

THE ROLE OF SOCIAL NETWORKS IN DISASTER RISK REDUCTION

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Abstract: As of recently, the role of social networks in the disaster risk management process has become significantly important. This is largely due to a huge number of smartphones with installed applications (Facebook, Twitter, etc.) that allow their users to share information in the form of text, images and video. By analyzing and describing the multiple possibilities and significance of social networks in various stages of disaster risk management (before, during and after), the authors conducted a research of quantitative research tradition with the aim of examining the attitudes of the students of the Academy of Criminalistic and Police Studies and the Faculty of Security Studies University of Belgrade in terms of possibilities, reliability and motivation for the use of social networks in such situations. The results obtained in the research show a high degree of motivation of respondents for the use of social networks in situations immediately before, but also during and after the manifested consequences of disasters. Emphasizing the undeniable advantages of using the social networks in disaster risk management, as well as the results of the research, decision-makers could create certain programs to improve citizen security and reduce disaster risks by using information platforms of the social networks such as Facebook, Twitter, Instagram.

Keywords: disasters, social networks, Facebook, Twitter, Instagram, attitudes.

INTRODUCTION

The significance of social networks in reducing disaster risk (Cvetković&Filipović, 2017) has grown sharply over the past decade. It can be said that the increase in the number of social network users was not the only factor that contributed to this but also the acknowledgment of different advantages of their use in such situations. For example, in disaster risk management, social networks (Facebook, Instagram, Twitter) can be used in different ways (Imran, Elbassuoni, Castillo, Diaz, & Meier, 2013a): listening to public debate, monitoring situations, extending disaster response and management, crowd-sourcing and collaborative development, creating social cohesion and furthering causes (including charitable donation) and enhancing research.

In addition, social networks can be defined as web-based services that allow their users to create public or semi-public personal profiles and exchange messages with other users in the same system (Ellison, 2007). Starting from some characteristics of disasters (unpredictability, destructive consequences, difficult functioning of critical infrastructure, etc.) (Cvetković, 2017) social networks enable emergency response services to collect a range of information directly on the territory affected by the consequences of such events. It may be information on disaster characteristics such as the intensity of danger (water level and speed, soil bursting, etc.) and its impact on people and their material assets, etc. It is certainly easier to get information about the urgent needs of people in terms of necessary water and food supplies, first medical aid, etc. through the social networks. The obtained information may vary depending on the type of the social network. Generally, there are social networking sites (Facebook, Twitter), sites for sharing multimedia content (YouTube), informational, professional, scientific sites (research.gate, academia.edu), etc. Through scientific social networks, one can obtain high quality and important information for decision-makers in the local community. These are, above all, various scientific works that provide clear recommendations for the improvement in certain areas of security.

During the catastrophe caused by floods in Serbia in 2014, the social networks were massively used for sharing all sorts of information. At first, the messages were about the news of poorly-defined shores, the location of water breakthroughs in the settlements, and damage to infrastructure. It can be said that hashtag (#) was covered with various information about the evacuation in Obrenovac, the condition of the embankments in Belgrade and other cities, as well as pictures of water levels and flooded streets. In addition to publishing various messages, within a few hours, a large number of groups and pages were created on which ordinary people organized volunteers, delivery, and assistance to help reach as many disadvantaged people as possible. Further information related to the various activities of coordinating the action of care by collective centers, distribution of food and water, organization of volunteer efforts, etc.

In order to use the social networks more effectively in reducing disaster risk, it is necessary to inform all relevant entities about the possibilities of using them before, during and after such events. Only in this way will it be possible to take advantage of all the benefits of using the social networks.

LITERATURE REVIEW

Houston et al. (2015) found that fifteen distinct disaster social media uses were identified, ranging from preparing and receiving disaster preparedness information, warnings and signaling, as well as detecting disasters prior to an event and (re)connecting community members following a disaster. Also, they said that the framework illustrated that a variety of entities may utilize and produce disaster social media content. Social media have a vital role in dissemination of information during natural or man-made disasters and the volume and velocity of tweets posted during that event today tend to be extremely high, making it hard for disaster-affected communities and professional emergency responders to process the information in a timely manner (Imran et al., 2013a). Paul (2015) highlighted that during recent disasters millions of status updates appeared on various social networks and this suggests that people's reliance on the social media at times of disaster has increased tremendously in recent years. He conducted research with an aim to establish how the information relevant to emergency services could be identified from Twitter automatically during and following a natural disaster. In order to do that, an automated method of evaluating whether an individual tweet may be relevant for first responders following a natural disaster was developed and tested. The new

