

Public expectations of social media use by critical infrastructure operators in crisis communication

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ABSTRACT

Previous research into the role of social media in crisis communication has tended to focus on how sites such as Twitter are used by emergency managers rather than other key stakeholders, such as critical infrastructure (CI) operators. This paper adds to this emergent field by empirically investigating public expectations of information provided by CI operators during crisis situations. It does so by drawing on key themes that emerged from a review of the literature on public expectations of disaster related information shared via social media, and presenting the results of an online questionnaire-based study of disaster-vulnerable communities in France, Norway, Portugal and Sweden. Results indicate that members of the public expect CI operators to provide disaster related information via traditional and social media and to respond to their queries on social media. CI operators should avail of the opportunities provided by social media to provide real-time information to disaster affected communities.

Keywords

Social media; traditional media; crisis communication; critical infrastructure operators; public expectations.

INTRODUCTION

Effective crisis communication can be defined as “the provision of effective and efficient messages to relevant audiences during the course of a crisis process” (Freberg et al., 2013:186). Large scale incidents such as the Mumbai terrorist attacks in November 2008 and the Haiti earthquake in January 2010 marked a watershed in the use of social media for sharing disaster information (Potts, 2014). Social media is the collection of software that enables individuals and communities to gather, communicate, share and in some cases collaborate or play (boyd, 2009). Some well-known examples include Facebook and Twitter. Twitter in particular has been increasingly used by emergency managers as a tool for crowdsourcing crisis information that helps build situational awareness during such incidents (Latonero and Shvlovski, 2010). This has led to the development of a series of guidelines for blue light organisations, such as police, firefighters, rescue services, etc. who use blue light sirens, as well as emergency managers on how best to use social media as a tool for crisis communication¹. Previous research in this emergent area has tended to focus solely upon how these actors use social media for emergency management (Reuter et al., 2016; Bruns et al., 2012; The American Red Cross, 2009), often overlooking the role

¹ See for example, EU projects DRIVER, CascEff, or COSMIC guidelines; Belgium Federal Interior Minister white paper (http://centredecrise.be/sites/default/files/brochure_sociale_media_fr.pdf) or the French Ministry of Interior’s crises communication kits destined for Prefectures (<http://www.interieur.gouv.fr/Actualites/L-actu-du-Ministere/Votre-prefecture-presente-sur-les-reseaux-sociaux>).

played by other key stakeholders such as critical infrastructure² (CI) operators. CI operators are the actors who are in charge of the critical infrastructure. In addition, there have also been few empirical studies (Reuter, 2015) exploring public expectations of information shared by CI operators during crisis situations. Indeed Reuter (2015) examined public information needs from energy operators during a blackout and found that the reason for and the expected duration of a power outage are of great interest to the public and that CI operators should make their information available for smart phones. However the work focused on the development of a smartphone application and had a relatively small sample size (12). Hence, this paper addresses these under-researched issues by drawing on key themes that emerged from a review of the literature on public expectations of disaster related information shared via social media, which is presented in the following section. Then the methodology and the results of an online questionnaire-based study of disaster-vulnerable communities in France, Norway, Portugal and Sweden are described. Afterwards, the findings are discussed with regard to social media use by CI operators during disasters. It concludes by proposing a number of recommendations for how CI operators can use social media to communicate with members of the public during crisis situations.

