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Caroline Rizza

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Chapter 22

Social Media Contribution to the Crisis Management Processes: Towards a More Accurate Response Integrating Citizen-Generated Content and Citizen-Led Activities



Caroline Rizza

Abstract The two policy questions addressed in this chapter cover the whole crisis management cycle from the response and recovery to prevention and preparedness. They consider both the benefit of using citizen-generated content and the challenges of integrating citizen-led initiatives in the response. On the one hand, focusing on data allows interrogating the IT methods available to collect, process and deliver relevant information to support decision-making and response engagement. On the other hand, considering citizens' contribution and initiatives to the crisis management processes and response requires working on organizational and collaborative processes from local, regional, national or transnational levels. This chapter frames an up-to-date state of the art on the questions of citizens' generated content and led initiatives for crisis management and response, and it proposes directions to policy makers to that respect. It places the question of mutual trust between institutions and citizens as a key problematic in a hybrid world where mediated communication and interactions with citizens required new and adapted practices from professionals of crisis management.

22.1 Introduction

The current global context, characterized by climate change and the COVID-19 pandemic, poses new challenges in terms of crisis management and collaboration between world regions, countries and actors (policy makers, emergency management services, citizens and private sector actors) (European Commission Joint Research Centre, 2021). Despite their more or less long-term consequences on

C. Rizza (✉)

Information and Communication Sciences, I3-Telecom Paris (UMR 9217), Institut Polytechnique de Paris, Paris, France

e-mail: caroline.rizza@telecom-paris.fr

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the environment and human activities, the manifestations of these phenomena are increasingly violent and frequent in a short-term perspective. Thus, so-called civil security crises such as natural disasters, technological events or urban crises are characterized, among other things, by rapid kinetics (with a crisis peak and a return to “normal”), uncertainty, tension, victims, etc.

The field of crisis informatics studies how networked digital technologies, for instance, social media from the 2000s onwards, interact with crisis management, from both social sciences and computational sciences sensibility, notably through data science (Palen et al., 2007, 2020; Palen & Anderson, 2016). More specifically, scientific literature in this field has highlighted the presence and simultaneous manifestation of citizen initiatives to respond to a crisis. During a disaster, people immediately react and help each other providing first aid to victims and very often organize themselves for helping with cleaning and rebuilding during the recovery phase. As illustrations, during the Nice attacks in July 2016 in France, taxis immediately organized themselves to evacuate people from the Promenade des Anglais; a few months earlier, during the Bataclan attacks in November 2015, Parisians opened their doors to welcome those who were unable to return home; Genoa in 1976 and in 2011, having experienced two exceptionally violent flash floods, twice saw its young city dwellers volunteering to clean up the streets and to help shopkeepers and residents for days on end (Rizza & Guimarães Pereira, 2014).

The use of social media in daily life has enriched this range of initiatives by allowing them to be manifested and organized online, in addition to the actions that usually arise spontaneously on the ground. In the examples given above, the hashtag #parisportesouvertes was used to publicize and organize the reception of Parisians during the attacks; in Genoa in 2011, a Facebook page “Gli angeli col fango sulle magliette” became the hub of communication and organization during and after the flooding, involving institutional bodies in particular.

Social media, as a virtual public space, allow the emergence and organization of citizen initiatives and make available new data supporting to build a more accurate situational picture of the event and its consequences on the ground. Nevertheless, they also complexify, in ways we will develop below, crisis management and constitute a challenge in the response provided by its managers. Their integration into the crisis management process requires mutual trust that the proximity of institutional and citizen actors may facilitate.

22.2 State of the Art

22.2.1 *Social Media and Crisis Management: New Perspectives*

Social media are Web 2.0 platforms or applications that allow their users to create content online, exchange it, consume it and interact with other users or their environment in real time (e.g., Kaplan & Haenlein, 2010; Luna & Pennock, 2018;

Reuter et al., 2020). In 2019 Facebook, Twitter and WhatsApp had 5.7 billion users worldwide (Statista, 2019) in Reuter et al. (2020). Thus, in recent years, the use of social media has increased considerably, and its nature has changed by becoming more collaborative, especially during crises or emergencies (Reuter et al., 2020).