algorithm resulted from iterative development and testing that assigns a relevance score to each tweet (Paul, 2015). Alexander (2014) found that literature concentrated mainly on specific topics, which included the following: how social networks function and how they are used; how to build and utilise algorithms either to enhance social networking or to monitor it; the extent to which people use social networks, how they perceive them and what their communication preferences are; the penetration of devices such as 'smart' mobile telephones and the extent to which these provide people with access to social media; how social media are used in disasters; the views and opinions of emergency managers and journalists regarding social media and the extent to which the new media are integrated with more traditional means of communication; how social media interact with the traditional sources of information etc. Keim and Noji (2011) found that the role of the social networks in disaster management became galvanized during the world response to the 2010 Haiti earthquake. Also, they found that during the immediate aftermath, much of what people around the world were learning about the earthquake originated from social media sources. Because of that, they concluded that the social media became the new forum for collective intelligence, social convergence, and community activism.

The social media can positively impact disaster relief efforts (Cvetković, Milašinić, & Lazić, 2018), as they do provide an inherent coordination capability for easily coordinating and sharing information, resources, and plans among disparate relief organizations (Gao, Barbier, & Goolsby, 2011). Besides that, disaster social media users in the framework include communities, governments, individuals, organisations, and media outlets (Houston et al., 2015). Several disaster researchers and practitioners have suggested that the use of social media can help build community disaster resilience (Dufty, 2012). Imran, Elbassuoni, Castillo, Diaz, and Meier (2013b) studied the nature of the social-media content generated during two different natural disasters and trained a model based on conditional random fields to extract valuable information from such content. Also, they evaluated their techniques over two datasets through a set of carefully designed experiments. Besides, they test their methods over a non-disaster dataset to show that the extraction model is useful for extracting information from socially-generated content in general. Lindsay (2011) found that in the last five years social media have played an increasing role in emergencies and disasters. It can be said that social media sites rank as the fourth most popular source to access emergency information. The social media can be used by individuals and communities to warn others of unsafe areas or situations, inform friends and family that someone is safe, and raise funds for disaster relief.

METHODS

The subject of this quantitative research is the examination of attitudes of students at the Faculty of Security Studies of the University of Belgrade and the Academy of Criminalist and Police Studies regarding the role of social networks in reducing the disaster risk. Starting from the fact that the students of the mentioned faculties were in already formed groups, we decided to use a cluster sample and the selection of the members of the population in the sample was carried out by selecting one whole group (third year of studies). On that occasion, 315 students were interviewed, out of which 115 were from the Academy of Criminalistic and Police Studies. One-step cluster sampling was conducted for reasons of lower costs of its realization. On the other hand, the lack of conducted research is reflected in the insufficient independence of selection of sample members, since members of the same cluster have a much greater chance of finding themselves in the sample than members of different clusters. Compared to the characteristics of the sample itself, it can be said that female respondents were slightly more included (57.2%) than men (42.8%). Starting from the structure of the

student population in relation to gender, it can be said that the sample is representative. When it comes to the age of the respondents, the sample was mostly covered by respondents aged 22 (47.6%), then 21 (31.7%), and 20 (20.6%). Regarding the ownership of the facility in which students lived, as expected, the largest number lived in rented facilities (62.8%), and then in those owned by a family member (37.1%). The largest number of students encompassed by the sample was unemployed (82.5%). When it comes to household income, the highest percentage of the respondents' income was up to 210 EUR (Table 1).

Table 1: Socioeconomic and demographic information on the respondents ($n = 315$).

Variable and number of respondents	Category	Number	%
Gender	Male	135	42.8
	Female	180	57.2
	20	65	20.6
	21	100	31.7
	22	150	47.6
Ownership of house	Rented	198	62.8
	Family member	117	37.1
Employment status	Employed	55	17.4
	Unemployed	260	82.5
Monthly family income (€)	Up to 210	130	41.2
	Up to 420	100	31.7
	Up to 630	50	15.8
	Over 750	35	11.1

In order to carry out the survey, the survey questionnaire was developed and tested by Abdullah, Nishioka, and Murayama (2016). They developed a questionnaire (using brainstorming) to investigate factors which influenced people's decision-making in forwarding disaster information. Also, they analyzed using exploratory factor analysis and as a result, five factors were derived from 3 question items which are: trustworthy information, the relevance of the information during disasters, willingness to supply the information, the importance of the information and self-interest.

