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# Shaken *and* stirred: Social representations, social media, and community empowerment in emergency contexts

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**Abstract:** In this paper we examine the use of Twitter and Facebook in two dramatic earthquakes that hit Italy: L'Aquila (in 2009) and Emilia (in 2012). Indeed, disasters disrupt everyday life and engage people in meaning-making processes aimed at recovering meaning and control of their world. In these cases, we argue that the use of social media may contribute to social representations processes and functions: cognitive coping, social sharing of emotions, preserving self-efficacy, boosting identity, and community empowerment. Different methods were adopted to examine the use of social media in the immediate aftermath, a few days after, and in the medium-long term. Differences between the events, combined with the differences between Twitter and Facebook, entailed a multiplicity of uses. Nevertheless, the analyses point to the same conclusions: by fostering new forms of communication and encounters, social media played an increasingly important role during and after the earthquakes. First, they were used for providing information and material coping, then they favored the social sharing of emotions and joint remembering, and finally they contributed to claiming voice and control. Results thus suggest that the use of social media favored different representational functions, which progressively contributed to community empowerment.

**Keywords:** functions of social representations, social media, earthquakes, disaster, empowerment

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The most vital sign of a society is its capacity to deal with social changes. Usually the social change assumes a wave rhythm. Pareto (1988 [1916]) describes the dynamics of social phenomena as "oscillating." But when social dynamics intersect with a natural or artificial disaster, then the change becomes composite and shows a precipitate of natural, artificial and social transformations simultaneously. Coping with such change is much more difficult.

Indeed, "disasters provide a realistic laboratory for testing the integration, stamina, and recuperative powers of large scale social systems." (Fritz 1968: 202). Disasters are thus privileged contexts for examining the following: how affected people conceptualize and co-construct the emergency they live through; whether and how people use social media to empower themselves; and the links between social representation processes, communication, empowerment, and identity issues.

Earthquakes, floods, and other natural (and artificial) disasters affect individuals and communities on levels ranging from the most intimate sphere (e.g., affects, home) to social well-being and cultural heritage: they oblige entire communities to question the assumptions that make their "relationship with the environment a sound basis for adaptation and psycho-social well-being" (Emiliani 2008: 9). Coping with these events thus involves cognitive, affective, and behavioral responses aimed at facing the new, the unknown, and the dangerous (see also Adey et al. 2015; Axia 2006).

Drawing on these premises, we will examine two of the major earthquakes that have struck Italy recently, in L'Aquila (in 2009) and in Emilia (in 2012).[1] We do not directly compare the two cases, but we explore the ways in which social media may have contributed to social representation processes and functions, at different stages of the copying process. In particular, we look for similarities as well as differences in context (L'Aquila and Emilia), social media platform (i.e., Twitter and Facebook), and time-span (soon after the events and in the medium-term) analyzed. Indeed, the two cases cannot be compared directly: first of all, the two earthquakes had different effects on the affected populations (in terms of casualties and injuries, as well as long-term damage to buildings and economic activities); second, by focusing on different social media platforms and timespans, we observe different stages of the disaster response process. As we will show in the following pages, relevant activity takes place immediately after a major quake: therefore, Twitter seems to represent a

1 At the time the research was conducted the earthquakes that heavily hit the center of Italy in 2016 (August 24, October 26, October 30) had not yet occurred.

valuable platform for short-term response. On the other hand, medium- and long-term activities, including mourning, memory building, and protest activities require the activation of social and relational processes: therefore, it seems worth exploring the way other social media platforms such as Facebook are perceived and used. Such differences also justify the different methods adopted for analyzing the two cases: analysis of content communicated via Twitter in the immediate aftermath, and a long term ethnographic approach aimed at gaining a deeper understanding of the strategic use of Facebook in the post-earthquake scenario.

Nevertheless, apart from the differences, the two cases provide relevant insight into lay mechanisms involved in social representation processes that are activated in earthquakes. Earthquakes, by destroying the physicality of places (e.g., homes, monuments, places of worship), threaten individual and community identities (Lewicka 2011). Seismic sequences, moreover, leave individuals in a persisting situation of uncertainty and menace, and create the ideal conditions for the out-of-control spreading of rumors (Festinger 1957). The two case studies thus provide an opportunity to reflect on the mechanisms that guide social representation processes in emergency situations.

The paper is organized as follows: in the next sections we summarize the contribution of social representation theory, and we discuss characteristics of social media, which are important in emergency contexts. Then, we present the Emilia Romagna and L'Aquila case studies, illustrating aims, methods adopted, and findings that emerged from the analysis. Finally, we discuss the main results and conclude with final remarks.

## 1 The contribution of social representation theory

Social science research has focused on individual and group factors that contribute to the prevention of disasters, resilience, and reduction of their negative impact (Lindell and Perry 2000; Prati et al. 2012). To this extent, risk-perception and evaluation of the events before, in the immediate aftermath and in the short-term wake of disasters have emerged as particularly important: cognitive schema, coping styles, and emotion regulation are among the most important factors that affect the successful management of disasters (see for example Saakvitne and Pearlman 1996).

Relief, recovery and development interventions in emergency contexts lever on these facets restoring individual and community sense of control and empowerment and re-constructing relations (Young et al. 1998; Pietrantoni et al. 2008).

Social representation theory (SRT) can contribute to this field of research-intervention in many ways. According to a classic definition, social representations "are at the interface of two realities: psychic reality, in the connection it has with the realm of the imagination and feelings, and external reality which has its place in a collectivity" (Moscovici 1988: 220). Communication thus plays a key role in SRT. Indeed, reality itself is a matter of competition and negotiations among the different voices that are present in the public sphere (Bauer and Gaskell 2008; Jovchelovitch 2005; Moscovici and Marková 1998). SRT stresses that meanings of "objects" are not the outcome of individual processes but of co-construction processes that connect the "ego" with the "alter." SRT thus identifies a link connecting individual thinking, communication, and socio-cultural systems of meanings that affect the way in which the communities cope with unexpected events and radical transformations of places (Breakwell 2001; Joffé et al. 2013; Sarrica et al. 2016).

In this sense, we may affirm that social representations have "a twofold function: first to establish an order which will enable individuals to orient themselves in their material and social world and to master it; and secondly to enable communication" (Moscovici 1973: xiii).

Emergencies disrupt this "material and social world." In this context different actors (laypeople, experts, media, authorities, stakeholders, etc.) get involved in debates aimed at interpreting and understanding the material and symbolic consequences of such radical change. This is when the primary function of social representations is manifested: *cognitive coping*, that is, making the unexpected meaningful, controllable, and thus less threatening.

Nevertheless, emergencies touch off deeper evolutionary mechanisms (cf. Bandura 2004). We may thus expect that social representation processes also serve other functions that are fundamental for survival and self-protection (Breakwell 2001).

The first function is the social sharing of emotions, which is one of the most fundamental mechanisms of recovery observed after significant trauma (Pennebaker and Harber 1993; Rimé et al. 1998).

