted that “Yes, it becomes institutionalized. Becomes easily acceptable.” Improving the ability to attract participants, while the main reason cited, was not the only one expressed in support of government sponsorship. Another respondent noted that the U.S. government is resource rich when s/he wrote, “Beyond simple endorsement, it seems to me that the U.S. government would have the resources, international and domestic connections, and credibility to research and lead an international effort to create the required site. The key would be to get countries to join in the effort so that the result would be truly international.”

On the other hand, two respondents did not think that government sponsorship was a good idea. One felt that it might become “corrupted by politics, vendors and such.” The other felt that it would not be a good idea “unless it was universally trusted.”

Sponsorship from a trustworthy source may be required to promote the perception of a stable and supported endeavor to users. Such a perception may increase trust and make it more comfortable for users to put forth the effort to build and use such a management social networking system.

From the answers to the survey, it appears that emergency professionals will be excited by the development of an SNS for emergency, albeit with some concerns (e.g., privacy, trust, reliability, validity of data). The mostly positive responses of this survey encourage the researchers to continue to study the needs of emergency professionals and to develop guiding principles that address both the needs and concerns of the potential members.

CONCLUSIONS AND IMPLICATIONS

SNSs have great potential to help manage the vast amount of information available to emergency management professionals. Many barriers exist, but solutions exist for some, while other unforeseen problems may surface.

Insights from Endress (2009) demonstrate just how many barriers there are to overcome which touch on many of our research questions of barriers, usability and costs:

“I think the major barriers are that it is such a radically different way for people to communicate as it relates to emergencies that it will take some time for them to say “wow, that is better”. In the emergency services, there are many silos and when you create something like this that levels the entire playing field, you have to convince them it will help them. There is very little technology in use by most emergency services. Fires are fought with big trucks, water and bravado. I think getting consumers to use the site will be slightly easier because most people have a natural desire to share and know what is going on. Whether they are willing to pay for that is another story.” (Endress, 2009)

A fundamental problem is, how do you bring all of this information together? Possible solutions exist like using hashing tags to route information, but this is not feasible from our previous responses demonstrating how it is already confusing using different terminology given the domain, country or other lingual challenges. We are looking into a possible domain specific SNS to help achieve this endeavor. The principles developed in this research will guide the development of the “one stop shop” and will be scalable for any size community of emergency professionals to network, find expertise, collaborate and share knowledge.

LIMITATIONS AND FUTURE RESEARCH

Our sample size was small which limits generalizability. In addition, we collected limited demographics which is a threat to representativeness. Also, we only look at SNSs which have positive goals and do not consider the effects that the world-wide digital divide might have on the success of our proposed SNS.

The research’s Phase IV development of an initial set of design principles will continue as more data are collected and analyzed until we assess that we have reached a saturation point. Phase IV will be completed by refining the design principles.

Additional research into how to motivate people and organizations to join the SNS is warranted. Questions such as how to market the idea and realization of the SNS and how to train new users need to be answered.

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