RESULTS AND DISCUSSION

After the survey was conducted, descriptive statistical analyses were initiated in order to determine the given responses. As for the question which social network they would use to share information about emergencies, the largest number of respondents indicated the Instagram (48.6%), Facebook (37.1%) and Twitter (14.3%). The explanation of why most respondents would use the Instagram as a social network in the sharing of information should be found in the characteristics of the networks themselves. Additional research is needed to get additional explanations about the choice of a social network (Figure 1).

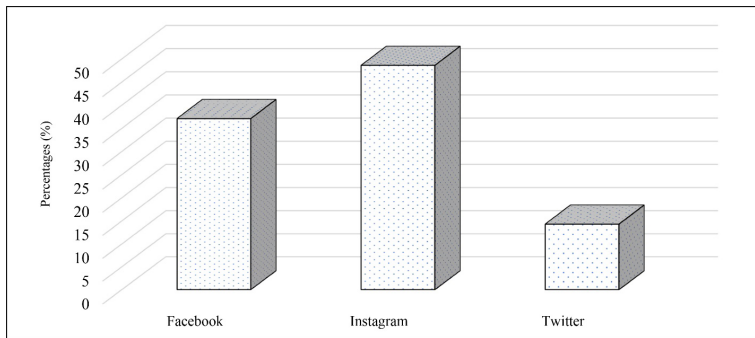


Figure 1. *Percentage distribution of answers.*

When it comes to disseminating information about disasters due to the belief that such information is predominantly accurate, the obtained research results ($M = 3.93$) show that 64.8% of the respondents agree with this assertion, while 35.2% of the respondents disagree (Table 2). It can be assumed that citizens want to share information that is true and that could help the competent authorities to improve the various aspects of citizens' safety. However, further research needs to be carried out to examine all the factors influencing the motivation of citizens to share information on disasters. Previous experience with disasters (Ardalan et al., 2010; Oral, Yenel, Oral, Aydin, & Tuncay, 2015; Shaw, ShiwakuHirohide Kobayashi, & Kobayashi, 2004) can have a major impact on taking preventive measures against such events, but also the awareness of the necessity to share important information through social networks. For these reasons, respondents were asked to evaluate the claim, "I am disseminating information about disasters because they have experience with common events". The obtained results ($M = 3.39$) show that 46.7% of the respondents agree with this statement, 29.5% neither agree nor disagree, and 17.8% disagree. Citizens who have experienced the consequences of certain disasters should be better in perceiving the needs of competent emergency and rescue services, bearing in mind that they had personally faced them.

Forwarding information on disasters via social networks could be related to knowledge (Adem, 2011; Cvetković et al., 2015; Cvetković et al., 2018; Cvetković, Lipovac, & Milojković, 2016; Pathirage, Baldry, & Seneviratne, 2010; Towers, 2015) that citizens have about specific cases of informing other citizens. The results of the survey show that 61.9% of the respondents agree, 14.3% neither agree nor disagree, and 22.9% disagree with the claim to forward information they have knowledge about ($M = 3.67$). In addition, 51.4% of the respondents forward the information because they are currently reading it and it has attracted their attention. On the other hand, 16.1% of the respondents neither agree nor disagree with such a claim, while 32.5% of the respondents do not agree at all ($M = 3.25$). A certain number of respondents (37.2%) agree with the claim that people are guided by their instincts or feelings when they forward information. In contrast, 22.9% neither agree nor disagree, while 40.1% disagree with that ($M = 3.06$). Thus, the majority of respondents disagree with the assertion that instinct or feeling may be the main motivational factor.

