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Ethical, Legal and Social considerations surrounding the use of Facebook groups during Hurricane Irma in Cuba

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ABSTRACT

While Hurricane Irma struck the Cuban Southern coasts, thousands of tourists were evacuated from this area and relocated in the Varadero peninsula. In a couple of days, all means for families and friends to connect with the tourists were down, leaving them without any information about the on-site situation. This paper focuses on the volunteer citizens' initiative to take advantage of social media, to enhance their own situational awareness in Varadero area, supporting fellow citizens to identify and localize their relatives. In particular, two Facebook groups that were created at the time are analyzed and their messages' content and objectives categorized. We will show that once more, social media has constituted opportunities for citizens to engage a specific response to the crisis, but at the same time has raised specific ethical and social issues. On one hand, social media has constituted a virtual space of care supporting self-help and psychological help between citizens, fostering at the same time community resilience. On the other hand, its use has also put at stake governance, responsibility, equity and privacy principles.

Keywords

ELSI, Social Media, Volunteers, Citizens, Hurricane Irma

INTRODUCTION

On September the 8th the eyewall of the hurricane Irma moved over Cuba from the South east. Initially, meteorologists hadn't predicted a direct hit for this Island. As prevention, nearly one million people from low-lying areas, including thousands of Canadian and European tourists were evacuated mostly in the Peninsula of Varadero (province of Matanzas), the northernmost point of the island of Cuba. The intensity of the hurricane was varying between categories 4 and 5 while moving through the island. By late morning on September 9, Irma had weakened to Category 3 but continued to cause significant damage for the next 24 hours while heading to the North, affecting all the northern Coast-Cayes and the provinces of Sancti Spíritus, Villa Clara and Matanzas (where tourists were displaced) until reaching Havana.

Looking for the events regarding Cuba's situation at that time, little information is available on the Internet. The chronology we propose here is mainly based on the exchanges we had through social networks with relatives

having experienced these events from inside (in the eye of the storm). On Wednesday the 6th, in Europe, Hurricane Irma is followed and announced as potentially dangerous for Cuba – At that time tourists were not aware of the threat. On Thursday the 7th, tourists had been informed that they would be moved to Varadero area in prevision of the Hurricane –forecasts were predicting that the hurricane would impact the south of the island before rapidly moving to the United-States coasts. On Friday the 8th, tourists have been placed in the several hotel complexes in the Peninsula of Varadero. At noon, they were informed that in prevision of the storm, they would be confined in their rooms (and more specifically, in the bathrooms during the highest point of the storm) upstairs. Irma was still supposed to move quickly to the coasts of the USA.

This is the last and direct contact with tourists until Monday the 12th. In the meantime, Hurricane Irma had changed its trajectory and had kept moving West until the region around Havana. On September the 9th, European families, without any news from their relatives, were aware of this change of situation discovering through the Internet that flooding had worsened, and the storm surge had been pushed to Varadero area.

This paper focuses on what happened on the social media between the 10th and 14th of September: indeed, while communication was not possible anymore and news media were not covering the event, citizens started to organize themselves to overcome this absence of information and answer the worried family demands. In absence of official visualization about what was going on during the crisis, we analyze how social media has been used by citizens to overcome this issue by collecting, gathering and providing by themselves relevant information. More specifically, we will show that, once again, social media has been used to build and engage an immediate response to the crisis by supporting the identification and localization process concerning tourists “absent from the map” and the update of the state of hotel complexes after the hurricane. Mainly based on the analysis of the content of two Facebook groups created at the time of the hurricane, we will categorize the content and objectives of these posts in order to better understand how social media can support and foster cooperation between citizens and authorities in order to define and engage a specific response to a crisis, in that case a better visualization / localization of the tourists on the ground. We will also discuss what we consider as the main ethical and social issues raised in this case in order to support a better visualization if that type of events would happen again.

STATE OF THE ART

In this section we present briefly the main findings related to the use of social media in crisis management from an ethical and social perspective. Without being exhaustive, we frame our case study in order to discuss these findings and draft some recommendations at the end of the paper.

