

Studying Social Technologies and Communities of Volunteers in Emergency Management

Sergio Herranz, Paloma Díaz, David Díez and Ignacio Aedo

DEI Lab

Computer Science Department

Universidad Carlos III de Madrid, Spain

sherranz, pdp, ddiez @inf.uc3m.es and aedo@ia.uc3m.es

ABSTRACT

Communities of volunteers are fundamental agents in the emergency management process. In spite of the unquestionable value that social technologies could bring to such communities of volunteers it is not clear whether they are exploiting all their potential and why. This work presents a qualitative study with volunteers from different emergency communities with the purpose of establishing design challenges to better leverage social technologies that can augment the capabilities of such communities. The results of the study suggest the need to address specific design challenges related to reliability, integrity, and efficient analysis of information. In addition, the integration of multiple interaction mechanisms and shared calendars as well as the design of effective and adaptive messages for crisis communications are also considered important aspects by emergency volunteers.

Author Keywords

Emergency management, communities of volunteers, social computing, computer-supported cooperative work

ACM Classification Keywords

H.5.3. [Information interfaces and presentation]: Group and Organization Interfaces – Computer-supported cooperative work

General Terms

Design, Human Factors

INTRODUCTION

Emergency management is defined as “the managerial function charged with creating a framework within which communities reduce vulnerability to hazards and cope with disasters” [7]. Due to the intrinsic complexity of emergency management, “technology is vital in extending our human capabilities to cope with either natural disasters or man-made disasters” [2]. In particular, a kind of technology that is capturing a great attention from researches in emergency management is social technology [18, 29]. Social

technology is defined as any type of “computing application that serves as an intermediary or a focus for a social relationship” (e.g. wikis, blogs, forums, online social networks such as Facebook or Twitter, etc.) [23]. These kinds of technologies are changing the way in which people communicate and share information during emergency situations [19], both from the citizens and the professional perspectives. Thus, there is an extensive research focused on analyzing how citizens utilize social technologies during disasters to improve communication and self-organization [14, 21, 24, 26]. From the point of view of professionals and practitioners, the opportunities provided by social technologies can be grouped in three main streams [18]: (1) using social technologies to receive information from citizens; (2) using social technologies to disseminate information to the public; and (3) using social technologies to support the activity of emergency management organizations. Few studies have considered how emergency organizations perceive the application of social technologies for their activities. There are works based exclusively on the professional’s viewpoint [3, 15], others that are focused on the perspective of emergency management students [27] but the majority exhibits a general point of view [18, 28, 29]. It means that they analyze the perception of emergency organizations in a general and uniform way, without focusing on one particular kind of organization (communities of volunteers, NGOs, groups of professionals, etc.).

In this paper we describe a more focused study that is aimed at understanding a specific kind of emergency organization: “emergency services volunteers”. These groups, organized as communities, constitute a fundamental agent in emergency management [5]. They are composed of volunteers with different backgrounds, who need regular interactions and collaborative behaviors to cope with crisis situations collectively [1]. Exploring these kinds of communities, this work aims at establishing design challenges to better leverage social technologies to enlarge their capacity to work effectively. With this purpose, a survey with thirty volunteers from different emergency services volunteers was conducted. Results of this survey suggest the convenience of providing specific socio-technical tools that fulfill the particular necessities derived from their activity. These results reveal that features such as

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the inclusion of different interaction mechanisms and shared calendars, or the design of effective and adaptive messages for crisis communications are considered fundamental by emergency volunteers. Similarly, aspects such as supporting reliability of information sources, or assisting the efficient analysis and representation of information should be addressed to make the most of social technologies in the particular context of emergency communities of volunteers.

The remaining of the paper is organized as follows. The next section establishes a theoretical background to understand the principal characteristics of emergency communities of volunteers and the potential ways in which social technologies could help them. Based on this background, the third section details the design and results of the survey. The next section discusses the design challenges derived from the survey. Finally, conclusions and further work are compiled in the last section.