A second function is facing potential danger by understanding it in a way that enables the preservation of well-being and self-efficacy. According to Joffé (2003: 66), "a core motivation in relation to risk apprehension is identity protection, which refers, simultaneously, to the protection of in-group and self-identity." The defense mechanism of splitting may thus operate behind social representations in order "to keep the bad away from the good in the hope that the good will not be invaded and destroyed" (2003: 62).

Finally, social representations serve power functions. They provide a shared system of knowledge, which can be mobilized to empower communities,

to claim positive identities, to re-construct the sense of continuity and to defend against stigmatizing or marginalizing practices (Howarth 2006; Sarrica et al. 2016).

In conclusion, the points that we have briefly summarized suggest that SRT provides useful theoretical tools to understand the meaning-making processes through which communities affected by disasters define what the unexpected event is and how their members will cope with it (Gruev-Vintila and Rouquette 2007). In these contexts, we can argue that social media facilitate precisely those symbolic, mediated coping processes that are at the core of the elaboration of new social representations (Wagner and Hayes 2005).

## 2 Social media use in response to emergencies

Social media are digital tools and have been designed from the start to be oriented around collaboration and sharing. The most recent catastrophic events, from the 2010 Haiti earthquake to the devastating 2013 Colorado floods, have shown that these potentialities are brought out in extra-ordinary contexts. If in an ordinary context, the potential of Web 2.0 applications allows people to participate in social and political life and hopefully challenge traditional hierarchies in media systems; in an extraordinary context they enable people to produce a real-time dissemination of information to wider publics, a better situational awareness and an up-to-date picture of what is happening on the ground. Traditionally, in disaster studies, communication-oriented research is focused on the institutional warning-response process and, above all, on the idea that catastrophes "are the affairs of the public authorities rather than the affairs of citizens" (Gilbert 1998: 93). In the cases of disasters, citizens have usually been considered more as people to be rescued than as active participants, but the mainstream use of digital and social media is marking a significant change in this research field. Today it is possible to look at disaster communication also from a bottom-up perspective, which brings new questions and new voices to the fore.

More specifically, research on the role of social media during and after natural disasters has focused both on *top-down* processes by analyzing institutional communication and emergency management practices (Hughes et al. 2014) and on *bottom-up* processes by analyzing self-organizing activities, including the role of digital volunteering (e.g., Starbird and Palen 2011; White et al. 2014). In this paper, we focus on *bottom-up* activities, which are crucial for understanding empowerment processes.

By exploring the current literature, one can find that social media enable citizens to play at least three roles: those of 1) first responders/volunteers; 2) citizen journalists/reporters; and 3) social activists (Kotsiopoulos 2014).

With regard to the first role played by citizens, it is worth highlighting once again how social media have rapidly changed the coverage of crisis events. This kind of application, which is based on content ordinary people generate, manipulate, or simply share online, can help citizens to organize and/or self-organize emergency relief and to self-mobilize, both from near and from afar (Starbird and Palen 2011), strengthening public resilience to catastrophe. While traditional media facilitate one-way dissemination, social media offer opportunities for two-way dialogue and can potentially create interaction between citizens and emergency organizations (Bortree and Seltzer 2009; Mulargia 2014). As explained by Fraustino et al. (2013: 16) "oftentimes, individuals experiencing the event first-hand are on the scene of the disaster and can provide updates more quickly than traditional news sources and disaster response organizations." In this sense some scholars have used the term "citizen sensors" (Goodchild 2007; Schade et al. 2010), since citizens as non-specialist creators of geo-referenced information contribute to crisis situation awareness and accelerate impact evaluations and needs assessments.

Furthermore – and here we explore the second role played by citizens – social media are faster than traditional media and institutions. As official sources provide relevant information more slowly (Spiro et al. 2012), people turn to social media in order to obtain time-sensitive and unique information (Kodrich and Laituri 2011).

Thirdly, several scholars have shown that the bottom-up communication practices related to social media have accelerated information flow and contributed to communities' empowerment, even though the online content sometimes lacked accuracy and needed validation. Moreover, recent research has shown that the content generated by ordinary people can allow citizens to seek emotional support. From the first moments, they can provide a way to share feelings and thoughts, keep in touch with loved ones (Gao et al. 2011), and reconnect with family and friends (Procopio and Procopio 2007; Semaan and Mark 2012).

Bottom-up communication processes in social media are not exempt from limits, of course. One of the most relevant is the predictable imbalance: "Diversity plus freedom of choice creates inequality, and the greater the diversity, the more extreme the inequality" (Shirky 2003: 48). In other words, if a system is sufficiently vast and unconstrained, a limited number of active people will receive much more attention and will have much more space than the

majority.[2] This gap has relevant effects in our case. On the one hand, most users will not participate very much, but simply lurk in the background without contributing to the informational gain with their updates, feedback, and opinions (Schradie 2011; Shirky 2008). On the other hand, the most active users will become key players, and may become, for example, influential "twit-stars" or professionals almost like mainstream journalists (Shirky 2003). Put more generally, this imbalance underlines that – even online – individuals do not play the same roles and do not have the same power in shaping alternative representations of the world. "This constitutes a distinctive conception of agency that underlies a social representations approach. What counts is the power to shape mutual expectations within a collective in such a manner as to enable or impede coordinated actions directed toward a given purpose" (Elcheroth et al. 2011: 745).

# 3 The Emilia Romagna and L'Aquila case studies: Aims and methods

## 3.1 Aims

In the next section we will present two distinct case studies concerning the practices of the use of Twitter and Facebook in the context of the earthquakes that struck the Emilia Romagna region (in 2012) and the city of L'Aquila (in 2009). The findings discussed are part of broader research projects (for a preliminary analysis of each single case study, see Comunello and Parisi 2014; Farinosi and Fortunati 2013; Farinosi and Micalizzi 2013; Farinosi and Treré 2010; Farinosi and Treré 2014; Sarrica et al. 2014). In particular, we focus on *bottom-up* communication processes, which are crucial for understanding the links between meaning-making processes and the needs for empowerment in emergency contexts (Fortunati 2014).

We examine the use of Twitter at the instant of the emergency and soon after the Emilia earthquake and the uses and practices linked with Facebook in the medium and long term after the earthquake in L'Aquila. Our goal is to explore, in addition to the differences between the cases, whether the communication on the two platforms contributed to social representations processes. Moreover, we will reflect on the common functions expressed by the practices of use of these

**2** Indeed, social media platforms follow power law distributions, which state that if we sort a set of elements by rank, the value of each position ($N$) will be approximately $1/N$.

two social networks in terms of social sharing of emotions, preserving well-being and self-efficacy, boosting identity processes, and community empowerment.

## 3.2 Methods and procedures

Different methodological approaches were adopted to examine bottom-up communication in the two cases.

The reason behind the methods chosen can be found in our interest in different phases of the aftermath, in the differences between the two earthquakes, in the peculiarities of the two social media platforms, and in the features of use of the two social networks. With regard to this last point, it is worth noting that public accounts largely prevail on Twitter; moreover, hashtags constitute a privileged arena for public thematic conversation. Instead, "private" profiles prevail on Facebook (i.e., only "friends" have access to the posts published), and users tend to consider the platform as a private space, mainly interacting with friends or acquaintances. Therefore, while conducting an analysis on (public) tweets appears as a legitimate research practice (and constitutes, as of now, the privileged research method for analyzing Twitter), analyzing public Facebook posts would exclude a majority of relevant posts and interactions, which take place in a private or semi-private manner. The analysis of the practices related to Facebook was thus integrated into a broader ethnographic perspective.