It is nowadays acknowledged that the use of social media in crisis management presents opportunities in terms of situation awareness i.e. “accurate, complete and real time information about an incident” (Lanfranchi et al., 2014). The past decade has been attesting about the significant increase of social media use for crisis management through several activities: seeking information, receiving timely information, determining crisis magnitude, checking in with relatives, self-mobilizing for both citizens and crisis managers (Ngamassi et al., 2017). Moreover, social media information constitutes an added value for crisis managers and affected or concerned people when traditional channels of information are not available (for instance, news media, radio, etc.), which is often the case in the first few hours of a crisis (Aupetit and Imran, 2017). Nevertheless, it has been established for a long time that citizen-generated content presents challenges such as data quality, trust and format content, which do not guaranty a “complete control over the internal flow of information concerning the crisis from source to organizational decision maker respectively” (Tapia et al., 2013). Despite the concerns about the legitimacy of such shared information, at the time of a crisis, social media constitutes backchannels supporting peer-to-peer communications which are positioned in contrast with the official or formal communications to the public (Sutton et al., 2008).

Whilst a traditional approach to crisis management and situation awareness relies on official communications channels and promotes a passive role for citizens considered as target rather than partners (Lanfranchi et al., 2014), the proactive role of citizens through social media has been becoming an essential support for the crisis management process (Romano et al, 2014; Palen et al., 2010). For instance, in “ecology of participants” established by (Diaz et al, 2013) citizens (initially “persons receiving information about a crisis”) can become sensors (i.e. witnesses or victims aware of information useful for the response activity), trusted sensors (i.e. citizens that crisis managers consider as reliable for specific reasons), nodes (i.e. citizens having accredited expertise supporting them to evaluate damages or to find the kind of required assistance) or agents (i.e. citizens able to execute actions following crisis managers directives).

(Taylor et al., 2012) have specifically assessed how, during the tropical cyclone Yasi, social media (mainly Facebook pages) has been mobilized by citizens to provide psychological first aid (defined as a psychosocial support delivered, as community-based activity, in response to crises in order to reduce initial distress, meet

current needs, promote flexible coping and encourage adjustment) and build community resilience. Interestingly, their findings underline that even if social media were popular in their sample, there was a strong interest for traditional media such as television. Social media were also orienting people to official sources and amplifying such sources' messages to a broader audience. On social media, people were seeking information, directly asking people for specific information, providing general information or responding directly to questions, explaining what was going on or directing people to further information, requesting help or offering help or practical assistance, and posting messages of support. Lastly, people overwhelmingly reported "feeling a sense of connectedness and usefulness, felt supported by others and felt encouraged by the help and support being given to people" (p. 25). To that extent, Rizza and Guimarães Pereira (2014) have illustrated how social media allowed citizens to answer competently to the 2011 Genoa flooding, hence to support the building of community disaster resilience. Social media, initially a backchannel has been integrated to the crisis management process by local authorities, and consequently have constituted a virtual space of care for citizens to exercise their care and solidarity by organizing rescue activities, reconstructions, etc. Then, social media also constitutes a means to foster community resilience defined as "the ability of a community to not only resist and recover from a disaster but also to improve as a result of the changed realities that the disaster may cause" (Dufty, 2011). Among the fundamental changes (Dufty, 2011) identifies, sharing responsibility with community groups and individuals constitutes a critical aspect.

Nevertheless, the use of social media for "self-help" purposes (i.e. a spontaneous peer-to-peer communication between citizens to overcome the crisis) leads also to privacy infringements, inequality, and it questions the responsibility of the actors involved. As an illustration, Watson and Finn (2013) discuss some of the privacy and ethical implications surrounding the use of social media during the 2010 Eyjafjallajökull volcano eruptions. On one hand social media have supported citizens stranded in Europe to communicate, organize their postponed travel, or get information from the aviation industry, and the aviation industry (i.e. airlines companies and authorities such as Eurocontrol or the European Organisation for the Safety of Air Navigation) to get information from its consumers and to communicate with them. But on the other hand, users were not given enough information about how their personal data was being used by service providers, social media companies and technology companies. In a meantime some travelers may not have had access to internet or mobile phone services (as they would have had if they have had been in their own country). Lastly, while social media may have been seen as a support to enhance citizens' empowerment and to foster their resilience, corporate and public entities should not have been exempted of their duties and responsibilities with regards to their citizens-consumers.