BACKGROUND

Emergency services volunteers are groups of volunteers who, organized as communities, contribute with their participation to official emergency management organizations [5]. These communities require regular interaction and strong inter-linkages to properly cope with crisis situations collectively [1]. These needs make social technologies a potential solution to assist their activity. In this section we deepen into the concept of emergency services volunteers and the opportunities offered by social technologies to improve the capabilities of these services.

Emergency services volunteers

Emergency management is seen nowadays not just as the responsibility of experts but also as the responsibility of volunteers who act as communities [6]. As a result, volunteering is an essential element to cope with emergency situations [1]. One of the most important examples of volunteering in emergency management is the ‘emergency services volunteers’ that are composed of groups of people who altruistically contribute with their effort and time to official organizations in the emergency management domain. More specifically, these groups are characterized by the following features:

- **Altruistic activity.** Altruism is an intrinsic feature of volunteering. It is an unpaid activity in which time and effort is given freely [9].
- **Critical environment.** Emergency services volunteers develop their work in critical environments where they have to contribute to avoid and reduce damages and risks.
- **Professional-amateur.** Sometimes, the concept of volunteer is incorrectly equated to an unqualified amateur. Although they are amateurs, they can be as qualified as paid workers [22]. In the context of emergency management this characteristic is even more significant because volunteers are involved in critical

activities that required a basic knowledge and preparation.

- **Community effort.** Emergency services volunteers go further than just putting people together to deal with crisis situations. They involve volunteers with different backgrounds who need to exhibit collaborative relationships and group dynamics to cope with crisis situation in a collective way [1]. As a result, these groups are organized as communities, making it necessary to develop an engagement with the group as well as strong inter-linkages between the members of the group.

What could social technologies do for communities of volunteers?

In this section we review the main uses of social technologies in emergency management to try to identify potential concerns to explore in the study with communities of volunteers.

Communication with the public is perceived as one of the most obvious and beneficial areas to apply social technologies [29]. In the case of emergency communities of volunteers, social technologies can be used as a channel to allow emergency organizations to receive information from the citizens as in the Social Media Disaster Response Center of the American Red Cross [8]. There are several concerns about this possibility including guarantying the reliability of information and credibility of resources [3, 11, 27], processing efficiently the great amount of information [3, 29], or managing information overload during a crisis [29]. In the case of service volunteers with scarce resources, this approach would probably require specific tools to process and validate the bulk of data generated in social networks.

A second approach consists of using the communication channel provided by social technologies but in the opposite way: to disseminate information to the public in a viral way [18, 25, 29]. The main advantages of this approach are having a rapid dissemination of information and the possibility of exploiting a mass notification channel that is the one citizens are using for other purposes [27]. This capability to reach great amounts of people might aid in volunteer recruitment and provide a higher visibility of voluntary efforts though there are also several concerns such as the risk of message manipulation [3, 25], the need for building a reputation in the social channel [3], or the problems for disseminating complete information because of the intrinsic limitations of the channel (e.g. limited length of information) [3, 25].

Social technologies are also pointed out as instruments with a great potential to support and expand some intrinsic capabilities of emergency management organizations [27, 28]. Particularly, in emergency communities of volunteers, providing communication mechanisms is mandatory for their success [13]. Social technologies enable community members not just to communicate between them

overcoming geographical dispersion, but also to connect one each other through a network that provides multiple ways to communicate [26] and a mass notification channel within the organization for community announcements [27]. As a community, voluntary members need to be able to work together and build collaborative relationships [13]. In this sense, social technologies could help to strengthen collaborative relationships prior to any emergency situation [29]. Having a better idea of the characteristics of other community members through public profiles, using wikis to collaboratively work on the same resource, creating groups based on similar interests or sharing information through shared walls (means of public messaging in the community) are some examples of how social technologies can assist this important issue. Collaboration within a group means to share information and resources. More specifically, emergency communities of volunteers need to manage a great amount of information and knowledge. In this aspect, social technologies are considered instruments with potential to sustain a shared repository of knowledge that could be used in the future to identify best practices from the past [27, 29].