In general, social media allow users to communicate and interact in different and often combined ways: information creation and dissemination, relationship management, communication and self-expression. Based on these activities, we can distinguish (Reuter et al., 2011):

- Wikis: for information gathering and knowledge creation according to a collaborative logic
- Blogs and microblogs: for publishing information and/or self-expression
- Social networks: for relationship management, self-expression and communication and information gathering
- Content sharing and indexing systems: for the creation and exchange of multimedia information (photos, videos)

Last but not least, platforms specialized in crisis management also exist: they are run by communities of volunteers and allow, for instance, collaborative mapping (e.g., Crisis mapper, a variation of OpenStreetMap), on-site and remote contribution (e.g., Ushahidi) and public-private-citizen partnership (Wendling et al., 2013).

Based on this categorization, social media are differentiated according to their main functions: Twitter as a microblog is used for the dissemination or collection of information; Facebook as a social network allows interaction between “friends” or within a “group” community; Wikipedia, as a collaborative encyclopaedia, supports the creation of collaborative knowledge and sense-making (Bubendorff & Rizza, 2021; Kaplan & Haenlein, 2010). Literature in the field highlights that during a major event, specific uses of social media rise such as a combination of the main function of a platform with other functions needed in the moment. As an illustration, to make sense to an ongoing event and face its uncertainty, the discussion pages of Wikipedia become the place for exchanges within the community of contributors in the same way as a group on a social network (Bubendorff & Rizza, 2020).

“Sharing and obtaining factual information is the primary function of social media usage consistently across all disaster types” (Eismann et al., 2016). Much of the literature in the field of crisis informatics has focused on “microblogging” activities, i.e., the use of social media by citizens to report on what is happening on site during a major event. These microblogging activities have been documented based on real events: they cover both the creation and distribution of information as well as the communication and response to requests for help (Palen et al., 2009; Palen & Vieweg, 2008; Reuter et al., 2011; Tapia et al., 2013). Due to their ubiquity in citizens’ life, their speed as a relay of information and communication and their accessibility through different platforms, microblogging activities have been considered very early as an opportunity for crisis management and communication. They constitute a place where real-time information about an event is being collected (Palen et al., 2010; Reuter et al., 2011; Vieweg et al., 2010). Interestingly, Reuter et al. (2020) distinguish two reasons for harnessing information from

social media: to establish a more complete picture of the situation, also known as “situational awareness”, and to engage a response on the ground, also mentioned as “actionable information” (see also Coche et al., 2019).

To this respect, several challenges related to the quality of the data and its relevance for the crisis management processes have been underlined such as issues of format, reliability, quantity, attention required, effective interpretation and contextualization (Grant et al., 2013; Ludwig et al., 2015; Moore et al., 2013; Tapia et al., 2011, 2013). From an organizational perspective, other challenges exist: issues of verification, accountability, credibility, information overload, dedicated resource allocation as well as lack of time and experienced and trained staff (Castagnino, 2019; Hiltz et al., 2014; Hughes & Palen, 2014; Kaufhol et al., 2019; San et al., 2013).

Lately, the literature on crisis management and institutional practices has been emphasizing new challenges. In order to effectively benefit from the multiple sources of available data, Munkvold et al. (2019), Pilemalm et al. (2021), and Steen-Tveit and Erik Munkvold (2021) show how “situational awareness and understanding” and “common operational picture” both require more effective collaboration between the engaged stakeholders based on specific organizational processes to be established. Technical and organizational challenges have been rising in terms of combination of different information sources (e.g., video and images, social media, sensor data, body-worn devices, UAVs and open data).