While social media constitutes a virtual space of care supporting self-help and psychological help between citizens, fostering at the same time community resilience, and an additional means of communication between stakeholders and affected citizens, its uses also put at stake governance, responsibility, equity and privacy principles, which will be discussed at the end of this paper.

METHODOLOGY

Shortly after Irma struck the Varadero peninsula, families of people confined in the hotels of the area lost contact with their relatives. On September 10th, two Facebook groups emerged, aiming to help people communicate about the situation in Varadero. The first one, created as a public group, "Varadero Hotel Contact" (further named Group 1), is defined by its creator as "a space to share information or ask questions about family and friends staying or working in Varadero." The second one, "Family And Friends Of Tourists Evacuated To Varadero" (further named Group 2) is a private group, with a name explicit enough for people to find it easily.

Although information is used to be spread on Twitter, it seemed that Facebook was used by people to follow it up and to organize their researches in the longer term. Indeed, whereas Twitter allows citizens to share and spread information from official accounts or to give brief news from the ground, Facebook has been the place for citizens to gather this information, and to go into further details to help the recovery via a co-construction process. Thus, we decided to focus our analysis on the two abovementioned Facebook groups to explore the profiles of messages sent by people all along the crisis response.

While traditional media focused on places where the hurricane made victims and more serious damages, people wondering about the crisis in Cuba created their own non-professional communication channels to share information. In France and the USA, the traditional media focused on the crisis happening in their own countries (French Overseas Departments and Territories, USA coasts). Thus, it is interesting to observe these two groups to get a better understanding of the way citizens bypass traditional media, thanks to social networks, to communicate and investigate... We started our observation at the first posts on each group, on September 10th, and we stopped at the beginning of September 15th. Throughout this interval, we looked at the messages posted by the members, the comments, but also the links, photos and videos shared by users, and we observed the way

people organized themselves to exchange information.

We gathered a dataset of 580 posts on the two Facebook groups (70% coming from Group 1, and 30% from Group 2). We processed messages in English, French and Spanish, which together accounted for over 95% of the dataset. Then, we classified these messages depending on their content (information, question, link, picture...).

As all data that has been gathered from these Facebook groups were fully anonymized, it is important to note that we did not define user profiles, but message profiles. Therefore, we can assume that a citizen can post messages that correspond to several classes, depending on his/her objectives and when he/she acts during the crisis. Thus, all the results presented here preserve the anonymity of individuals, and focus on the types of communication within the Facebook groups during the crisis.

RESULTS

After having analyzed these posts, we distinguished three main types of messages:

1. The messages asking for information
2. The messages giving information
3. The messages managing communication

Then, we saw that the two first classes could be divided in subclasses, which can be described as follows.

Messages asking for information

In this class, we have two types of messages, depending on the information they are looking for:

- The *Questions –Q-* are written by relatives and friends of people evacuated to Varadero. They post messages asking for information about loved ones they have lost contact with. Their posts are often short and, most of the time, expose the name of the person they want to find, the link they have with them and the last place they know they have been.
- The *Travel –T-* messages ask questions with a really different objective: the authors wonder about the damages the hotels have suffered, and about the airlines traveling from and to Cuba. Indeed, these users have planned to visit Cuba and are wondering about the logistical troubles their trip might be affected of.

Messages giving information

These messages are slightly different regarding the sources of the information they provide, reflecting sometimes the accuracy of their testimony:

- The *Observations –O-* are messages of authors directly present on the ground. They have lived or seen the disaster, and share information, pictures and videos from Varadero to show others the situation progress.
- The *Relays –R-* are written by users that are directly in contact with any instance on the ground. They often had phone calls or text messages from relatives or hotel members, and share on Facebook the information they have obtained.
- The *Shares –S-* are messages of members that act only on the Internet. They share content posted by others on websites and social networks, such as articles, Twitter posts or information from other Facebook pages.