Let us remember that Twitter usage in Italy was scarce in 2009 and, although Twitter users had broadcast the news of the earthquake before mainstream media, no relevant grassroots earthquake-related conversations were recorded on Twitter during and after the L'Aquila seismic sequence. By contrast, in May 2012 (Emilia earthquake) Twitter usage was much more widespread in Italy,[3] and conversations about the Emilia seismic sequence reached significant volumes ("#terremoto" was a long-lasting *trending topic* in Italy during that period). At the same time, preliminary analysis suggested that Facebook Groups and Pages explicitly related to the Emilia earthquakes had low levels of engagement soon after the quakes occurred. For this reason, we decided to investigate the role of Twitter in Emilia Romagna by looking at the frequency of tweets and submitting geo-localized tweets to thematic content analysis. We

**3** Twitter does not provide any official user data per country. Nevertheless, market research firms provide data that can be considered reliable. According to Statista (www.statista.com), for instance, in June 2012 there were 3.1 million Italian Twitter active users.

examined the frequency of tweets and carried out a thematic categorization[4] of a sample of the tweets produced in the area close to the epicenter. We selected three different moments of the seism in order to explore, though in a short time span, whether the usage varied over time. The selected phases are the following: 1) during the first two hours after the major tremor (20 May 2012, 2:00 am – 3:59 am UTC); 2) two days after the tremor (22 May 2012); 3) seven days after the initial event (27 May 2012).[5]

Facebook was consolidating its position in 2009 in Italy, and was perceived as an innovative tool. The strategic use of the platform in L'Aquila was investigated following an ethnographic approach, combining different qualitative research tools, in order to obtain a deeper understanding of the adoption of this social network in the post-earthquake scenario. We investigated media practices of users involved in the disaster, and we tried to identify prevalent typologies of use, gathering together different data: hermeneutic analysis of five commonly used Facebook groups, which were opened after the earthquake, 32 semi-structured interviews in L'Aquila, and a 5-year period (2009–2014) of non-participant in situ observation. We explored the online activities of the members of the Facebook groups in order to investigate the practices and tactics behind their adoption of the platform. In particular, out of the five Facebook groups we focused on the Coordinamento Carriole Aquilane ("L'Aquila Wheelbarrow Coordination," https://www.facebook.com/groups/333399523599/) and the citizen committee of "3&32" (i.e., the hours and minutes of the main tremor, https://www.facebook.com/groups/79826092084/), which were by far the most used ones, with more than 3,000 members each. We took into account three months of the online groups' activity and conducted online content analysis (Herring 2010). On the basis of the number of posts, comments, and online interactions on the Facebook groups, we also contacted the most active city-dwelling members of the online platform, with whom we carried out 32 semi-structured interviews. In most cases, these individuals were involved not only in Facebook group discussions, but also in other online spaces, such as personal blogs, where they narrated their lives after the earthquake and wrote in depth about the events in L'Aquila. For this reason, we considered these active users as key

**4** The analysis was carried out *manually*; 25% of the tweets were analysed jointly by two researchers, before proceeding to individual analysis; tweets whose attribution appeared controversial were largely discussed.

**5** We decided to include the whole day, for the second and third phases, in order to collect a higher number of tweets. These phases have been selected also in order to avoid the interference of the second major tremor in the seismic sequence (May 29).

players who may have had a privileged role in shaping mutual expectations and in fostering specific social representation (Elcheroth et al. 2011; Shirky 2003). The interviews were submitted to thematic analysis (Flick 2009) in order to determine the most important categories characterizing interviewees' opinions. Finally, these contents were integrated with five years of observations, which started soon after the earthquake in 2009.

## 4 Twitter, quasi-real time communication: A symbolic resource in the Emilia Romagna seismic sequence

During the Emilia Romagna earthquake sequence, 27 people died and more than 350 were injured; several buildings, factories and houses were damaged. The first major tremor (20 May 2012) was a 5.9 magnitude earthquake, and was followed by many other significant quakes. The seismic sequence affected a population that was largely unaware of living in a potentially seismic area.

The analysis of Twitter activity is part of a broader research project that has analyzed Italian Twitter users' localization and communication patterns during the seismic sequence (Comunello 2014). The whole database includes 12,799 tweets that contain words such as *terremoto* ('earthquake') and that were written in Italy between May 20 and 4 June 2012. The territory hit by the earthquakes was divided into three different zones (red, green, and white) referring to the macroseismic intensity map created by the INGV (National Institute of Geophysics and Volcanology) using the MCS scale.[6] In the "red" zone (between the cities of Mantua in the north, Bologna in the south, and Reggio Emilia in the west), users experienced very high earthquake intensity. Within the "green" zone, the earthquake was experienced with less intensity. In the "white" zone, the earthquake was not directly experienced. All tweets were extracted in real time by the INGV using the Twitter Streaming API (Gaffney and Puschmann 2014: 56).

Even if only a very small number of the global tweets (about 2%) contain geographical information (Leetaru Kalev et al. 2013), the user's localization is a key element to describe the specific use of Twitter during earthquakes.

**6** The "red zone" includes degree V and over; the "green" zone includes degrees III and IV. The "white zone" covers degrees I and II.

The majority of the tweets in the broader database (including all three zones) were produced shortly after each major tremor. The first geo-localized tweet was written in the red zone, less than a minute after the magnitude 5.9 tremor. Overall, tweets produced during May 20th account for 33.1% of the whole database (which includes two weeks), while tweets written in the first 2 hours after the magnitude 5.9 tremor account for 51.7% of the tweets of the entire day. Interestingly, the majority (53.9%) of the tweets belong to the green zone (which included several greater urban areas) and 13% to the white zone (where the earthquake was not felt). The analysis of the broader database in terms of mentions and retweets shows that Italian public institutions and municipalities played a minimal role in the Twitter conversation, except for the @ingvterremoti account, which received several citations by the Twitter users.

In this paper, we devote the principal focus to the *red zone*. Therefore, the sub-dataset includes 4,227 tweets related to the May 2012 seismic sequence in Emilia that contain words such as *terremoto* ('earthquake') and are geo-localized within the "red zone." By focusing on this sub-dataset we aim at exploring the ways in which the most affected populations used Twitter to deal with the earthquake.