PUBLIC EXPECTATIONS OF DISASTER RELATED INFORMATION ON SOCIAL MEDIA

Types of information

Members of the public expect to be kept informed about the threat to their lives and properties at each stage of the disaster cycle (Perko et al., 2013; Tierney, 2009). They expect to be able to find out what has happened, what is expected to happen, and what steps they should take to mitigate the risk to themselves and their homes (Ryan, 2012). For example, after the Nepal earthquake in 2015, a survey of *LastQuake* app users conducted by the European Mediterranean Seismological Centre (EMSC) found that 44% of respondents wanted to be provided with “Dos and Don’ts”, in order for them to understand how to act after an earthquake (Bossu et al., 2015). People also expect to receive information written in a language that is jargon-free and easy to understand (Kaufman et al., 2012). This should also account for the different languages spoken by disaster affected communities. Delays in the evacuation of flood vulnerable areas in New Orleans during Hurricane Katrina in August 2005 were attributed to the fact that sections of the Spanish-speaking population had not heeded warnings, which had only been disseminated in English, despite US 2005 census data finding that one third of Spanish speakers speak English “less than well” (Jennings et al., 2013). Crisis communication should therefore be not only timely and accurate, but also tailored to the specific characteristics of the target population.

Social media and crisis situations

Social media has been identified as an increasingly important source of information that supports decision making processes during crisis situations. While there can be a considerable lag between the occurrence of a crisis situation and news reports about it, social media has been recognised for its potential to provide complementary and relevant information for crisis management in near real-time (Meier, 2013). That said, the public expect to receive crisis information from key stakeholders via both social and traditional media channels (The American Red Cross, 2009). Research has consistently shown that citizens seek information from whatever media channels are available to them during disasters, as was the case during large-scale incidents such as Hurricane Sandy and the 2011 Great East Japan Earthquake (Burger et al, 2013; Mitomo et al., 2013). Expectations about the availability of crisis information on social media have continued to rise over the past decade. A study commissioned by the American Red Cross (2009) found that sites such as Facebook and Twitter were the fourth most popular source of information during crisis situations. Subsequent surveys conducted in the European Union found that 43% of respondents used social media to look for information during a past emergency, with 58% stating that they would do so in the case of a future disaster (Reuter et al, 2016). During the 2011 Great East Japan Earthquake and Tsunami, more than half of Japanese citizens were said to have used sites such as Twitter to search for disaster-related information. Research suggested that 60% of non-affected individuals, 80% of indirectly affected individuals, and over 55% of directly affected individuals believed that the internet and social media were the most reliable information sources during the disaster (Takeuchi et al., 2012). As per the Reuter and Spielhofer (2016) survey, which found that 77% of respondents felt that crisis information was shared much more quickly online than via traditional media channels, social media appeared popular due to the ease with which these populations could search for and obtain information about the earthquake. Furthermore, both Facebook and Twitter were heavily used to find out information in Germany during the 2013 European Floods, with 157 Facebook pages and groups being created (Kaufhold et al.,

² The European Union defines CI as “an asset, system or part thereof that are essential for the health, safety, security, economic or social well-being of people, and its disruption or destruction would likely have a significant impact upon the ability of a Member State to maintain those functions (Council Directive, 2008).”

2016).

Social media use by authorities

There is already significant evidence to suggest that citizens are turning to the social media channels of emergency services to obtain information during crisis situations (Lindsay, 2011). During the 2010-11 Queensland floods, Queensland Police Service Media Unit used its Twitter account (@QPSMedia) to provide real-time information to those living in affected areas. Bruns et al. (2012) argued that this helped establish @QPSMedia as the most prominent and widely visited social media account for crisis information in Queensland. Furthermore, the public also expect a quick response if they contact blue light organisations via sites such as Facebook and Twitter. The American Red Cross survey (2009) found that 80% of respondents believed that emergency response organisations should monitor social media sites in order to respond quickly to calls for help. This resonated with the findings of the Reuter and Spielhofer (2016) survey, which suggested that 42% of European citizens expect emergency services to respond within one hour of them posting for help on their social media sites.

Social media use by CI operators

In contrast to emergency management organisations, there remains relatively little empirical research exploring public expectations of information provided by CI operators during crisis situations. Self-evidently, citizens are likely to expect regular updates on progress towards the restoration of services provided by these operators. Hence, power companies are expected to provide customers with accurate information about power restoration in the wake of extreme weather events (Lacey, 2014). Some CI operators have already used social media to address the information needs of disaster-affected populations, as was seen when Hurricane Sandy made landfall near New Jersey in September 2012. New York's Metropolitan Transportation Authority (MTA) used its website, Facebook and Twitter accounts to post regular updates on service availability to its customers (Kaufman et al., 2012). Energy company Public Service Enterprise Group (PSE&G) also used Twitter to update the public about the daily locations of their tents and generators during the power outages that followed Sandy (Fine, 2013).