When it comes to the transmission of information over social networks, a number of people are forwarding information to draw attention to themselves or to achieve specific interests (Ellison, Steinfield, & Lampe, 2007; Kwon & Wen, 2010; Lin & Lu, 2011). Of the total number of respondents, 21.9% agree with the claim, 14.3% neither agree nor disagree, and 63.8% disagrees with the claim that disaster information is being disseminated to mislead other people's attention ($M = 2.19$). Since the majority of respondents disagree with this assertion, it can be assumed that respondents are experiencing such events emotionally and, according

to their personal empathy, assume that the majority of citizens forward information to help other people, not for the purpose of realizing some personal interests. On the other hand, the results of the survey show that 21% of respondents agree, 33.3% neither agree nor disagree, while 45.7% of respondents disagree with the claim that relevant information is being transmitted because citizens are excited to share significant information ($M = 2.53$). In addition, sharing information to protect people is one of the most important factors for motivating citizens (Phillips Jr, Ting, & Demurjian, 2002). The results of the survey show that 50.5% of the respondents agree, 26.7% neither agree nor disagree, and 22.8% disagree with the claim that information is being forwarded with the desire to spread the warning information ($M = 3.50$). The results obtained are expected to be taken into account in previous research (Sutton et al., 2014). In addition to the warning feature, a number of people can also forward information to remind other people what they need to do to protect themselves in a given situation (Chatfield, 2013). According to the obtained results, 60% of the respondents agree, 21% neither agree nor disagree, while 19.1% of respondents disagree with the claim that forwarded information can remind other people of certain activities ($M = 3.65$). Then, it was found that 61% of respondents agree, 19% neither agree nor disagree, while 20% of respondents disagree with the claim that information transfer can improve the safety of other people ($M = 3.66$). It is interesting to note that a greater number of respondents agree 50%, 31.4% neither agree nor disagree, and 29.5% disagree with the claim that information with negative content is forwarded because other people may be introduced to a bad example ($M = 3.09$). There are also people who use social networks to share opinions and experiences (Meissner, 2002). Of the total number of respondents, 29.5% agreed, 30.5% neither agreed nor disagreed, and 49.1% disagreed with the claim that information is exchanged for the purpose of exchange of opinions and experience ($M = 3.09$) (Table 1).

Table 1. Descriptive statistic regarding questions.

Questions	Mean	St. deviation	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I forward because I believe true information is more important than false information, so we should spread it.	3.93	1.24	5.7	8.6	21	16.2	48.6
I forward because I have experienced disasters before.	3.39	1.20	6.7	17.1	29.5	23.8	22.9
I forward information that I know and have some knowledge regarding that.	3.67	1.37	10.5	12.4	14.3	23.8	38.1
When I read the information and it captures my interest, I forward it.	3.25	1.38	16.2	16.3	16.1	29.5	21.9
I follow my instinct (or feeling) to spread the information	3.06	1.41	16.2	23.8	22.9	12.4	24.8
I forward the information to attract other people attention to get famous	2.19	1.33	45.7	18.1	14.3	15.2	6.7
I forward because I feel excited to share information about the unusual situation topic disaster.	2.53	1.27	30.5	15.2	33.3	12.4	8.6
I forward because I want to spread the warning information to other people.	3.50	1.23	5.7	17.1	26.7	21.9	28.6