Unsurprisingly users in the red zone appear generally more "involved" with the earthquake compared to users from the other zones. They produce a more constant number of tweets during the whole seismic sequence and they show the highest mean number of tweet per user (4.2). Moreover, they produce the highest percentage of tweets containing hashtags, which are a tool for effectively organizing communication in a topic-oriented way. In addition, their active

**Table 1:** Categories of the analyzed tweets.

| Category | Definition | SR prevalent functions |
|---|---|---|
| Information | Tweets providing "firsthand information" concerning the event and tweets reporting "second-hand information" (from media, other users, public institution, etc.) | *Cognitive coping*: making the unexpected meaningful and controllable |
| Location | Tweets making reference to specific places (in addition to automatic geo-localization) | *Cognitive coping*: making the unexpected meaningful and controllable |
| Emotional | Tweets describing the user's mood and her/his emotional reaction (e.g., fear, surprise, irritability, etc.) | *Social sharing of emotions*: recovery observed after significant trauma |

(*continued*)

**Table 1:** (*continued*)

| Category | Definition | SR prevalent functions |
|---|---|---|
| Irony | Tweets composed of jokes, ironic stories and funny anecdotes of things that took place during the event | *Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism |
| Routine interruption | Tweets describing the interruption of the user's everyday activities (e.g., sleeping, going to school, commuting) | *Cognitive coping*: making the unexpected meaningful and controllable |
| Comments | Tweets conveying general comments on the event, such as the role of mass media; personal reflections, etc. | *Power functions*: empowerment, identity claim, continuity, defense against stigma |
| Information request | Tweets asking for information about the magnitude of the earthquake, number of victims or emergency guidelines to follow | *Cognitive coping*: making the unexpected meaningful and controllable |
| Meta social media | Tweets containing comments on the role of social media in crisis response | *Power functions*: empowerment, identity claim, continuity, defense against stigma |
| Polemic against institutions | Critiques of political institutions | *Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism<br>*Power functions*: empowerment, identity claim, continuity, defense against stigma |
| Solidarity | Expressions of solidarity with victims | *Social sharing of emotions*: recovery observed after significant trauma<br>*Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism |
| Other | Other kinds of tweets | |

participation is confirmed by the highest original tweet ratio, in other words, users in the red zone actively contribute to create information more than distant users who often limit themselves to repeating information provided by others. Despite broader participation, also in this case it is possible to observe imbalance in the participation: the most active users in the red zone produced 162 tweets (3.8%), and the four most active users produced 8.2% of tweets in the entire red zone.

The thematic categorization of the tweets illustrates that Twitter was used to establish a micro-autobiographical storytelling of the event that supports various collective sense-making processes (Table 1).

The first result is that Twitter was used as a quasi-real time communication resource, as shown by the size of the three sub-corpora. From during the first two hours after the major tremor (20 May 2004:03:52 local time, 02:03:52 UTC) we collected 408 tweets. Two days after the major quake, Twitter activity had significantly decreased: with two days elapsed since the main tremor (May 22nd), 122 geo-localized tweets were produced, and one week after the main tremor (May 27th), 109 geo-localized tweets were produced by users tweeting from the red zone. Moreover, a significant percentage of tweets written in the following days (more specifically, 57 out of 122 tweets produced on May 22nd, and 32 out of 109 tweets produced on May 27th) are produced by INGV (National Institute of Geophysics and Volcanology), and refer to subsequent minor tremors occurring during the seismic sequence. Since INGV produces standardized earthquake information (providing the magnitude, coordinates, and other information about each quake), we decided to exclude such tweets from the following categorization and devote a main focus to the first time slot (the first two hours after the major quake on May 20th), during which the number of tweets is significantly higher.

As Figure 1 shows, on May 20th there is a prevalence of tweets reporting information (80 %) aimed at providing details concerning the emergency: firsthand information (63.3 %), and information produced by media outlets

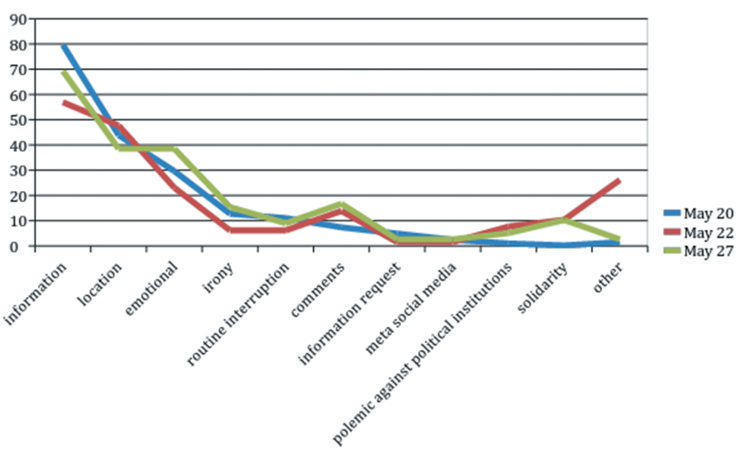


**Figure 1:** Categories of tweets – percentages within single time slots (20 May 2012: 4.00 am – 5.59 am local time; May 22 and 27: entire day).

("second-hand information" 16.6 %), respectively. Especially during the first minutes after the tremor, users tended to simply report that they had felt an earthquake (several users only tweeted "earthquake"). Afterwards, they started enriching their tweets with more information (e.g.: "Very strong earthquake in Castel Maggiore!!!," May 20th, 04:24 local time), or to share information produced by media outlets, sometimes elaborating on it (e.g.: "#earthquake Rai News is unfortunately reporting a casualty in Bondeno," May 20th, 05:59 local time). Even though the tweets were geo-localized, many tweets (43.8 %) included location details: in the first minutes, the localization of the user prevailed; afterwards, when they had collected information both on social media and/or on broadcast media, they started referring to the (supposed) localization of the epicenter. Moreover, some users provided specific information about their personal perception of the quake: they reported that they woke up because of the earthquake, some damage to the building, or that they felt an intense (or a moderate) quake. Many tweets express emotions, mainly fear, surprise, anxiety, anger (29.7 %). The emotional emphasis is often obtained, besides through word choice, through punctuation (such as a repeated usage of exclamation marks) or emoticons (e.g.: "More shakings?!! I can't stand it #earthquake," May 20th, 5:57, local time).

Another relevant coping strategy is irony: users seem to turn to irony in order to downplay the shock produced by the earthquake, indeed also in the broader database the majority of the ironic tweets were produced by users from the red and green zones (i.e., people who directly felt the quake). Ironic tweets (12.7 %) included jokes, funny stories, and gags to downplay the shock produced by the earthquake (e.g.: "Well, at least I found out that it was an #earthquake and not a poltergeist in my room," May 20th, 4:47, local time). Some tweets report what users were doing when they felt the quake (11.0 %). The sudden interruption of their everyday activities attests that something very big was happening and could not be immediately resolved.

Two days and seven days after the first major tremor, the number of tweets had significantly decreased.

The main functions of the tweets did not significantly vary between phases two and three, with some exceptions (Figure 1). The great majority of these tweets contain firsthand information. Users directly reported the name of the locations where the most critical events took place, and continued to use Twitter as a means to describe their emotions. On the whole, Twitter was used as a platform to express the cognitive and practical consequences of the on-going emergency.

Other functions emerged in the days after the main tremor. Two and seven days after it we recorded a growing incidence of comments, solidarity, and polemics against political institutions. However, the limited number of such tweets tentatively suggests that Twitter is not suited to acting as a catalyst for these kinds of process as much as Facebook was seen to be in the context of the other earthquake examined.