22.2.2 From Citizen-Generated Content to Citizen-Led Activities: Opportunities and Challenges

As mentioned in the introduction, social media have been supporting emergence and organization of online citizens’ initiatives at the occasion of a major event. Literature commonly distinguishes “real volunteers”, who act on site to respond to the crisis from “virtual volunteers”, who, located anywhere, provide help and support by organizing action and processing information on social media (Reuter et al., 2013). This distinction helps to understand how social media has become a place for expressing and organizing solidarity (Batard et al., 2018; Rizza & Guimarães Pereira, 2014). Whether these citizen initiatives take place on site or online, they are mostly spontaneous: spontaneous volunteers are people who act in response to or in anticipation of a disaster and who may or may not have the required skills (Drabek & McEntire, 2003). The notion of “affiliation” (‘affiliated’/‘unaffiliated volunteer’) with a crisis management organization allows refining this characterization (Batard et al., 2019; Stallings & Quarantelli, 1985; Zettl et al., 2017). Some volunteers have signed agreements with public institutions and their actions are coordinated. This is the case of the VOST (Virtual Operations Support Team) in Europe, for example, but other user communities such as the Waze community can also be mentioned.

Consequently, social media enable citizens to build a collective and coherent approach to the event (Stieglitz et al., 2018). The generated content can be understood as a key element in the achievement of social resilience (Jurgens & Helsloot, 2018) where resilience is the ability of social groups and communities to recover from or respond positively to crises (Maguire & Hagan, 2007; Reuter & Spielhofer, 2017).

As described above, there is a need for collaboration and reliable models between heterogeneous actors (such as police, firefighters, infrastructure providers, public administration and citizens) in order to improve collaborative resilience, i.e., the ability of a community to prepare for, respond to and recover from a crisis (Board on Earth Sciences and Resources, 2011; Goldstein, 2011). Therefore, the opportunities of organization and collaboration with social media offer in response to the crisis concretized their organizational dimension.

However, this aspect should not minimize the challenges raised by citizens' initiatives or engagement during a major event and the added complexity, time and organization they require from crisis management institutions. Citizen activism can have negative effects (Reuter et al., 2020). Three examples illustrate this view. During the 2011 attack in Norway, citizens' action to save people from the attack and expression of public opinion on social media made the management of the crisis more complex for the rescue teams and crisis managers who had to respond to these citizen dynamics at some point of the crisis (Perng et al., 2013). During the 2015 Bataclan attacks, the use of the hashtag #parisportesouvertes associated with personal addresses of Parisians who were offering places to victims or people stranded outside has also required regulation from the authorities to protect citizens who were putting themselves in danger. The manhunt against the rioters of the 2011 Vancouver riots also underlines the negative side of this activism and necessity from public institutions to be fully prepared when mobilizing it (Rizza et al., 2014).

22.3 Computational Guidelines

This section is articulated around two policy questions proposed by De Groeve et al. and included in a publication of the Joint Research Centre that aimed at collecting the upcoming research needs in terms of policy questions around different topics, including emergency response and disaster risk management (Bertoni et al., 2022).

22.3.1 *Which Contribution to the Crisis Management Cycle?*

The two proposed policy questions in Bertoni et al. (2022; Chap. 15) cover the whole crisis management cycle from the response and recovery to prevention and preparedness. They consider both the benefit of using citizen-generated content and the challenges of integrating citizen-led initiatives in the response. Focusing on

data allows interrogating the IT methods available to collect, process and deliver relevant information to support decision-making and response engagement. Social network analysis can also play a relevant role in the context of disinformation campaign (Starbird, 2020; Starbird et al., 2019). Considering citizens' contribution and initiatives to the crisis management processes and response requires working on organizational and collaborative processes from local, regional, national or transnational levels.

22.3.2 Towards an Actionable Information for Practitioners

In this section, we aim to address the first set of policy questions from Bertoni et al. (2022; Chap. 15) related to the optimization of crisis response and computational methods supporting to both harness and process multiple sources of citizen-generated content. The multiplication of such data sources brings to crisis managers several visions of an event and may support settling a more accurate situational awareness based on more information, geo-localization of the data collected and cross-verification through several platforms or formats (e.g., text, images, sensors). In that respect, in the field of crisis informatics, several systems have been developed to process emerging sources of data from social media, sensors in smart cities, UAVs as well as external data such as open data and multidisciplinary data archives.