I forward because I want to remind other people so that they are alert about it.	3.65	1.17	4.8	14.3	21	31.4	28.6
I forward because I believe my action could save other peoples life.	3.66	1.27	7.6	12.4	19	26.7	33.3
I'm forwarding the negative content because I can learn and alert other people of bad example.	3.09	1.27	16.2	13.3	31.4	23.8	15.2
I forward information because I want to allow exchange of opinion and discussion on the specific disaster topic in timeline.	3.09	1.27	12.4	26.7	30.5	14.3	15.2
When forwarding, I can check whether the information is true or false.	2.93	1.23	15.2	22.9	18.1	25.7	18.1
I check the information in the disaster area, so I decide to forward it.	3.09	1.34	10.5	20	21	28.6	20
I forward because I think it is important to share the information I read.	3.28	1.27	10.5	14.3	28.6	30.5	16.2
I forward because I want to inform the public who may not follow the specific Facebook, Instagram or Twitter account.	3.27	1.26	5.7	18.1	24.8	30.5	20
I forward so that people can make summary of it, for example, on their website.	3.44	1.18	11.4	20	25.7	30.5	12.4
Although I do not know about it, I forward the information so that my followers and other people can give feedback and tell about it.	3.12	1.20	13.3	16.2	31.4	18.1	21
I do not know the forwarded content in details. But if I think the information is important, I will forward it.	3.17	1.30	15.2	14.3	29.5	26.7	14.3
I forward because I want to allow my followers to add their opinion on this information.	3.10	1.25	28.6	17.1	21.9	24.8	6.7
I forward because I want to get response from disaster management professionals who may read the information.	2.63	1.31	26.7	26.7	18.1	21	6.7
I forward because I think it is good for every people to have the information about a disaster.	2.54	1.27	14.3	26.7	27.6	22.9	8.6
I forward because I feel awkward after I saw the high number of forwarding information.	2.85	1.17	21.9	24.8	22.9	23.8	5.7
I will forward if the one who forwarded the message has a good 'follower' relation.	2.96	3.28	15.2	15.2	29.5	29.5	10.5
I forward because I trust the informer.	3.05	1.21	18.1	17.1	28.6	24.8	10.5
I forward because the information may relate to my followers' situation.	2.91	1.25	15.2	29.5	26.7	22.9	5.7
I forward because by forwarding, I can collect disaster information for other peoples' use and need.	2.74	1.14	12.4	18.1	31.4	24.8	13.3
I forward because the information from social networks are faster updated than the information from TV.	2.74	1.14	11.4	16.2	26.7	22.9	22.9
I forward because the information come from trusted source and highly believable site.	2.70	1.19	8.6	21.9	27.6	19	22.9
I forward because I can get detailed disaster information from local people rather than from news and TV.	3.09	1.20	14.3	18.1	29.5	21	17.1
I forward because there is a proof from disaster locations together with the information.	3.30	1.29	18.1	15.2	28.6	22.9	15.2
I forward the information which contains facts in it.	3.26	1.26	8.6	15.2	35.2	27.6	13.3

I forward disaster information because I want to get advice on disaster preparation.	3.09	1.28	10.5	18.1	28.6	26.7	16.2
I forward because I can get early information from social networks before I proceed to check on the safety status of my friends and family by telephone.	3.01	1.31	10.5	16.2	24.8	32.4	16.2
I forward because hashtag function helps and allows me to easily gather a lot of information about the disaster.	3.22	1.12	13.3	12.4	59.5	32.4	12.4
I will forward the information because I feel pressured and desperate in tense situations.	3.20	1.21	16.2	18.1	28.6	25.7	11.4
I will forward if the information is for fun or joke.	3.28	1.21	14.3	22.9	27.6	18.1	17.1
I will forward if the information is a positive thing.	3.18	1.20	9.5	17.1	28.6	24.8	20

When forwarding information via social networks, the question arises as to whether those who forward such information examine the accuracy of its content. The analysis of the obtained results shows that 43.8% of the respondents agree, 18.1% neither agree nor disagree, while 38.1% of the respondents disagree with the claim that forwarded information is accurate ($M = 2.93$). As one of the reasons for information forwarding, we have examined the agreement with the statement, "I check the information in the disaster area, and therefore I decide to forward it". Of the total number of respondents, 48.6% agree with the claim, 21% neither agree nor disagree, and 30.5% disagree with the claim ($M = 3.09$). On the other hand, 46.7% of respondents agree, 28.6% neither agree nor disagree, while 24.8% of respondents disagree with the claim that information is forwarded because it is important to share information that are readable ($M = 3.28$). In addition, 40.5% of the respondents agree with the opinion on forwarding information for the purpose of informing the public, 24.8% neither agree nor disagree, and 23.8% disagrees with the claim ($M = 3.27$). 42.5% of respondents agree with the claim that information is forwarded so they can be found on some websites, 25.7% neither agree nor disagree, and 29.5% disagree with that ($M = 3.44$). The disclosure of information because of the followers is also a very important factor with which 38.1% respondents agree, 31.4% neither agree nor disagree, and 29.5% of respondents disagree with the mentioned factor ($M = 3.12$).