## 5 How the community of L'Aquila used Facebook to empower itself over time

During the night of 6 April 2009, a magnitude 6.3 earthquake hits the town of L'Aquila, in central Italy. It caused the death of 309 people and serious damage to L'Aquila and surrounding villages, destroying many areas of the medieval center, the social, political, and cultural heart of the town. In the days immediately following the seism, the city center was closed off to citizens for security reasons. The post-emergency phase was framed by mainstream Italian journalists with the phrase "the miracle in L'Aquila" to convey the idea that – thanks to the Berlusconi government – a fast, efficient, and almost miraculous post-seismic reconstruction was taking place. This catchphrase was supported by numerous appearances of Berlusconi on national and international TV channels, and by the live coverage of several events culminating in the G8 Summit, which was purposely moved from Sardinia to L'Aquila.

Many citizens turned to Facebook since the very first moments after the disaster.

Summarizing a large amount of ethnographic data and online observations (Farinosi and Micalizzi 2013; Farinosi and Treré 2010; Farinosi and Treré 2014), the perception and use of Facebook by people affected by the 2009 earthquake can be classified in six main categories (Table 2).

The interviews with key players and the on-site observations helped us to understand the goals behind Facebook use and how its use was useful at contributing to empowerment and counter-empowerment processes among citizens.

First, the number of accounts increased after the earthquake, and the reasons that individuals reported in the interviews for activating new Facebook profiles give us an idea of the importance projected onto the use of Facebook. People – especially older individuals – did not own a social media account before the earthquake because they thought joining these platforms was a waste of time. In the days immediately after the tragic event, the situation changed radically and

**Table 2:** Categories of Facebook perception and use after the earthquake of L'Aquila.

| Categories | Descriptions | SR prevalent functions |
|---|---|---|
| Information | Use of Facebook to spread information about safe, dead or missing people; to seek timely information about damage and warnings; to improve situational awareness; to map the status of the community. | *Cognitive coping*: making the unexpected meaningful and controllable |
| Emotional | Use of Facebook to seek and provide emotional support and human contact; to share emotions and concerns with community members; to share mourning; to keep in touch with loved ones. | *Social sharing of emotions*: recovery observed after significant trauma |
| Solidarity | Use of Facebook to create a sense of social cohesion and community; to offer or solicit help. | *Social sharing of emotions*: recovery observed after significant trauma<br>*Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism |
| Relationship | Use of Facebook to stay in touch and communicate with friends and family; to interact with each other and re-establish the ties with other citizens | *Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism |
| Self-mobilization | Use of Facebook to create a new space for discussion and aggregation; to organize emergency relief and coordinate volunteers to request donations; to coordinate collective actions and protest movements; to monitor public policies and complain about the political situation | *Cognitive coping*: making the unexpected meaningful and controllable<br>*Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism<br>*Power functions*: empowerment, identity claim, continuity, defense against stigma |
| Counter-narrative | Use of Facebook to disseminate contents produced by non-professional journalists; to bypass traditional gatekeepers and propose independent and bottom-up information on the local situation; to provide an alternative to mainstream media; to claim power and control | *Preservation of identity*: well-being, self-efficacy, protection of in-group and self-identity, splitting mechanism<br>*Power functions*: empowerment, identity claim, continuity, defense against stigma |

numerous people started to join this online platform in order to connect or reconnect with others, to obtain mutual emotional support, and to restore a sense of control and empowerment (Farinosi and Treré 2014).

This point emerged clearly from the words of Enza B., who said:

> I realized Facebook was the first thing to do, so I could maintain contacts with friends ... I felt relieved, I wasn't alone anymore, because I was really frustrated at the beginning.

In the very first moments after the earthquake, the platform proved to be a useful tool to help people in connecting with friends and family. Facebook primarily served to alert friends and family and communicate to the loved ones what their current status was, and to offer or solicit help. It let users tell others whether they were unharmed, check the well-being of friends in affected areas, and spread information about people who had been rescued, had been found dead under the rubble or were still missing. As one of the activists explained to us:

> In the first days ... for me Facebook was the only channel to get information about the people who didn't answer the phone and had disappeared, it was the only place where you could find out that a person had been rescued from the debris or not. (Luca C.)

In short, this social medium was seen as a tool of emotional support, a space to find information, a modern tam-tam, and an effective public sphere. Talking about Facebook, Luca said:

> it was really useful because a friend of mine would say "Marco has survived and is fine. Spread it!" and everyone would put on their wall that Marco was fine and so I believe that in that moment Facebook was incredibly useful ... I will never use it so intensively like during those days! (Luca C.)

After the earthquake, Facebook also became a space for discussion and aggregation, and provided an alternative to mainstream media in order to keep people updated as well as to find useful information regarding what was happing in the city. Facebook in the post-earthquake scenario represented an online environment where the social life that had been interrupted by the seism was relocated.

In the absence of traditional public spaces – destroyed or damaged by the seism – the online social sites acted as surrogates of the offline gathering places. In this context, Facebook, as a mediated public space, had a pivotal role above all for the many inhabitants displaced in the tent camps or in other cities. People used Facebook to re-establish the ties that had been broken offline because of the earthquake. According to Francesco, a young amateur journalist:

> The Web was important because obviously after the earthquake the squares don't exist anymore. There are no physical spaces to meet in and the virtual square became Facebook, the blogs and forums where citizens and committees exchange ideas and make appointments. (Francesco P.)

In addition, it was used also to create several memorial pages dedicated to the victims of the earthquake and to share mourning, leaving public thoughts and messages to people who had passed away (Farinosi and Micalizzi 2013).

In the long term, Facebook became more and more a place for recovering voice, for proposing a counter-narrative and for claiming power. Active users perceived this tool as crucial in the construction and coordination of collective actions such as the *Il Popolo delle Carriole*, *Mettiamoci una pezza* ('Let's put a patch on it'), and citizens' committees like "3&32" (Farinosi and Treré 2010; Farinosi and Fortunati 2013). Moreover, it was crucial in the dissemination of the content produced by non-professional journalists (Farinosi and Treré 2014). Thus, Facebook was elaborated by the users not only as an empowerment tool for citizens, but also as a pivotal medium for counter-power. In fact, according to several city dwellers, everyday life in post-earthquake L'Aquila was different from that depicted by the Italian mainstream media and the "miracle" was nothing more than a media mystification, in strong contrast with their existence and all the rubble and debris, which still dominated the city center. Some of them, talking about the overabundant news of the days after the disaster, used the term "*information bulimia*"; others, describing how mainstream media coverage twisted or left out particular events, showing only the tip of the iceberg in terms of the post-earthquake situation, talked about "Fascist practices of censorship" (Federico N.). Ezio B., for example, said:

> "Everything is OK in L'Aquila" ... My son lives in Milan and came to L'Aquila for the Easter holidays. He visited me and said that this was the message being spread by the television ... What does that mean?! Later I began to realize that actually outside L'Aquila there was the idea that here everything was going right, according to an ideal "miracle of L'Aquila" mentioned in the news.