Nevertheless, as pointed out by Coche et al. (2021a), the adoption of such systems in crisis management practices is low and may be understood or interpreted by a gap between practitioners' expectations and what these systems provide: actionable information vs. situational awareness. The key element here relies on the fact that systems aim at improving the situational awareness by addressing practitioners' information needs about the event while practitioners expect an "actionable information", that is to say, a complementary piece of information allowing them to take a decision and engage concretely a response on the ground.

Once settled, systems supporting EMS should collect, process and match multiple data sources and formats in order to both establish a relevant situational awareness of the event and to aggregate data in order to build actionable information supporting the engagement of a response. In this context, actionable information is relevant, timely, precise and reliable. In their research works on social media contribution to crisis management and response, Coche et al. (2021a) demonstrate that actionable information can be identified by systems only if a situational awareness is established first. Underlining the issue that information management and filtering systems for actionable information detection remain mostly unexplored in the field, they propose to design and build new systems based on a four-step architecture where the two last steps focus on actionable information: (1) data collection and management; (2) what they call "information creation" to establish a sufficient perception of the situation; (3) "information management" to understand the situation and be able to take a decision; and (4) "information filtering" to anticipate the evolution of the situation.

22.3.2.1 Designing Automatic Emergency Systems to Support Local EMS and EU Supervision: Directions

Once settled the objective of data processing systems in terms of situational awareness and actionable information, recommendations about design and implementation of such systems into practices can be addressed.

Designing crisis situation models is based on the data available at the time of the event, and, for this purpose, heterogeneous data sources such as phone calls, the information provided by the rescue teams on the ground, sensors and UAVs or news media exist. Nevertheless, these channels do not allow automated implementation and therefore neither implementation of viable crisis models.

Interestingly, social media data are already in a digital format and can be processed by a computer with minimal human interaction to input the data (Coche et al., 2021b). About automatic social media processing systems, three main types of systems to provide information to decision-makers can also be identified:

- Automatic data filtering systems
- Real-time systems providing semantic enrichment (based on spatial, social and/or emotional context of the content)
- Automatic clustering of tweets based on machine learning to filter messages from social media and successfully classify them in a category or another depending on their content and the context of the crisis, or to extract and cluster the information according to different parameters and similarities

Open data and multidisciplinary open archives also constitute relevant sources of data both to contextualize an event and to analyse its impact. Chasseray et al. (2021) and Lorini et al. (2020) propose to use meta-modelling and ontology to structure this available knowledge and feed decision support systems. Relevantly, they insist on the necessity to mobilize experts to validate the information extracted through this processing. While computational method supports data extraction and processing, expert intervention can specifically focus on decision-making and response engagement.

Decision support systems in crisis management and response should also facilitate collaboration between stakeholders. Based on Fogli and Guida (2013), Fertier et al. (2020) assign three properties to these systems related to collaborative dimensions: sharing information with citizens, interacting with other information systems and coordinating heterogeneous and independent stakeholders while anticipating the effects of decisions made. To that respect, it is important that support decision systems based on the heterogeneous data available (“decision support environment”) provide to each crisis cell an up-to-date common operational picture allowing them to take decision, coordinate and collaborate. Fertier et al. (2020) also assign four key capabilities to these systems: improving the situation awareness through automatic collection and interpretation of raw data; processing data, in real time, by means of easy subscription to new sources; managing the issues related to big data; and processing heterogeneous data to update the model of a complex situation in real time.

However, systems of systems enabling multiagency crisis management strengthen the issue of making mass surveillance possible and require a specific attention. Interoperability combined with systems of systems and big data processing can foster the development of a technological and bureaucratic apparatus for all, encompassing surveillance and eroding civil liberties (Büscher et al., 2014; Rizza et al., 2017). The potentiality of collecting and processing data from participatory sensing makes fuzzy the boundary between decision support and control or surveillance. For instance, the knowledge database created through such system could contain pervasive information revealing individuals' habits, routines or decisions and, consequently, constitutes a privacy infringement.

To address these issues, a human practice focused approach is particularly useful when designing crisis management information systems: it allows designing and developing tools in close collaboration with EMS to and supporting them in restructuring their services in integrating these tools in their practices. It also prevents from misuse by closely working with stakeholders, understanding and framing their needs at the multiple level of the command chain. Indeed, in this context, crisis management system processing data, providing decision support and collaboration between stakeholders are more likely to be integrated into practices in respect of the rules and processes of each institution.