METHODOLOGY

Three research questions emerged from the literature reviewed above:

- 1) What do European citizens expect of CI operators in regards to information provision during crisis situations?
- 2) Are there any noticeable similarities/differences between public expectations based on demographic factors?
- 3) How can CI operators meet these expectations?

In order to investigate these questions, the EU Horizon 2020 project IMPROVER (Improved risk evaluation and implementation of resilience concepts to critical infrastructure) designed an online questionnaire-based study. Ethics approval was sought and obtained from the respective authorities prior to data being collected. The target population for the questionnaire was adults aged 18 years and over who were familiar with four IMPROVER Living Labs, or clustered regions of different types of infrastructure which provide specific services to a city or region. These were: Barreiro Municipal Water Network, Oresund Region, Oslo Harbour, and French transportation networks (roadways). In order to maximise the response rate, the questionnaire was translated into six languages (English, French, Danish, Swedish, Norwegian, and Portuguese) prior to its distribution. It was structured as follows: first, a brief description of the IMPROVER project was provided and participants were informed of their right to withdraw from the project at any time, as well as how all data would be handled during the project. For the purposes of this questionnaire, respondents were presented with the following definition of a disaster: "an event which has catastrophic consequences and significantly affects the quality, quantity, or availability of the service provided by the critical infrastructure." Second, a Likert scale was used to measure participants' expectations. Participants were asked two questions regarding information provision. The first asked, "During and immediately after a disaster, I expect critical infrastructure operators to provide me with information..." and presented four scenarios: via calling their telephone number, on their website, on their social media site and through traditional media e.g. interviews with television networks or the radio, press releases. The second asked, "During and immediately after a disaster, I expect critical infrastructure operators to respond to my questions and comments on their social media sites e.g. Twitter." The questionnaire also asked about the participants' demographics. Data from the questionnaire was collected between 28 March 2016 and 30 April 2016. The questionnaires were translated back into English at the data entry stage. The questionnaire was disseminated through the IMPROVER consortium partners' contacts as well as through the Living Labs.

Sample characteristics

The sample consisted of 403 respondents. Due to the dissemination method, this self-selected sample was not broadly representative (at least by age, sex, or education level) of the European population, nor those of the geographical locations from which participants were drawn. Sample characteristics showed that 57% of participants were male, 41% female, with 2% choosing not to answer that question. Most were highly educated, with 77% reporting that they have a university degree or higher qualification. Both young and old people appeared to be underrepresented in the study. Respondents aged 18-24 accounted for only 8% of the total sample, with only 16% identifying themselves as aged 55 years and above. While 26 nationalities responded, 88 percent of the questionnaire sample consisted of French, Norwegian, Portuguese or Swedish respondents. As such, comparisons depending on nationality were carried out only for these four nationalities. Given the nature of the questionnaire, it was no surprise that 90% of the participants stated that they used social media sites on a regular basis. Finally, respondents who used social media were asked to list a maximum of three sites that they used most frequently. Results showed that overwhelmingly Facebook was listed (91%), followed by Instagram and Twitter (21% and 20%, respectively) (see Figure 1).