The city thus witnessed an explosion of grassroots-generated content on online platforms. Blogs, Facebook, and YouTube were flooded with posts, comments, videos, and pictures regarding everyday life after the catastrophe and the city's reconstruction process (Farinosi and Treré 2010). Locals relied on Facebook to challenge the "media spectacle of catastrophe" and to make the voice of the people heard. Furthermore, they were aware that this news production and sharing acted as a sort of civic mutual aid in a community that was trying to rebuild its ties using every available tool (Farinosi and Treré 2014). One of them said that the creation of grassroots information represented a gift to the

entire community and for this reason a lot of people thanked him "because they felt represented by this communication for providing not only information in the classic sense, but information with a heart, in the ways we told our stories about our community, because obviously being involved we can invest them with emotions and we can communicate our feelings" (Luca B.).

Exemplary of both empowerment and counter-power, the Facebook use in post-earthquake L'Aquila is marked by the collective action of the "People of the Wheelbarrows." This group emerged in February 2010, when Italian mainstream media reported a phone tap between two entrepreneurs. One was telling the other how he laughed that very night thinking about the opportunities to profit financially from the rebuilding process. This recording provoked strong indignation and acted as a catalyst on people who were frustrated and tired of unfulfilled promises of reconstruction.

A few days after the recording was made public, about 6,000 citizens started to reclaim the city center and to confront the police who blocked access to the off-limits zone. They claimed to be an active part of the city reconstruction and expressed the desire to promote transparency in the management of the disaster funds. On 28 February 2010, in order to coordinate the offline protests, they created a Facebook group, called "L'Aquila Wheelbarrow Coordination," which grew to 3,318 members in a few days. Analyzing three months of the life of the group (from the day of its foundation on Facebook to the end of May 2010), it is possible to identify three different levels of participation. Only a few members were "primary participants," who interacted almost every day and contributed to the effective enrichment of the Facebook group in terms of content, comments, links shared and discussions (i.e., the most active member wrote 93 posts in three months, and only five people made more than 30 posts during the same period). A larger percentage of members contributed occasionally: "secondary participants" left only one or a few comments ($n = 170$, around 5% of members) or simply clicked the "like" button. The vast majority of members (around 95%) merely consume information and content posted by others without expressing any kind of manifest involvement ("passive participants").

The Facebook group was to be pivotal for planning, organizing, coordinating, and promoting offline events, town meetings, and all the protest activities. In addition, they used Facebook to report online – through textual and/or visual content – what happened during their meetings in the square. This also enabled them to connect with the L'Aquila inhabitants who were exiled after the earthquake to hotels on the Adriatic coast or to other cities far from L'Aquila. In this sense, we can see the adoption of Facebook itself as an important part of the process of re-appropriation of the offline public spaces and as a tool of participation. In this regard, it is also worth highlighting the use of dialect in online

communications, which served as an identity value, useful for redefining the community boundaries after the traumatic experience the community had lived through (Farinosi and Micalizzi 2015; Farinosi and Treré 2010).

## 6 Discussion and final remarks

Results confirm expected similarities and specificities of the two case studies and show the importance of observing disaster communication also from a bottom-up perspective (Gilbert 1998; Starbird and Palen 2011; White et al. 2014). Indeed, far from being informed and rescued purely by authorities, citizens played an active role both in Emilia and in L'Aquila.

As expected, in both case studies the use of social media in the immediate aftermath favored the emergence of "citizen sensors," who provided detailed information and contributed to awareness, coordination, and first responses. Moreover, comments and polemics against institutions were present on both social platforms. This happened especially in L'Aquila, where in the long term Facebook was used as a platform for citizen journalism and for coordinating social movement and activism.

Results suggest that the use of Twitter and Facebook favored different representational functions.

A first signal of the activation of social representations processes comes from the tweets sent almost during the earthquake. Many tweets, in fact, report routine interruption and the re-establishment of everyday habits. In the first case, users provide out-and-out micro-storytelling: even with the limitation of 140 characters, they produce a narrative that refers to their routines before the earthquake, and underline how the disaster interrupted such routines. At the same time, two days and seven days after the main tremor, in order to contrast this feeling, some Twitter users proudly describe how they were re-establishing everyday habits (such as: going to work, reopening commercial activities, shopping) while the emergency was still in progress. In L'Aquila, instead, Facebook was used to show the permanence of the emergency situation, the fracture of normality. Online platforms, in any case, were a resource that people used to deal with the unexpected and with a daily life that had been significantly modified by the earthquake. We may thus conclude that communication via social media contributed to the first of social representation functions, which is cognitive coping: to re-establish an order, a sense of orientation, understanding and control over the world, which has been disrupted (Moscovici 1973).

The second main function served by both Twitter and Facebook use was the social sharing of emotions (Pennebaker and Harber 1993; Rimé et al. 1998). Many

users turned to Twitter in order to express their first reactions to a tremor, or even to simply testify that they have been affected by the tremor. Firsthand information, which was the prevailing category, mainly exerted such a witnessing function. Another important category was emotional tweets, through which users expressed their affective reaction to the earthquake. Sometimes, Twitter users seemed to feel the urgency to simply express that they were involved in such a disaster; therefore, some of their tweets exerted a phatic function, aiming at taking part in the shared conversation. Using Twitter to share fear, anxiety or even anger thus exerted a central role in users' coping strategies, and constituted a constant trend throughout: in the very first moment, on the second day and one week after the major tremor. More specifically, some users underlined that Twitter provided the only reassuring element during the disaster: a sense of togetherness. The same content emerged with even greater emphasis in L'Aquila, where Facebook was used not only to share immediate feelings, but also to share grievances and memories, as exemplified by memorial pages dedicated to the victims of the earthquake (Farinosi and Micalizzi 2013).

Irony, in this regard, seems to be the other face of the same coin. Irony emerged in the immediate aftermath and may have been prompted by the splitting mechanism hypothesized by Joffé (2003): it makes it possible to verbalize intense and unspeakable emotions, and to preserve well-being and self-efficacy while trying to make sense of the unexpected.

Finally, representational functions linked with identity processes and community empowerment emerged later on. Even though such mechanisms were already present in tweets produced seven days after Emilia earthquakes, as expected it was the key players from L'Aquila who used the online platform mainly as a place where the earthquake could be understood, processed, discussed, described and re-mediated. The use of Facebook was purposely aimed at fostering processes of re-construction of lay knowledge and coordination among locals. In the long term, bottom-up social representations of self and the emergency situation were developed by challenging the mainstream narrative and favoring a sense of control and empowerment.

All the different practices of Facebook use by the L'Aquila community make evident that social media were perceived as reliable spaces to express themselves and tell stories about the local area. The Internet was perceived and used as a way to bypass traditional gatekeepers and directly communicate critical views on the post-quake situation (Farinosi and Treré 2014). This use of Facebook contributed to hindering the narrative of the post-earthquake provided by the Italian mainstream media from the bottom up. The participation in community content creation and sharing became significant at both individual and social level and joined with a reconnecting factor. The online activism can

also be interpreted as an expression of resilience: the capacity to withstand and cope with difficult circumstances, overcoming the traumatic experience together with the other members of the community. Through building a sense of connectedness with the local community, Facebook use allowed the most active people to improve social life, promote grassroots initiatives, re-establish a powerful sense of identity, and counter mainstream media reports.

We can conclude that both social media platforms enabled "ordinary" people to create and share, rather than simply consume, content as never before and thus opened up a greater potential for meaningful use and empowerment after a natural disaster.