Box 1: In Summary

- Multiple formats and sources of citizen-generated content raised opportunities in terms of crisis management and response: some of these data support to contextualize and understand the event (e.g., open data, multidisciplinary data archives) and others to make decision and engage response on the ground (sensors, UAVs, social media).
- Computational modelling methods can support establishing a more accurate and timely situational awareness and providing pieces of data constitutive of actionable information: they move expert intervention from the collection and processing of the data to the analysis and decision-making phases.
- In the case of disinformation campaign, social network analysis constitutes a relevant tool to reveal and understand the ongoing dynamics.
- Such systems constitute challenges for both practitioners and researchers and IT designers. Practitioners need to integrate new information and their processing in their decision-making processes and to coordinate and collaborate more closely. Researchers and IT designers have to develop data processing and decision-making systems embedding these new properties, answering to practitioners' needs and giving a specific attention to legal and ethical frameworks.

22.3.3 Integrating Citizen-Led Activities in the Crisis Management Processes

This section addresses the second round of policy questions from Bertoni et al. (2022; Chap. 15) more focused on citizen-led activities and their possible integration to the crisis management processes. Social media have made possible most of these activities through the organizational dimension they propose. Beyond the benefits of using citizen-generated content by means of new computational methods, how making the most from these grassroots initiatives in the crisis management cycle?

22.3.3.1 Social Media as a Communication and Organizational Infrastructure

We usually think of social media as a means of communication used by institutions (e.g., ministries, municipalities, fire and emergency services) to communicate with citizens top-down and improve the situational analysis of the event through the information conveyed bottom-up from citizens (Zaglia, 2021). The literature has demonstrated the changes brought by social media, how citizens have used them to communicate in the course of an event, provide information or organize to self-help.

There are therefore an informational dimension and an organizational dimension to the contribution of social media to crisis management (Batard, 2021; Rizza, 2020):

- Informational in that the published content constitutes a source of relevant information to assess what is happening on site. For example, fire officers can use data from social media, or photos and videos during a fire outbreak, to readjust the means they need to deploy.
- Organizational in that aim is to work together to respond to the crisis: for example, creating a Wikipedia page about an ongoing event (and clearing up uncertainties), communicating pending an institutional response (as it has been the case during Hurricane Irma in Cuba in 2017), helping to evacuate a place (Gard, France, July 2019), taking in victims (Paris, 2015; Var, November 2019) or helping to rebuild or to clean a city (Genoa, November 2011).

22.3.3.2 Citizens: First Links of the Crisis Management Chain?

While institutions according to a top-down perspective use citizen-generated content and more largely social media to assess and communicate with citizens, citizen initiatives affect institutions horizontally in their professional practices. There is indeed a significant difference between harnessing and using online published data to understand an ongoing event or its consequences on the ground from supporting organized grassroots initiatives or engaging citizens on site to face an event. There is still a prevailing idea that citizens need to be protected, even if the COVID-19 crisis

has been showing that the public also wants to play an active role in protecting themselves and others. In that respect, during the first 2020 lockdown, panels of citizen-led initiatives have emerged to support states facing the first peak of the crisis: sewing masks or making them with 3D printers to public hospitals, turning soap production into hand sanitizer production, proposing to translate information on preventative measures into different languages and sharing it to reach as many citizens as possible, etc. Despite this experience, according to some institutions, doing so would be recognizing that, somehow, crisis managers are failing (Batard, 2021).

Consequently, another dimension is delaying the integration of these initiatives in the common or virtual public space. It implies placing the public on the same level as the institution; in other words, citizen-led initiatives do not just have an “impact” horizontally on professional practices and their internal rules and processes (doctrines), but their integration requires citizens to be recognized as full participants, as actors, of the crisis management and response processes. Then, the main question concerns the required conditions supporting to both recognize citizens as actors of the crisis management processes and response and integrate their initiatives in these processes.