Messages managing communication

Finally, these messages *Manage –M-* the way people interact within the groups. They structure the comments, thank those giving information and encourage others to share information they obtained. They sometimes summarize the information of the day in synthetic posts and help people find the good contact for their investigation. In addition, in Group 2, they share and frequently update a file with a list of hotels that were confirmed safe – *i.e.* no victims.

Thus, we obtained six categories of messages, which are represented differently in the public and private groups. The distribution of these types of messages is presented in the table below.

Table 1. Distribution of the posts on both groups according to the types of messages

	Profiles						
	Observer	Relay	Sharer	Questioner	Traveler	Manager	Total
Group 1	8	65	104	161	39	28	405
	2,0%	16,0%	25,7%	39,8%	9,6%	6,9%	
Group 2	6	88	8	44	2	27	175
	3,4%	50,3%	4,6%	25,1%	1,1%	15,4%	
TOTAL	14	153	112	205	41	55	580
	2,4%	26,4%	19,3%	35,3%	7,1%	9,5%	

The second step of the analysis was to look at the way these types of messages evolve during the event, from September 10th when no one had contact with their relatives, to September 14th, when the communication networks are back between people.

In *Figure 1*, we can see the relatively different evolution of the types of messages all along the analysis, which represents the state of mind of Facebook groups' users at each moment of the situation management.

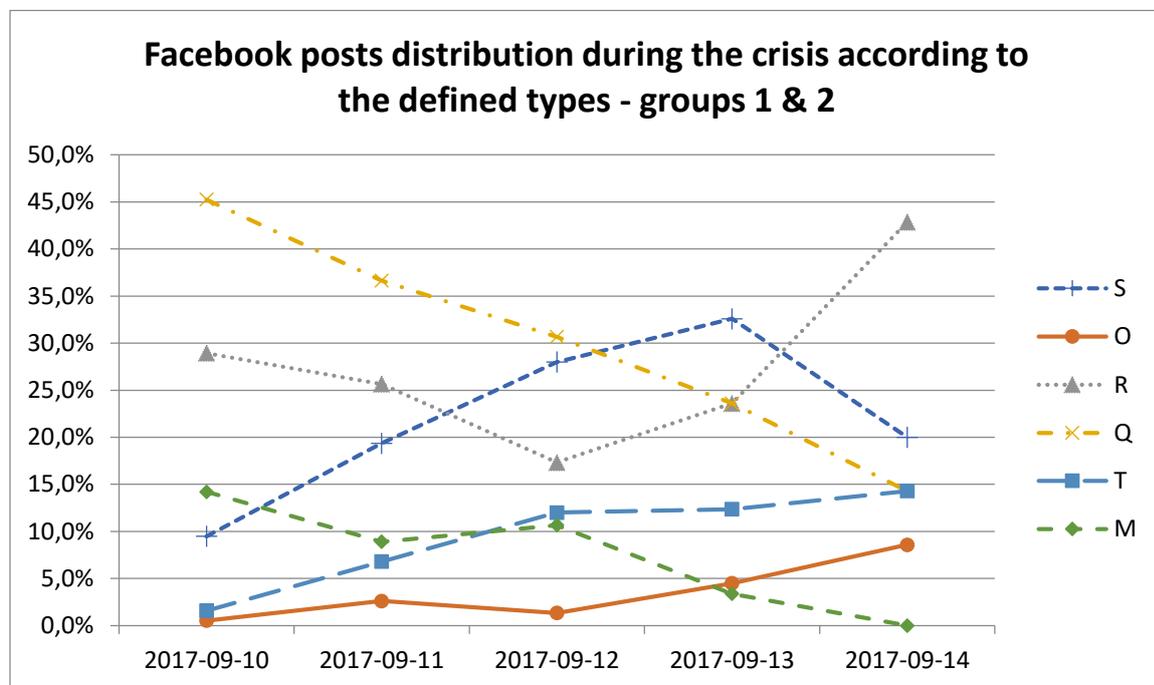


Figure 1. Facebook posts distribution during the crisis, according to the defined types.