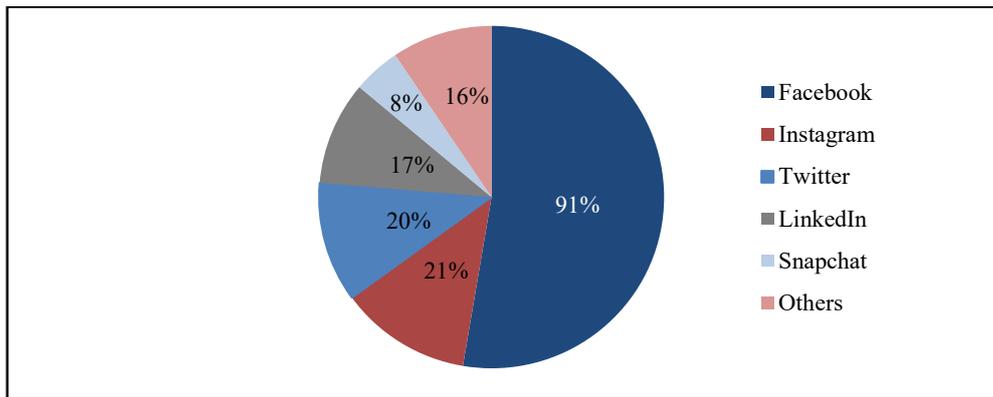


Figure 1 Respondents’ most frequently used social media sites.

RESULTS

Every respondent expected CI operators to provide information during and immediately after a disaster via at least one media channel (telephone, social media, traditional media or website). CI operators were expected to use traditional broadcast media such as newspapers, radio or television to communicate with members of the public during such incidents, with 96% strongly agreeing or agreeing with this statement (see Figure 2). The majority of respondents (57% strongly agreed, 30% agreed) also had high expectations in relation to the availability of crisis information on the website of operators. Pertinent to this study, most agreed (49% strongly agreed, 25% agreed) with the proposition that CI operators should use social media for crisis communication, with 74% strongly agreeing or agreeing.

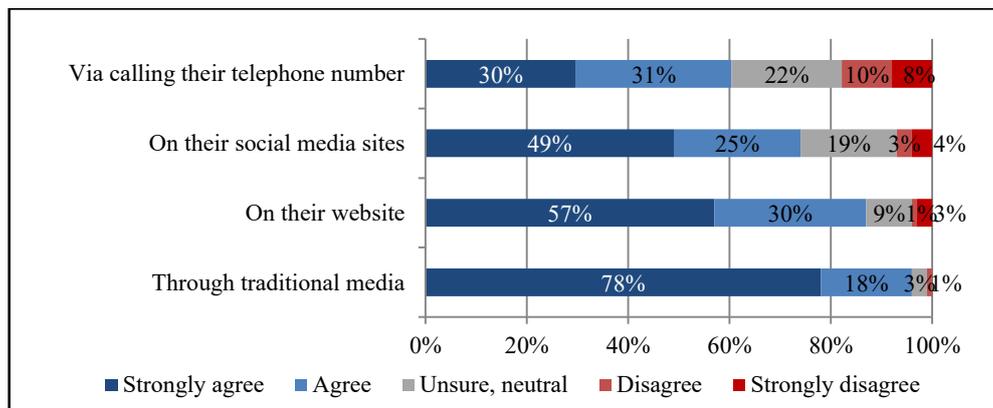


Figure 2 Respondents’ expectations of information provision from CI operators during and after a disaster.

The study also found that expectations of information provided by CI operators during crisis situations varied according to different age groups, previous experience of social media use, and nationality. Social media was more popular among the youngest respondents, with 70% of 18-24 year olds strongly agreeing that they should be kept informed through sites such as Facebook and Twitter, compared to just 37% of those aged 55 years old

and older. A similar finding emerged in relation to expectations that such information should be available on the website of CI operators. Those who declared that they were regular social media users were the most likely to expect to receive information from CI operators on these platforms. Indeed, 78% agreed or strongly agreed with this proposition, in comparison to only 29% of those who did not use social media sites. Social media non-users mostly (47%) declared that they are unsure or neutral. However, there appeared to be no significant differences between social media users and non-users in terms of their expectations of the other media channels.

There were some differences in terms of Portuguese respondents who had a higher expectation that information should be provided via a dedicated telephone line compared to respondents from other countries: 78% of Portuguese respondents agreed or strongly agreed with this proposition, compared to 67% of French, 59% of Norwegian and only 32% of Swedish respondents. In contrast, Portuguese respondents had lower expectations of obtaining such information via CI operators' websites. Conversely, there were no observable differences in terms of expectations of the media channels used by CI operators during crisis situations based on gender or educational level.