22.3.3.3 Building Specific Partnerships and Collaborations with Existing Online Communities

As underlined in the introduction of this chapter, the integration of citizen-led initiatives into the crisis management processes requires mutual trust from both sides. Again, the COVID-19 crisis illustrates the existing distrust against institutions, which has taken the form of misinformation campaign and required specific actions to counter this phenomenon. Among them, Wikipedia community has been working to making sense to major events, and, in that respect, the discussion pages associated to each article related to the crisis reveal the specific work done by Wikipedian contributors (Bubendorff & Rizza, 2020, 2021). Even if its contribution has not been yet fully recognized in crisis management, Wikipedia is a notorious community. Other online communities not affiliated to crisis management, such as forecast or road traffic groups, have also been playing an increasing role at the time of an event and need specific attention by publishing, for instance, prevention messages. Consequently, working closely with these communities in order to be able to mobilize them at the time of an event from the prevention to the recovery phases would be an asset. Affiliated communities of volunteers such as the VOST play already fully their part by providing online support to crisis managers. Their collaboration has been recognized and formalized through institutional agreements. They constitute today a trustful and reliable network to be mobilized before, during or even after a crisis. Establishing such agreements with other citizens, communities (as already mentioned, forecast or road traffic group but also related to air or water quality, earthquake monitoring, etc.) would allow crisis managers and decision-

makers to rely on complementary and reliable raw data sources easily mobilizing in case of need.

The geographical proximity of actors in the same area enables them to get to know each other better and therefore encourages mutual trust – this trust constitutes a key component to success. In order to build such partnership with online communities, it is necessary working locally on specific areas to understand the composition of the network of local actors and initiate collaborations at each level of the national territory. At the European level, mobilizing and animating these communities by topics (air, water, fire, etc.), types of crises (floods, earthquake, technological event, urban crisis, etc.), type of data (social media, sensors, etc.), etc. would allow an EU monitoring of data and an EU kind of virtual taskforce.

Box 2: In Summary

- Social media constitute an infrastructure and a public place allowing citizens to communicate, coordinate and provide self-help initiatives.
- From an organizational perspective, integrating citizen-led initiatives into the crisis management processes and the response implies recognizing citizens as the first link of the crisis management chain.
- Building collaboration and partnership with online affiliated and (non-)affiliated communities will support the constitution of relevant networks of experts easily mobilized from a local to a European level to provide data and monitor citizen-led initiatives.

22.4 The Way Forward

Crisis management institutions are increasingly challenged by citizen-generated content and citizen-led initiatives. The first one constitutes new opportunity to better assess, monitor the situation and to engage a more accurate response on the ground but, at the same time, requires time, human resources and competences to aggregate, analyse and integrate these data in the usual processes. While responding specifically to the effects of an event on site, the second ones make the usual processes more complex in several ways: they require a specific and additional attention; they can disturb the institutional response. Nevertheless, affiliated and non-affiliated volunteers and their initiatives have been demonstrating their relevant contributions to crisis management at the time of an event.

What we argue in this chapter is the necessity from both types of actors (crisis managers and citizens) to both getting used of each other's online practices. Bridging the gap between such initiatives and their integration in the crisis management processes and response relies on (re-)establishing a mutual trust between institutions and citizens. Citizens have to get used to online official communication in their daily

life in order to be able to get the message and understand it when it is published at the time of an event. Crisis management institutions need to understand and adapt to online rules of communication to be able to be heard on online public sphere. This communication goes beyond the usual diffusion of prevention or behavioural messages and requires real interaction with citizens.

In this context, computational methods and decision support systems have been improved: they tend to collect and analyse more and more multiple data sources and rely on different methodologies. They still require to be designed closely with practitioners to guarantee an answer to their needs and to ensure their integration into practices. Despite their contribution, such systems constitute only a decision support; in other words, they allow the expert intervention moving from the data extraction and processing to the analysis and decision-making phases. As an illustration, computational methods and systems may allow the VOST to focus on the analysis of the situation to be reported to crisis management institutions instead of manually screening and collecting information on social media.

Despite the benefit of such methods and systems, what we would like to underline is the necessary reorganization of institution internal processes in order to be able to fully and relevantly integrate citizen-generated content, as well as citizen-led initiatives in the crisis management processes.

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