However, it is worth highlighting once again that social media platforms – similar to other social contexts – are characterized by a high inequality in participation because they deal with "ordinary" people, where a tiny minority of users usually accounts for a disproportionately large amount of the content (Schradie 2011; Shirky 2003; Shirky 2008). Such inequities alert us that the analysis of social media platform alone may give a biased understanding of the community under scrutiny. In Emilia, for example, a few users accounted for about 8 % of the tweets; nevertheless, it should also be pointed out that the more users were directly involved, the more they actively contributed to the online debate: the average Twitter production is higher in the red zone than in more distant ones.

This imbalance was even more evident in L'Aquila, which is why we integrated the hermeneutic analysis of online content with in situ observations and interviews with key players.

A second caveat concerns the distance that can be created between the most active people and the large majority (Shirky 2008), which may lead several people to quit, one of the challenges that assimilates online communities and more traditional grassroots movements. In L'Aquila during the mobilization phase of collective action, between 2010 and 2011, the group we analyzed lived a great moment of popularity; then, numerous members decided to quit. Today, the Facebook group of the Coordinamento Carriole Aquilane has only 49 members, while the "3&32" group had 3,966 people. The decrease in members may be somehow related to the fulfilment of the functions of the group itself: once the emergency has ended and once the users have managed to have a voice and establish their counter-narrative, the group had no more reason to exist However, it should also be noted that one of the reasons of this decrease was the perception of an ever-increasing politicization of the groups, which changed the perceived identity of the group and eventually led many members to leave them. Further research is needed to explore this long-term phase, since we cannot exclude that also this decision shows an increased self-reliance and return to normality, after emergency and protests.

Despite these caveats, observing these shared processes of collective meaning co-construction provides significant insights into the functions served by social representations processes, and on their sequence: starting from cognitive coping and social sharing of emotions, to splitting mechanisms exemplified by irony, to identity and empowerment processes.

In this regards the analysis of the Emilia and L'Aquila case studies suggests that communicative processes activated by people affected by disasters prove to be useful for developing timely, well-targeted and effective intervention. Indeed, bottom-up processes are pivotal resources for community resilience, recovery and empowerment, which are by far the most important goals that institutions should seek in disaster management.

## References

Adey, Peter, Ben Anderson & Stephen Graham. 2015. Introduction: Governing emergencies: Beyond exceptionality. *Theory, Culture & Society* 32(2). 3–17.

Axia, Giovanna. 2006. *Emergenza e psicologia [Emergency and psychology]*. Bologna: Il Mulino.

Bandura, Albert. 2004. Health promotion by social cognitive means. *Health Education & Behavior* 31(2). 143–164.

Bauer, Martin K. & George Gaskell. 2008. Social representations theory: A progressive research programme for social psychology. *Journal for the Theory of Social Behavior* 38(4). 335–353.

Bortree, Denise S. & Trent Seltzer. 2009. Dialogic strategies and outcomes: An analysis of environmental advocacy groups' Facebook profiles. *Public Relations Review* 35(3). 317–319.

Breakwell, Glynis M. 2001. Mental models and social representations of hazards: The significance of identity processes. *Journal of Risk Research* 4(4). 341–351.

Comunello, Francesca (ed.). 2014. *Social media e comunicazione d'emergenza [Social media and emergency communication]*. Milan: Guerini.

Comunello, Francesca & Lorenza Parisi. 2014. Social media e disastri naturali: Un'analisi dei tweet durante il terremoto in Emilia [Social media and natural disaster: Analysis of tweets during the Emilia earthquake]. In Francesca Comunello (ed.), *Social media e comunicazione d'emergenza [Social media and emergency communication]*, 33–46. Milan: Guerini.

Elcheroth, Guy, Willem Doise & Stephen Reicher. 2011. On the knowledge of politics and the politics of knowledge: How a social representations approach helps us rethink the subject of political psychology. *Political Psychology* 32. 729–758.

Emiliani, Francesca. 2008. *La realtà delle piccole cose: Psicologia del quotidiano [The reality of small things: Everyday psychology]*. Bologna: Il Mulino.

Farinosi, Manuela & Emiliano Treré. 2010. Inside the "People of the Wheelbarrows": Participation between online and offline dimension in the post-quake social movement. *The Journal of Community Informatics* 6(3). Retrieved from http://ci-journal.net/index.php/ciej/article/view/761/639

Farinosi, Manuela & Emiliano Treré. 2014. Challenging mainstream media, documenting real life and sharing with the community: An analysis of the motivations for producing citizen journalism in a post-disaster city. *Global Media and Communication* 10(1). 73–92.

Farinosi, Manuela & Leopoldina Fortunati. 2013. A new fashion: Dressing up the cities. *Textile* 11 (3). 282–299.

Farinosi, Manuela & Alessandra Micalizzi (eds.). 2013. *NetQuake: Media digitali e disastri naturali. Dieci ricerche empiriche sul ruolo della Rete nel terremoto dell'Aquila [Digital media and natural disaster: Ten empirical research on the role of the Net in the earthquake of L'Aquila]*. Milan: FrancoAngeli.

Farinosi, Manuela & Alessandra Micalizzi. 2015. Geolocating the past: Online memories after an earthquake. *in* Andrea Hajek, Christine Lohmeier & Christian Pentzold (eds.), *Memory in a mediated world: Remembrance and reconstruction*, 90–110. Basingstoke: Palmgrave.

Festinger, Leon. 1957. *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.

Flick, Uwe. 2009. *An introduction to qualitative research*. London: Sage.

Fortunati, Leopoldina. 2014. Media between power and empowerment: Can we resolve this dilemma? *The Information society* 30(3). 169–183.

Fraustino, Julia D., Brooke F. Liu & Yan Jin. 2013. *Social media use during disasters: A review of the knowledge base and gaps*. Final Report to Human Factors/Behavioral Sciences Division, Science and Technology Directorate, U.S. Department of Homeland Security. College Park, MD: START.

Fritz, Charles E. 1968. Disasters. *in* David Sills (ed.), *International encyclopedia of social sciences*, 202–207. New York: Free Press.

Gaffney, David & Cornelius Puschmann. 2014. Data collection on Twitter. *in* Katrin Weller, Axel Bruns, Jean E. Burgess, Merja Mahrt & Cornelius Puschmann (eds.), *Twitter and society*, 55–67. New York: Peter Lang.

Gao, Huiji, Geoffrey Barbier & Rebecca Goolsby. 2011. Harnessing the crowdsourcing power of social media for disaster relief. *IEEE Intelligent Systems* 26(3). 10–14.

Gilbert, Claude. 1998. Reply to Hewitt. *in* Enrico L. Quarantelli (ed.), *What is a disaster? Perspectives on the question*, 91–95. London: Psychology Press.

Goodchild, Michael F. 2007. Citizens as sensors: The world of volunteered geography. *GeoJournal* 69(4). 211–221.

Gruev-Vintila, Andreea & Michel-Louis Rouquette. 2007. Social thinking about collective risk: How do risk-related practice and personal involvement impact its social representations? *Journal of Risk Research* 10. 555–581.