About the evolution of the types of messages during the event

At the beginning of the crisis, we see that most of the questions are about family and friends. People are trying to contact their relatives, but cannot find any information, so they worry about them. Then, we progressively note more questions regarding the flights, the damages to the hotels. These questions are asked by people who had been planning to travel to Cuba and want to know whether they will have to change their bookings.

At the end of the crisis, from September 13th, the fact is that people are more relaxed, and they start to thank everyone who helped them get news about their families. From this time, and with an increasing representativeness, the emotions are being revealed. People ask fewer questions about their relatives, and those who relay information from the ground are more positive.

About the functions

It is important to remember that we are not dealing here with people profiles but with message profiles. In fact, all authors of messages take a specific function each time they publish something within the group, depending

on the type of message

The *Share* messages help information to be spread, and make the Facebook groups a crisis management tool for the citizens. They share information from traditional and non-traditional media such as other Facebook pages, Twitter accounts, links from articles and some YouTube videos. Here is the idea of using social networks as a backchannel.

Among these identified messages types, those creating a link between volunteer citizens and professionals are the *Manage* and the *Share types*. Indeed, the *Manage* messages sometimes communicate about useful contacts for people looking for information, and the *Share* ones can disseminate information sent by professionals through other communication channels such as press, or Twitter official accounts.

About the information gathered by the groups' members and its confrontation

One of the main concerns of the members within the two groups has been to update the status of the hotels in Varadero. More precisely to keep a list of hotels that could be considered as safe. As a result, Group 1 ended up with a list of 27 hotels that were confirmed to be safe, and the Group 2 with a list of 25 hotels. However, after having checked the spelling and location of these two lists, it appears that 23 different hotels were confirmed by both groups as safe, while the remaining actually referred one of the 23 hotels (wrong name or syntax mistake).

Still, four hotels were not confirmed and kept several members worried, even after the 14th. However, what was not proposed among the messages was to create and update a map of all hotels. Once done, as illustrated in *Figure 2*, one can quickly note that some of the 'unconfirmed' hotels (in yellow) were actually closely surrounded by 'confirmed' hotels (in blue), which could have been a relief for the friends and families of concerned tourists.

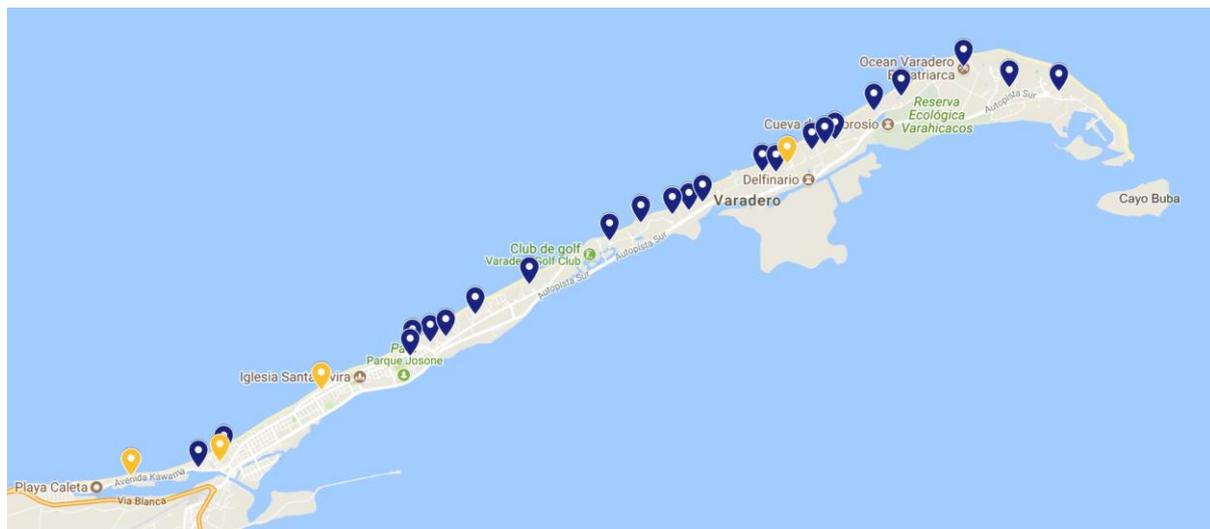


Figure 2. Map of all confirmed (blue) and unconfirmed (yellow) hotels, September 14th.