CI operators responsiveness to comments posted on their social media accounts

When asked if they expect CI operators to respond to questions and comments sent by members of the public to their social media accounts, there appeared to be greater uncertainty (see Figure 3). While one respondent out of two either agreed or strongly agreed, 25% were unsure about whether CI operators should respond on social media. No significant differences linked to sex, age, or education level were found in the responses to this particular question. Those who used social media (56% agreed or strongly agreed) were more likely to agree that CI operators should respond to these social media queries than non-users (32% agreed or strongly agreed). Although based on a small sample, the finding that Norwegian respondents were the least likely to agree with this proposition (36% compared to 51% of the Swedish, 61% of the French and 66% of the Portuguese respondents) merits further investigation.

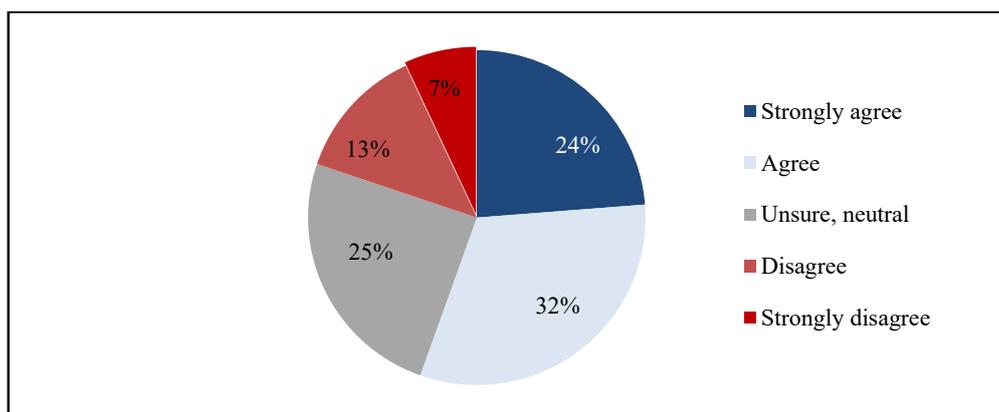


Figure 3 Respondents' expectations for two way communication on social media during and after a disaster.

DISCUSSION

Crisis information should be provided on social media but CI operators are not necessarily expected to engage with the public on these sites

Results indicate that members of the public expect CI operators to provide disaster related information via both traditional and social media. Social media should be considered a main channel for information dissemination, as 74% of respondents expect it. There appears to be a greater expectation for information to be pushed via social media (as only 7% of respondents disagreed or strongly disagreed with the proposal) than for queries to be answered (20% of respondents disagreed or strongly disagreed). Indeed, 25% of respondents were unsure about whether CI operators should respond to questions and comments on social media. Despite this, the high level of respondents who do expect CI operators to respond on social media (56%) demonstrates the importance of two-way communication. Since individuals turn to the media platforms that they are already familiar with during crisis (Fire Services Commissioner Victoria, 2013; Steelman et al., 2014), it seems natural that respondents who use social media have higher expectations for social media use by CI operators than social media non-users.

Some evidence of a ‘digital divide’ in relation to CI operators’ use of internet and social media during crises

However, expectations were found to be influenced by age and nationality. Indeed, it would seem that the use of social media by CI operators is slightly more of a young person’s expectation. Younger respondents also were more inclined to expect to find information on the CI operator’s website, even though the senior respondents are all internet users, and 81% of respondents 45 years or older use social media. When it comes to nationality, one reason that Portuguese respondents have a higher expectation to get information via calling the CI telephone number could be because of the way in which the Portuguese questionnaire was disseminated (via the Barreiro municipality’s Facebook Page). The Living Lab in Barreiro currently uses this method to provide information to the public, and does not have their own website or social media accounts. Another reason that Portuguese respondents seem to have lower expectations for website could be because Portugal has a lower Internet access by household rate and a less frequent Internet use than the other studied countries³ (Eurostat, 2015). However, the lack of such a difference for social media expectations between countries may indicate that the Portuguese Internet access hides a wider generation gap than in other countries (ibid) and this is mostly a young respondents’ expectation. This suggests that whatever the country, young respondents expect to get information on social media.