Due to the altruistic nature of voluntary involvement [30], organization and planning of community efforts could become difficult to manage. As a consequence, coordination of voluntary efforts might raise troubles. Social technologies such as shared calendars or online scheduling tools could help to organize meetings or duties in an easier and more flexible way [29]. Another particularity of these kinds of communities is the importance of spaces that support learning and training of volunteers [13]. Contribution of social technologies to provide these educational opportunities could go from static shared learning resources such as video-tutorials or professional libraries, to spaces of knowledge transmission such as forums, wikis or question-asking facilities.

Areas of usage	Particular use/benefits	Examples
Communication with the public	Rapid dissemination of information, closer relationships with citizens, visibility to voluntary efforts, aiding in volunteer recruitment. Obtaining timely information of warnings, enhancing involvement of citizens.	Facebook, Twitter, blogs, forums.
Communication within the community	Enhancing networking, knowledge exchange, mass notification of community announcements.	Facebook, instant messaging, email.
Collaboration	Strengthen collaborative relationships, providing mutual awareness, sharing ideas.	Facebook groups and profiles, electronic whiteboards, shared walls, wikis.
Knowledge management	Sustaining a repository of knowledge, sharing best practices.	Wikis, collaborative online storage services.
Coordination	Organizing and sharing meetings, planning duties and voluntary efforts.	Shared calendars, scheduling tools.
Learning and training	Assisting transmission of knowledge, providing a knowledge base.	Wikis, forums, question-asking facilities, video tutorials.

Table 1. Possible applications of social technologies in emergency communities.

A SURVEY WITH VOLUNTEERS

Technology plays a critical role for supporting communities [17]. Nevertheless, this importance does not mean that establishing a technological support should be the first task for starting a community of volunteers. On the opposite, launching a community needs firstly the engagement of people and then an appropriate technological support to sustain their work [17]. Following this assumption, before setting the technological support it is important to understand the individuals who form that community as well as what are their needs. In the context of this work, a volunteer is understood as a person who altruistically contributes with his/her effort to official organisms or agencies in the field of emergency management.

In order to explore the opinions of such individuals, an online survey composed of closed questions was performed by volunteers of different emergency services. Goals, requirements for potential participants, techniques for data gathering and analysis, and results of the survey are detailed in the following subsections.

Goal

This survey had three main goals. The first one consisted of exploring the current use of social technologies in emergency communities of volunteers. The second goal was focused on exploring how volunteers conceive and envision the application of social technologies to support their work in the community. The third goal dealt with examining the opinions and concerns of volunteers toward the use of social technologies for communicating with the public in two ways: disseminating and receiving information during an emergency situation. This particular interest comes because although it is one of the most popular and potentially beneficial uses [29], it presents several concerns from the organizations point of view [11] so we wanted to confirm whether volunteers had or not a similar perception.

Participants

The participants were thirty volunteers who belong to different emergency management communities in Spain. In order to contact them, a previous list of emergency management communities of volunteers in Spain was made. Afterwards we contacted the communities that composed the list, checking the willingness of volunteers to collaborate in our study. Finally, we gathered thirty volunteers who satisfied the following established requirements. First requirement was that volunteers must be formal volunteers. It means that they do not collaborate by their own, but their contribution is channeled through specific organizations. In terms of community involvement, second requirement was to gather both regular and episodic volunteers with both a full time and a part time involvement.

Data Collection and Data Analysis

The survey was based on an online questionnaire that was open between January 2012 and March 2012. The process

was started by sending an e-mail message to the selected participants. This e-mail contained a link to the web-based questionnaire. Once a participant completed the questionnaire, his/her responses were automatically processed and stored in an online spreadsheet. All of the thirty participants who were contacted completed the whole questionnaire.