Herring, Susan C. 2010. Web content analysis: Expanding the parading. *in* Jeremy Hunsinger, Lisbeth Klastrup & Matthew Allen (eds.), *The international handbook of internet research*, 233–250. Berlin: Springer Verlag.

Howarth, Caroline. 2006. A social representation is not a quiet thing: Exploring the critical potential of social representations theory. *British Journal of Social Psychology* 45(1). 65–86.

Hughes, Amanda L., Lise A. A. St. Denis, Leysia Palen & Kenneth M. Anderson. 2014. Online public communications by police & fire services during the 2012 Hurricane Sandy. In *Proceedings of the 32nd annual ACM conference on human factors in computing systems*, 1505–1514. New York: ACM.

Joffé, Helene. 2003. Risk: From perception to social representation. *British Journal of Social Psychology* 42. 55–73.

Joffé, Helene, Tiziana Rossetto, Christian Solberg & Cliodhna O'Connor. 2013. Social representations of earthquakes: A study of people living in three highly seismic areas. *Earthquake Spectra* 29(2). 367–397.

Jovchelovitch, Sandra. 2005. Social representations in and of the public sphere: Towards a theoretical articulation. *Journal for the Theory of Social Behavior* 25(1). 81–102.

Kodrich, Kris & Melinda N. Laituri. 2011. Making a connection: Social media's key role in the Haiti earthquake. *Journal of Communication and Computer* 8. 624–627.

Kotsiopoulos, Ioannis. 2014. Social media in crisis management: Role, potential, and risk. In *Proceedings of the 2014 IEEE/ACM 7th international conference on utility and cloud computing*, 681–686. London: IEEE.

Leetaru Kalev, H., Shaowen Wang, Guofeng Cao, Anand Padmanabhan & Eric Shook. 2013. Mapping the global Twitter heartbeat: The geography of Twitter. *First Monday* 18. 5–6.

Lewicka, Maria. 2011. Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology* 31(3). 207–230.

Lindell, Michael K. & Ronald W. Perry. 2000. Household adjustment to earthquake hazard a review of research. *Environment and Behavior* 32(4). 461–501.

Moscovici, Serge. 1973. Foreword. *in* Claudine Herzlich (ed.), *Health and illness: A social psychological analysis*, IX–XIV. London: Academic Press.

Moscovici, Serge. 1988. Notes towards a description of social representations. *European Journal of Social Psychology* 18. 211–250.

Moscovici, Serge & Ivana Marková. 1998. Presenting social representations: A conversation. *Psychology and Culture* 4. 371–410.

Mulargia, Simone. 2014. Twittare in condizioni di emergenza. Dall'attivazione spontanea degli utenti alle strategie istituzionali [Tweet in emergency. From spontaneous activation of users to institutional strategies]. In Francesca Comunello (ed.), *Social media e comunicazione d'emergenza [Social media and emergency communication]*, 33–46. Milan: Guerini.

Pareto, Vilfredo. 1988 [1916]. *Trattato di Sociologia Generale [Treatise of General Sociology]*, vol. 4. Turin: UTET.

Pennebaker, James W. & Kent D. Harber. 1993. A social stage model of collective coping: The Loma-Prieta earthquake and the Persian-Gulf war. *Journal of Social Issues* 49. 125–145.

Pietrantoni, Luca, Gabriele Prati & Luigi Palestini. 2008. *Il primo soccorso nelle maxi-emergenze e nei disastri [First aid in massive emergency and disasters]*. Bologna: Clueb.

Prati, Gianluca, Valeria Catufi & Luca Pietrantoni. 2012. Emotional and behavioral reactions to tremors of the Umbria-Marche earthquake. *Disasters* 36(3). 439–451.

Procopio, Claire H. & Steven T. Procopio. 2007. Do you know what it means to miss New Orleans? Internet communication, geographic community, and social capital in crisis. *Journal of Applied Communication Research* 35. 67–87.

Rimé, Bernard, Catrin Finkenauer, Olivier Luminet, Emmanuelle Zech & Pierre Philippot. 1998. Social sharing of emotion: New evidence and new questions. *European Review of Social Psychology* 9(1). 145–189.

Saakvitne, Karen W. & Laurie A. Pearlman, the Staff of the Traumatic Stress Institute. 1996. *Transforming the pain: A workbook on vicarious traumatization*. New York: W. W. Norton.

Sarrica, Mauro, Mara Germani & Sonia Brondi. 2014. Istanti, ore, giorni dopo il terremoto: Spunti dall'analisi dei tweet per la Psicologia dell'Emergenza [Moments, hours, days after the earthquake: Cues for Emergency Psychology from tweets analysis]. *in* Francesca Comunello (ed.), *Social media e comunicazione d'emergenza [Social media and emergency communication]*, 87–106. Milan: Guerini.

Sarrica, Mauro, Alice Roseti, Sonia Brondi, Pierluigi Cervelli & Giovanna Leone. 2016. Flooded by a wall of water: Parent-child reminiscing about local environment and unwanted changes. *Qualitative Research in Psychology* 13(3). 209–230.

Schade, Sven, Gianluca Luraschi, Bertrand De Longueville, Simon Cox & Laura Díaz. 2010. Citizens as sensors for crisis events: Sensor web enablement for volunteered geographic information. Paper presented at *WebMGS 2010*. August 26–27, Como, Italy.

Schradie, Jen. 2011. The digital production gap: The digital divide and Web 2.0 collide. *Poetics* 39(2). 145–168.

Semaan, Bryan & Gloria Mark. 2012. "Facebooking" towards crisis recovery and beyond: Disruption as an opportunity. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work*, 27–36. New York: ACM.

Shirky, Clay. 2003. Power-laws, weblog and inequality. *in* Jon Lebkowski & Mitch Ratcliffe (eds.), *Extreme Democracy*, 46–52. E-Book available at http://www.extremedemocracy.com/.

Shirky, Clay. 2008. *Here comes everybody: The power of organizing without organizations*. New York: Penguin.

Spiro, Emma S., Jeannette Sutton, Matt Greczek, Sean Fitzhugh, Nicole Pierski & Carter T. Butts. 2012. Rumoring during extreme events: A case study of Deepwater Horizon 2010. Paper presented at the *International Conference on WebSci 2012*. Evanston, IL, June.

Starbird, Kate & Leysia Palen. 2011. "Voluntweeters": Self-organizing by digital volunteers in times of crisis. Paper presented at the *ACM 2011 Conference on Computer Human Interaction*, Vancouver, BC, Canada, May.

Wagner, Wolfgang & Nicky Hayes. 2005. *Everyday discourse and common sense: The theory of social representations*. Basingstoke: Palgrave.

White, Joanne, Leysia Palen & Kenneth Anderson. 2014. Digital mobilization in disaster response: The work & self-organization of on-line pet advocates in response to Hurricane Sandy. In *Proceedings of the ACM 2014 Conference on Computer Supported Cooperative Work*, Baltimore.

Young, Bruce H., Julian D. Ford, Josef I. Ruzek, Matthew J. Friedman & Fred D. Gusman. 1998. *Disaster mental health services: A guidebook for clinicians and administrators*. Menlo Park, CA: National Center for Post-Traumatic Stress Disorder.