DISCUSSION AND PERSPECTIVE

A do-it-yourself visualization that remains non-professional

What we have seen about the use of social media during the hurricane Irma in Cuba reaches the conclusion of the state of the art. Fellow citizens have been able to provide psychological first aid to each other (Taylor et al., 2012): they tried to reduce initial distress and meet the actual needs that emerge at the time of crisis, for instance by localizing persons in the hotel in the absence of information about the Varadero area. As we have shown, the lists that have been established covered almost all the hotels. Social media, once again, has constituted an additional and virtual space of care, supporting citizens to express their solidarity and exercise their care (Rizza and Guimarães Pereira, 2014). The episode of the hurricane Irma in Cuba illustrates the panel of opportunities offered by social media in crisis management to obtain a situational awareness of an event while traditional channels are not available and to foster community resilience by constituting a tool easily used by fellow-citizens to engage their own response (Dufty, 2011).

Nevertheless, while specifically looking at the events, ethical, and social considerations can be drafted: privacy, governance, responsibility and equity have been put at stake during the crisis.

First of all, the way the lists of hotels have been created and updated illustrates the amateurism of these volunteers, which might have led to misinformation. These lists have been useful for worried people, supporting them in the idea to act to find their relatives; but they presented errors and may have also led to more concerns (specifically, when people has started to post messages saying they had received news while others were still waiting and were not understanding why they had not received yet any news from their relatives supposed to be in the same hotel). Furthermore, in the case of the public group (Group 1), personal information about tourists and their family was posted and consequently available for third parties (such as service providers, social media companies and technology companies). Consequently, transparency and consent principles may have been infringed, creating an information asymmetry between people opening their personal data to localize their parents or friends and third party collecting it for business purposes (Watson and Finn, 2013).

Secondly, if the two Facebook pages have clearly constituted backchannels supporting peer-to-peer communications to overcome the absence of official or formal communication to the public about the crisis in Cuba (Sutton et al., 2008), they also called for more, or for a specific attention from part of the crisis managers. From Monday the 11th, people started to call official authorities to report their relatives as missing persons or to support authorities to establish their localization. Reactions when they were explaining from where they got news or specific information demonstrate that mistrust with regard to social media remains despite advantages they present. Thus, since social media support affected communities to organize a specific and immediate response to a crisis, they should be considered by crisis managers as a means to co-construct this response. What we are arguing here is that the integration of social media in the crisis management process may support a co-responsibility and a more agile response to the crisis: looking at what was going on social media when Irma impacted Cuba might have supported authorities to identify distress from fellow citizens who were worried about their family and friends (even if their lives were not endangered). Doing so, it could have supported local authorities in defining a more adequate and inclusive answer: for instance, focusing on social media, we do not know much about the persons who were not connected or had not a Facebook account and who probably remained without any news or any psychological first aid provided through these pages.

To conclude, social media in crisis management keeps rising ethical, legal and social concerns which call for more attention from part of crisis managers. Each time they are mobilized during a crisis, it is for better or worse, or at least, unintended consequences may emerge and call for a framework. Nowadays, Virtual Operations Support Teams (VOST) are acting on social media as soon as a crisis occurs. In the French-speaking countries, and more specifically in France, they are called VISOV (“Volontaires Internationaux en Soutien Opérationnel Virtuel”). We have started a three-year-project in collaboration with the VISOV and institutional partners such as Zone de Défense et de Sécurité de Paris and Ministère de l’Intérieur and other academics and private partners to better frame these issues and integrate efficiently volunteers and social media in the crisis management processes¹. This paper presents the very beginning of the case study around the hurricane Irma. Deep interviews with the persons involved in the Facebook pages (at least, the administrators and some active users) will support us to understand the motivations behind the creation of these pages at the time of a crisis, as well as the profile(s) of volunteers during the crisis – we don’t know yet if, for instance, a person changes of functions during the crisis. Last but not least, interviews with the service in charge of the monitoring of the crisis in official institutions will be also conducted in order to confront the two perspectives.