Apart from an introduction with demographic and personal experience questions, the questionnaire was composed of a set of closed questions grouped into two parts. The first section analyzes the current utilization of social technologies as well as how volunteers conceive the application of social technologies to support emergency communities of volunteers. The second section focused on exploring the perception of participants about the possible contributions and concerns of social technologies regarding communications with the public. This popular area of usage includes two-way communications: disseminating information to the public and receiving information from them. For most questions, a 5-point Likert scale was used, from 1 (strongly disagree) to 3 (neutral) to 5 (strongly agree). Mode and medium were employed to measure the central tendency.

Results

Information about personal experience and skills with social technologies is shown in Table 2. In order to facilitate the understanding of the questionnaire, it included an introduction in which the definition and characteristics of social technologies were explained. In general terms, most participants show a medium-high levels of expertise on social technologies. Furthermore, the majority of participants use this kind of technology with a daily frequency. These results show that participants have a seamless relationship with social technologies.

	Total	Percentage
<i>1.5 Level of expertise on social technologies</i>		
Very low	1	3,33%
Low	0	0%
Medium	12	40%
High	13	43,33%
Very high	4	13,33%
<i>1.6 Frequency of use of social technologies</i>		
Never	1	3,33%
Occasionally	1	3,33%
Weekly	5	16,66%
Daily	23	76,66%

Table 2. Information about personal experience and skills with social technologies.

Section two had the goal of exploring the current usage that volunteers make of social technologies as well as how they

conceive their application to support their activity. The most remarkable result in this section is the strongest perception of the importance of social technologies to increase the capabilities of emergency communities of volunteers. In spite of this importance, results reveal that from the potential usages of social technologies determined in the background of this paper, current utilization of these technologies in these kinds of communities seems to be exclusively focused on communications and coordination efforts. This fact suggests an untapped and partial application of social technologies. Regarding the application of particular social technologies, participants highlighted e-mail as the most used. Apart from e-mail, volunteers also opt for innovative and recent technologies such as Facebook or WhatsApp. In terms of social technological services, according to the participants, a community should mainly integrate both asynchronous (e-mail) and synchronous (instant messaging) communication services as well as shared community calendars. Depending into synchronous communications, participants seem to prefer those that are less intrusive (instant messaging instead of videoconference). Finding or not videoconference intrusive could be a reason of the disagreement of participants about its usefulness (Item 2.4.2). While a slightly majority of them showed a positive attitude toward their use (Mode=4), many others also rated it with negative values; being reflected in the median (Median=3).

Item / Question		
	Mode	Median
2.1 I consider that social technologies could augment the performance and capabilities of communities in the emergency management field	5	5
2.2 In which of the following potential usages are social technologies being applied in the community you belong to?		
	Total	Percentage
<i>Supporting communications within the community</i>	28	93,3%
<i>Supporting communications with the public</i>	3	10%
<i>Building collaborative relationships</i>	5	16,66%
<i>Coordination efforts</i>	19	63,33%
<i>Knowledge management</i>	9	30%
<i>Learning and training</i>	1	3,33%
<i>Others</i>	0	0%

2.3 What of the following social technologies do you currently use to collaborate, communicate or share information with other community members?

	Total	Percentage
<i>E-mail</i>	21	70%
<i>SMS</i>	6	20%
<i>Facebook</i>	16	53,33%
<i>Twitter</i>	3	10%
<i>WhatsApp</i>	11	36,6%
<i>Blogs</i>	1	3,33%
<i>Others</i>	2	6,66%

2.4. What technological services should have a community to improve collaboration among community members?

	Mode	Median
2.4.1 A community should integrate a instant messaging service	5	5
2.4.2 A community should integrate a videoconference service	4	3
2.4.3 A community should integrate an electronic whiteboard	3	3
2.4.4 A community should support communication by e-mail lists	5	4,5
2.4.5 A community should integrate a shared community calendar	5	4
2.4.6 A community should integrate a repository of knowledge	4	4

Table 3. Part of results of communities and technologies section.