Thus, social media could be used in such a way as to target and better reach young people during disasters. Indeed, more effective crisis communication uses targeted messages (Medford-Davis, 2014). It is important to keep in mind that while young people are more present on social media and have a higher expectation of social media use by CI operators, they are not the only ones. As social media is meant to compliment more traditional crisis communication methods and not replace them, it remains a useful way to reach even more people in times of crisis.

Limitations

The limitations of the study should be acknowledged in the interpretation of the results presented above. As discussed earlier, this was a self-selecting sample that was not representative of the demographics in the four respective Living Labs. While acknowledging that online questionnaires usually have lower response rates than those administered via paper, it should also be noted that the use of the website to distribute the questionnaire was likely to have skewed the sample in favour of those who used the internet and social media on a regular basis. The international aspect of the survey may also cause an inaccurate generalisation of the findings, as social and cultural backgrounds may create different meanings for the Likert scale (Boulan, 2015). Furthermore, people often respond to online surveys by providing snap judgments based on available information and may be influenced by emotional or contextual factors (Schwarz et al., 1999).

RECOMMENDATIONS FOR SOCIAL MEDIA USE BY CRITICAL INFRASTRUCTURE OPERATORS DURING AND IMMEDIATELY AFTER A DISASTER

While a number of guidelines for how blue light organisations can use social media during disasters have been published over the past decade, few seem to focus on how CI operators could use these platforms to contribute to disaster information flows. Here we present a brief look at our ongoing work to develop a social media communication guide for CI operators to deploy during crisis situations, based on the literature and questionnaire results. While the questionnaire results are not representative of Europe, and indeed differences were found depending on nationality, the literature on effective crisis communication should be applicable to all CI operators, regardless of country of residence. That said, a key part of effective crisis communication is to know your stakeholders and their expectations. As such, further research should be conducted to learn about expectations for other nationalities. The following sections describe how CI operators should attempt to meet the information needs of disaster vulnerable and affected communities. They should provide information on 1) what has happened, 2) what is expected to happen, and 3) what citizens should do to mitigate the effects of such incidents.

What has happened

Firstly, it is vital that CI operators publicly acknowledge the disruption to their service(s), even if no further information on their cause and likely resolution is known. It is also important for operators to inform members of the public that they are working to restore these services even if no new information is available at that time (Petersen et al. 2016).

³ Percent of households with Internet access: Norway 97%, Sweden 91%, France 83%, Portugal 70%. Percent of individuals who used Internet in the last three months: Norway 97%, Sweden 91%, France 85%, Portugal 69%.

CI operators should also use functionalities such as the ‘Retweet’ on Twitter to share messages from official sources. Official sources include emergency services, incident managers and local authorities, whereas unofficial sources are most likely to consist of content posted by citizens. Studies have shown that such repetition of crisis information is more likely to convince people to take appropriate action to protect themselves and their communities from harm (Tierney, 2009; New Zealand, the Ministry of Civil Defense & Emergency Management, 2010; Stephens et al., 2013; Reilly et al., 2016). For example, recent research has shown how music festivals in Belgium repost or retweet content originally posted by local Police and other blue light organisations in the case of an incident (Reilly et al., 2016).

What is expected to happen

As soon as is possible, CI operators should provide an estimate of when services will be fully restored. During Hurricane Sandy, for instance, customers became increasingly frustrated when power companies refused or were unwilling to give them an accurate timeline for restoration of electricity and other key utilities in affected areas (Pramaggiore, 2014). While it is beyond the scope of this paper to explore these strategies in full, Reilly and Atanasova (2016) suggest that social media can help key stakeholders such as CI operators prevent a communication vacuum from developing while simultaneously preventing cascading effects that might occur from citizen speculation about the causes and effects of crisis situations.