REFERENCES

- Aupetit, M., and Imran. M. (2017). Interactive Monitoring of Critical Situational Information on Social Media. In Aurélie Montarnal Matthieu Laurus Chihab Hanachi F. B. Tina Comes (Eds.), *Proceedings of the 14th International Conference on Information Systems for Crisis Response And Management*. Albi, France. pp. 673–683
- Díaz, P., Aedo, I., Romano, M., and Onorati, T. (2013). Supporting Citizens 2.0 in Disasters Response. *Proceeding of MeTTeG*, 79-88
- Dufty, N. (2011). Engagement or Education. *The Australian Journal of Emergency Management*, Vol. 26, n°3, July 2011, pp. 34-39

¹ Funded project by the French National Research Agency (ANR) MACIV “Management of citizens & volunteers: the social media contribution in crisis situation”, 2018-2021.

- Lanfranchi V., Mazumdar, S., and Ciravegna, F. (2014). Visual design recommendations for situation awareness in social media. In S.R. Hiltz, M.S. Pfaff, L. Plotnick, and P.C. Shih, (eds.) *ISCRAM 2014 Conference Proceedings – 11th International Conference on Information Systems for Crisis Response and Management*, pp. 792-801
- Ngamassi, L., Malik, A., Zhang, J., and Edbert D. (2017). Social Media Visual Analytic Toolkits for Disaster Management: A Review of the Literature. In Aurélie Montarnal Matthieu Laurus Chihab Hanachi F. B. Tina Comes (Eds.), *Proceedings of the 14th International Conference on Information Systems for Crisis Response And Management*. Albi, France, pp. 786-797
- Palen, L., Anderson, K. M., Mark, G., Martin, J., Sicker, D., Palmer, M. and Grunwald, D. (2010). A vision for technology-mediated support for public participation and assistance in mass emergencies and disasters. *Proceedings of the 2010 ACM-BCS Visions of Computer Science Conference (ACM-BCS '10)*. British Computer Society, Swinton, UK, UK, pp 12.
- Rizza, C., and Guimarães Pereira, Â. (2014). Building a resilient community through social network: Ethical considerations about the 2011 Genoa floods. In S.R. Hiltz, M.S. Pfaff, L. Plotnick, and P.C. Shih, (eds.) *ISCRAM 2014 Conference Proceedings – 11th International Conference on Information Systems for Crisis Response and Management*, pp. 294-298
- Romano, M., Onorati, T., Díaz, P., and Aedo I. (2014). Improving emergency response: Citizens performing actions. In S.R. Hiltz, M.S. Pfaff, L. Plotnick, and P.C. Shih, (eds.) *ISCRAM 2014 Conference Proceedings – 11th International Conference on Information Systems for Crisis Response and Management*, pp. 170-174
- Sutton, J.N., Palen, L., and Shklovski, I. (2008). Backchannels on the front lines: Emergent uses of social media in the 2007 Southern California Wildfires. In F. Fiedrich and B. Van de Walle, (eds.) *Proceedings of the 5th International ISCRAM Conference – Washington, DC, USA, May 2008*, pp. 624-631
- Tapia, A.H., Moore, K.A., and Johnson, N.J. (2013), “Beyond the Trustworthy Tweet: A Deeper Understanding of Microblogged Data Use by Disaster Response and Humanitarian Relief Organizations”, *Proceedings of the 10th International ISCRAM Conference – Baden-Baden, Germany, May 2013*, pp. 770-778
- Taylor, M., Wells, G., Howell, G., and Raphael, B. (2012). The role of social media as psychological first aid as a support to community resilience building. A Facebook study from ‘Cyclone Yasi Update’. *The Australian Journal of Emergency Management*, Volume 27, No. 1, February 2012, pp. 20-26.
- Watson, H., and Finn, R. (2013), “Privacy and ethical implications of the use of social media during a volcanic eruption: some initial thoughts”, *Proceedings of the 10th International ISCRAM Conference – Baden-Baden, Germany, May 2013*, pp. 416-420