Results of the third section are contained in Table 4. This section aims at exploring how participants perceive that social technologies could contribute to the emergency management field in terms of communications with the public. Results show that the attitude of participants toward the usage of social technologies to send information to the public is positive. In this sense, all the possible benefits suggested in the questionnaire were positively rated by participants. Despite these benefits, participants also showed several concerns about this usage. In particular, their main concerns were related to the integrity of information and the necessity of specially designed messages to be effective.

Item	Volunteers	
	Mode	Median
3.1. In a specific crisis situation, official agencies should use social technologies to send information to citizen	5	4
Using social technologies for sending information to citizens provide the following benefits		
3.1.1. Information can be rapidly spread	5	4
3.1.2. You can reach more people: citizens, organizations and journalists	4	4
3.1.3. You can get a closer relationship with citizen which might result in a better understanding of crisis	4	4
3.1.4. You can get a closer relationship with citizens which might result in the creation of networks of interest	4	4
Using social technologies for sending information to citizens present the following problems		
3.1.5. You might be not reaching people you think	4	4
3.1.6. Messages can be manipulated	5	4
3.1.7. You need to be constantly active in social technologies	4	4
3.1.8. Messages have to be specially designed to be effective (short informative texts, use of multimedia)	5	4
3.1.9. You need to build a reputation in the social network before using it as a communication channel	4	4
3.1.10. There is a duplication of efforts in information dissemination that might be difficult to manage at the organization level	3	3
3.1.11. Other media (tv, radio, public screens...) are more effective	4	4
3.2. In a specific crisis, official agencies should use social technologies to receive information from citizens	4	4
Using social technologies for receiving information from citizens provide the following benefits		
3.2.1. You can get a better picture of the evolution of the situation	4	4
3.2.2. You can get a better idea of how people is perceiving the disaster	4	4

3.2.3. You can involve citizens in the response phase	4	4
Using social technologies for receiving information from citizens present the following problems		
3.2.4. You cannot guarantee the source of the information is reliable	5	4
3.2.4. There is too much information to be processed efficiently	5	4
3.2.5. There are many different social technologies application to be checked	3	3,5

Table 4. Results of social technologies section.

Receiving information from citizens through social technologies is also pointed out as positive, but slightly less positive than sending information. In this case, although participants consider that this application of social technologies could provide several benefits, concerns seem to have more significance than benefits for the participants. In particular, reliability and efficient processing of information are highlighted by volunteers as two serious problems for this use of social technologies.

DISCUSSION

Through empirically exploring the perception, needs and concerns of emergency management communities of volunteers, this research aimed at establishing design challenges to make the most of the capabilities offered by social technologies in the particular context of emergency communities of volunteers.

The growth of social technologies has created countless possibilities to support and augment the capabilities of communities. Nevertheless results of this study point out toward a need of taking better advantage of the potential opportunities offered by social technologies. According to the study, in spite of volunteers appearing to be receptive towards the use of social technologies, they do not utilize them in an intensive manner. On the contrary, they make a partial use focused exclusively on supporting coordination and internal communications efforts. Common reasons put forward to explain the deficiencies in the employment of technologies in organizations composed of volunteers are the possible low levels of technical expertise of volunteers [20] and the not positive perception of community members about the impact of technologies in their activities [12]. However, results of our study show a positive perception of volunteers about the application of social technologies. More specifically, they consider social technologies as a great instrument to improve the performance of communities. Besides, the results of the study highlight that community members have a fluent relationship with technologies, being determined to use new technologies as long as they help mediate in their activities.