What citizens should do to mitigate the effects of incidents

As previously stated, when a disaster strikes, people begin a search for information about how they should act. As such, it is a good opportunity to provide the public with appropriate, CI specific advice, such as to, if conditions are safe, turn off the gas before leaving the house after an earthquake. While currently several CI operators have disaster preparedness sections on their websites⁴, it is important to repeat this information during crisis events to disaster affected communities to help them to take appropriate action (Petersen et al., 2016). An example that could be replicated by CI operators could be the EMSC Safety Tips. Following their survey, the EMSC created cartoon images of the main messages of the behavior to adopt and avoid after a violent shaking no matter the country of residence, which is pushed to users of their app in a given location when violent shaking has occurred near them.

How to provide the information

As discussed earlier, it is important to provide information in a language people can understand, especially in a European context where many languages are spoken. Indeed, during Hurricane Sandy, CI operators were criticised for providing information about evacuation using public transport exclusively in English, whether on the website or social media (Kaufman et al., 2012).

CI operators should make a point of responding to the public via social media. It is especially important to respond on social media, as it generally encourages interaction and dialogue between users, creating information space that is essentially decentralized and devoid of hierarchy (Giroux, 2013). Not only would this help to meet public expectations, but also research shows that synchronous (where you can respond) messages are more effective in eliciting action during an urgent situation, making for more effective crisis communication (Stephens et al., 2013). Two-way communication has also been found to be fundamental to building trust and local impact (McDonald, 2016).

As previously stated, people continue to use media they are already familiar with during disasters (Fire Services Commissioner Victoria, 2013; Steelman et al., 2014). Based on the questionnaire results, it is highly recommended that CI operators be present on Facebook.

CONCLUSION

Our findings suggest that CI operators should continue to use traditional media during crisis situations, as almost all respondents expect to be able to find information through this means. This should be supplemented through the provision of disaster related information on website and social media platforms maintained by CI operators. Websites were identified by our participants as particularly important channels for such information. However, there was also an expectation that CI operators should provide this information for members of the

⁴ See SoCalGas (<https://www.socalgas.com/stay-safe/emergency-information/emergency-preparedness>), PG&E (https://www.pge.com/en_US/safety/emergency-preparedness/emergency-preparedness.page), or SDGE (<http://www.sdge.com/safety/electric/case-accident-involving-electric-line>).

public on their various social media platforms. Young people and social media users appear to have higher expectations in regards to the use of social media by CI operators in times of crises. As social media is meant to compliment more traditional crisis communication methods and not replace them, it remains a useful way to reach even more people in times of crisis. The expectation to be on social media did not necessarily mean that sites such as Facebook and Twitter should be used to encourage dialogue and interaction between these companies and members of the public. Indeed, there appeared to be a greater demand for information to be pushed via social media than for queries to be answered during such incidents. While over half of respondents believed that there should be some two-way communication via these sites, a sizeable minority (25%) were unsure if CI operators should be responding to online queries. Nevertheless, it should be acknowledged that this was a self-selecting sample that was not representative of the demographics in the populations studied, and as it was an online questionnaire it most likely attracted people who generally use the Internet and social media. Further work is needed to explore how the perspectives of citizens who are unable or unwilling to use digital media.

Based on these findings, recommendations for social media use by CI operators during and immediately after a disaster were presented. CI operators should communicate on social media about 1) what has happened, 2) what is expected to happen, and 3) what to do. Furthermore, they should acknowledge when there has been a disruption; provide estimations for service restoration times; repeat official disaster information from official sources; give infrastructure specific advice; and respond to the public in a language they understand. Future work will consider the implications of these findings for CI operators and efforts to build community disaster resilience within these Living Labs. A communication strategy, encompassing both digital and traditional media platforms, will be developed for CI operators to deploy during each stage of the incident.

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