The respondents were asked to evaluate the agreement with the claim that they are familiar with the content of the message they are sending. According to the obtained results, 41% of respondents agree with the above statement, 29.5% neither agree nor disagree, and 29.5% of respondents disagree ($M = 3.17$). Observed from another angle, 31.5% of respondents agree, 21.95% neither agree nor disagree, while 45.7% of respondents agree with the statement that they forward information so that his or her followers can write their opinion about it ($M = 3.10$). 27.7% of respondents agree with the assertion that the information is forwarded so that feedback can be obtained from the protection and rescue forces managers, while 18.1% of respondents neither agree nor disagree and 53.4% of respondents disagree ($M = 2.63$). The majority of respondents disagree with the aforementioned claim and accordingly, reasons for the forwarding of information should be sought in other motivational factors. Further analyses found that 29.5% of respondents agree, 27.6% neither agree nor disagree, and 41% disagree with the claim that information is forwarded because it is good for everyone to be familiar with the disaster information ($M = 2.54$). On the other hand, 40% of respondents agree, 29.5% neither agree nor disagree, and 30.4% disagree with the claim that they would forward the information if there is a good connection with followers ($M = 2.96$). Then, it was found that 35.3% of respondents agreed, 28.6% neither agreed nor disagreed, and 35.2% disagreed with the claim that information is forwarded because a source is reliable ($M = 3.05$). It was found that 28.6% of respondents agree, 26.7% neither agree nor disagree, and 44.7% disagree with the forwarding of information that may be related to followers ($M = 2.91$). Regarding the disposition to disseminate information about disasters because such forwarding

is much faster than on television and radio, 45.8% of respondents agree, 26.7% neither agree nor disagree, and 27.6% disagree ($M = 2.74$). Of the total number of respondents, 41.9% agreed, 27.6% neither agreed nor disagreed, and 30.5% disagreed with the claim that information coming from a reliable source is forwarded ($M = 2.70$). 38.1% of respondents agreed that disaster information should be sent directly through people affected by the consequences of disasters, 29.5% neither agree nor disagree, while 32.3% of respondents agree ($M = 3.09$). A large number of respondents agree that forwarding of such information is very important and necessary. In relation to the forwarding of information for which there is evidence, 38.1% of respondents agree, 28.6% neither agree nor disagree, and 33.3% disagree ($M = 3.30$). Of the total number of respondents, 40.9% of respondents agreed, 24.8% neither agreed nor disagreed, while 26.7% of respondents agreed that forwarding of information was conditioned by the speed of disaster information ($M = 3.09$). The dissemination of disaster information is also due to high pressure. 37.1% of respondents agree with this view, 28.6% neither agree nor disagree, and 34.3% disagree ($M = 3.28$). Also, 44.8% agree, 28.6% neither agree nor disagree, and 26.6% of respondents disagree with the claim that information are being forwarded if they are positive ($M = 3.18$).

CONSLUSION

Based on the fact that a large number of people use some of the existing social networks, decision-makers, as well as emergency response officers, should pay much more attention to their use in reducing disaster risk. They can be ideal for raising awareness of citizens about the existing dangers which surround them, as well as for educating them on preventive measures in order to mitigate or eliminate the consequences of such events. Social networks can play a key role in informing citizens, gathering help for affected people, gathering people to help vulnerable ones. Certainly, the use of social networks can have serious negative consequences, such as spreading misinformation, raising an unnecessary level of fear, etc.

In relation to preventive activities, social networks can be used to disseminate all information on disaster hazard characteristics at the local level. It is possible to introduce citizens with risk maps in the areas they live in. In addition, it is possible to develop interactive online campaigns to improve the readiness of citizens to respond in such situations. On that occasion, it is possible to use educational videos, photos, and text in the context of the hazards characteristic of the area in which people live. In addition to preventive activities, social networks can be very helpful in responding to and eliminating the consequences of the events that have occurred. Endangered people can photograph and record a large number of details important for making final decisions about the actions of members of the emergency rescue services. The obtained results of the research showed a great interest among the respondents in the use of the social networks in order to share information about disasters. Numerous factors influence the motivation of people to share information during disasters, and one of them is certainly concern for the safety of other people.

After disasters, social networks can greatly facilitate the setting of priorities for the distribution of food and water. Surely, in order to exploit the full potential of the social networks, it is also necessary to educate citizens how they can help emergency rescue services in the implementation of activities aimed at reducing the disaster risk. Relevant strategies, both national and local, should take into consideration the potentials of the social networks for reducing the risk of disasters. It is necessary to continue with the implementation of the research in order to as much as possible clarify doubts about the importance of the social networks in the process of disaster management.

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