Due to their enormous popularity and acceptance amongst the public, generic social technologies such as Facebook or Twitter have been considered possible solutions for supporting the activity of emergency management communities [28]. However, we should not forget that these generic social technologies were not designed for dealing with the specific problems and issues of emergency management communities. This study points out that suitable socio-technical support for these kinds of communities should take into account a set of design challenges that the current social technologies have not addressed yet. In particular, these design challenges are related to following issues:

- **Supporting trust and reliability.** Building trust and reliability is fundamental for these kinds of communities. Trust is essential for effective interactions and social relationships [4]. In addition, in emergency management deciding which sources of information are or not reliable is critical to cope to an emergency situation [11]. Nevertheless, results reveal a clear problem of credibility in crisis communications through social technologies. In particular, the main problem deals with the difficulty to guarantee reliability of the sources of information. As a consequence, it is crucial to incorporate mechanisms that help determine which sources of information could be reliable.
- **Information integrity.** According to the study, guarantying the quality and veracity of information requires not just relying on the sources of information but also relying on the integrity of that information. Therefore, it is also necessary to make efforts in terms of security and information quality to reduce the concerns of emergency volunteers regarding the possible manipulation or hacking of information in social technologies.
- **Information processing.** Emergency volunteers understand that social technologies have a great potential to promote and effective information exchange between the public and emergency organizations. In fact, they consider that social technologies can enhance the involvement of citizens during crisis situations. However, this combination of information sources generates a vast amount of information that can be difficult to control and manage. In particular, emergency volunteers were especially concerned by the difficulty of analyzing such a large amount of information at critical life-saving times. These uncontrolled volumes of information could add information overload, therefore increasing the difficulty of making decisions during an emergency situation [11]. This is especially relevant in a domain as emergency management in which an efficient decision-making is critical to avoid and reduce damages and risks. As a result, specific technology for these organizations should be designed to efficiently filter, represent and navigate between large amounts of information.

- **Personalization and adaption of messages.** Communications channels provided by social technologies introduce some constraints in the messages such as the limited length of information. In addition, these channels cannot be adapted to the particular needs of communication of the emergency management domain. Examples could be the need of specific resources such as audios or maps of evacuation routes, or the possibility of highlighting the critical information for the domain (risks, injured people, warning areas, etc.). The study has revealed the importance that these constraints and limitations have for emergency communities of volunteers. As a result, the challenge consists of enabling that messages can be specially designed to be effective in the emergency management domain, making these messages adaptable to the particular needs of emergency situations.
- **Interaction support.** Social technologies can be beneficial not just for information exchange with the public but also among community members. In this sense, the study highlights the need of providing diverse possibilities of interaction within the community. More specifically, results of the study noted the convenience of integrating both synchronous (instant messaging) and asynchronous (e-mail) communications mechanisms as well as providing a shared community calendars. Regarding synchronous communications, emergency management volunteers seem to prefer those that are less intrusive (instant messaging instead of videoconference).

CONCLUSIONS

Exploring the perception of emergency management communities of volunteers, this study shows that they consider social technologies a potentially useful instrument to be applied in their activities. In spite of its potential, results reveal that they do not utilize social technologies to all their potential. They do a partial usage focused exclusively on internal communication and coordination efforts.

Although further studies that deepen in the knowledge about communities of volunteers might be required to derive sound conclusions, a promising explanation to this limited use of social technologies could be a lack of specific tools that really fulfill the needs of emergency management communities of volunteers. Perhaps, our persistence in leveraging generic tools (tools that are not specifically focused on emergency communities), rather than trying to create new ones that encompass the particular features and needs derived from a complex domain as emergency management, is slowing down their adoption in these kinds of communities. Following this approach, the main challenge deals with designing specific socio-technical tools that keep in mind the specifics needs that arise from voluntary organizations [16] and from such a critical and complex domain as emergency management [2]. In particular, emergency volunteers consider fundamental to

support the reliability and trust of information sources, guarantee the integrity of information exchange, and assist the efficient analysis of information. In the same way, the design of effective and adaptive messages for crisis communications and the variety of interaction mechanism are considered important features for these tools.

Further work will be focused on extending the study, exploring others emergency communities of volunteers. In addition, other interesting further work could deal with providing suitable guidelines to address the design challenges exposed in this study.

ACKNOWLEDGMENTS

This work has been partly supported by the urTHEY project (TIN2009-09687) funded by the Ministry of Science and Innovation (MICINN) of the Government of Spain.

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