Efficiently allocating safety tips after an earthquake – lessons learned from the smartphone application LastQuake

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ABSTRACT

In a context of information overload, actors in disaster management are facing challenges to efficiently allocate critical information during a crisis. Based on the empirical experience of EMSC (Euro-Mediterranean Seismological Centre) with its application LastQuake, this paper explores ways to provide safety information in a timely manner, to the people who actually need it. First we introduce the method used to design and implement universally understandable visual safety tips, taking Ethical, Legal and Social Issues (ELSI) into consideration. Then, results on the effective use of the feature are presented. Findings demonstrate the importance of designing universal tools to limit the use of personal data as well as the necessity of developing a multichannel approach for efficient crisis information allocation.

Keywords

Earthquake, Risk reduction, Disaster app, Safety tips, ELSI.

INTRODUCTION

Earthquakes, one of the gravest natural hazards worldwide, annually cause a consequential number of injuries and death around the world. In 2018, over 4 000 casualities were recorded[1]. However, earthquakes *per se* do not harm or kill people; collapsing buildings and hazardous behaviours do (Johnston et al., 2014). Just as quake resistant buildings are necessary to reduce earthquake risk (Rahman, 2017), preventing risky behaviours also efficiently contributes to achieve this goal. Information before, during and after an earthquake has been found to reduce anxiety and increase resilience (Beatson et al., 2014; Bossu et al., 2018; Zhang, 2013). Furthermore, information sharing during every stage of the disaster cycle has been found to be a universal need, leading the Red Cross and Red Crescent Societies to declare that "people need information as much as water, food, medicine or shelter" (IFRC 2005). Thus, citizens must be informed about proper earthquake-related behaviours to adopt.

As earthquakes cannot (to date) be predicted, behavioural information must be sent once the event has occurred. Furthermore, as it usually takes time before trained professionals arrive on the ground, safety information about good behaviour should reach citizens in such a timely manner as to fill this gap (Milliken & Linton, 2016). Regarding information needs *during* a crisis, Ryan found that people expected to receive information about how they should behave and what they should do (Ryan, 2012). Hence, the messages should be sent right after the beginning of the crisis. Moreover, earthquakes occur all over the world, sometimes in border regions and due to

[1] https://www.unisdr.org/archive/63267

the massive development of global tourism, for a given earthquake, people with different cultures and risk culture can be impacted. Thus being able to provide safety tips to all witnesses right after the event regardless of their cultural background appears necessary. One ever more popular means of meeting this information need and reducing earthquake risk is through what are known as "disaster apps".The Euro-Mediterranean Seismological Centre (EMSC) has developped the lastQuake app to detect felt earthquakes and provide information about them. Based on the EMSC team experience,this article then examines the efforts of the Lastquake App to create and implement the sharing of behavioural information to earthquake eyewitnesses via "safety tips". It does so by first presenting a literature review on disaster smartphone applications (apps) and then describing the empirical methodology used by the EMSC, developer of LastQuake. It demonstrates how the "safety tips" were designed and implemented considering Ethical, Legal and Social Issues (ELSI). Then it examines the results of the monitoring system to draw conclusions upon the effective use of these "safety tips." Our findings show that EMSC safety tips were highly used during seismic events and help in educating citizens in general to adopt good behaviours after an earthquake.

DISASTER APPS

When a disaster strikes, people expect to find accurate and timely information on different channels and from a range of actors that they can trust[2]. Often this includes what used to be called "new technologies", aka social media, disaster apps, websites, etc. These tools have created opportunities to efficiently spread and collect information in case of disaster, including earthquakes (Aydin et al., 2016; Bachmann et al., 2015; Beatson et al., 2014; Tagliacozzo & Magni, 2016). While certain of these "new technologies" such as social media do enable one to circulate a large amount of messages to a large audience, they may also create communication challenges. As Hagar (2011) demonstrated, during a crisis, citizens on social media may be facing an information overload as the diverse actors and agencies involved in the response spread, each, an important number of messages. This adds to the difficulty of finding relevant and trustworthy information. In this context of information overload, how can actors in disaster management succeed in passing the right information to the right citizen, the one who needs it?

Disaster apps can be considered as a solution to the information overload problem. A wide range of emergency preparedness and disaster response smartphone apps now exist (Bachmann et al., 2015) and they provide opportunity to directly reach citizens in need. Indeed, smartphones present the strong advantage of enabling a precise localization of the user, through the GPS system (if enabled). Apps are thus efficient tools to directly reach citizens in the affected area, including tourists (Bachmann et al., 2015) who may not know the authoritative local source or may not be able to access information due to language barriers. They enable efficient warnings (Douvinet, 2018) and can be a practical tool to spread critical information about good behaviour to adopt and the ones to avoid, in a timely manner.

However when dealing with crisis information, one must not only think about how to reach the citizen in need but also about the technological and cultural suitability (Steelman et al., 2015). The question of suitability is especially important for disaster apps since a user must "opt-in", or download, the app. Thus, making the app attractive to the users is necessary.

If perceived usefulness and efficiency are key to effective use, trust is also decisive (van Velsen et al., 2013). This implies the need to take ELSI into account. For instance, when using users' localization to efficiently allocate safety instructions, institutions are collecting sensitive and personal data. This should be reflected upon and done in compliance with the law, such as, for instance, the General Data Protection Regulation (GDPR) enforced by the European Union (McDonald, 2016). A study lead by Adhikari et al. (2014) also showed that security and privacy issues can lead to great turnover in apps use. Privacy by design has thus become a key recommendation and even legal obligation, for apps in general, including disaster apps (Jasmontaite & Dimitrova, 2017; Kuner & Marelli, 2017; Kuner, 2018;).

Lastly, when managing a disaster app, it has been proven important to involve users in its development (Kouadio, 2016). It ensures a better understanding of needs and potential variations in use linked to cultural factors.

EMSC'S DISASTER APP: LASTQUAKE

The EMSC has developed a unique and innovative earthquake detection and multichannel information system. It is a perfect blend of crowdsourced data from eyewitnesses and data collected from seismic

[2] IMPROVER EU H2020 project, D4.1, Available at : http://improverproject.eu/2016/06/23/deliverable-4-1-social-resilience-criteria-for-critical-infrastructures-during-crises/

institutes. The system involves websites, social media and the app LastQuake (Bossu et al., 2015). The free and add-free app (available for Android and iOS) is now used in most countries around the world (

Figure 1) especially in all active seismic areas, by about 300 000 people[3]. The LastQuake users' community is composed of earthquake eyewitnesses, citizens with relatives living in seismic areas, as well as by scientists and emergency managers.

Figure 1. LastQuake users in the world

Through LastQuake, eyewitnesses can share their experience. Through 12 visual pictures, users can report the intensity of what they felt (Figure 2c). The visual thumbnail-based questionnaire has been proven to be more efficient than traditional online questionnaires and increase the number and speed of collected testimonies (Bossu et al., 2017). Users are provided with timely information about felt earthquakes[4] around the world and can read testimonies from those in the area (for a more detailed explanation, see Bossu et al., 2018). Providing information about the earthquake itself (such as the location and the magnitude) but also about its consequences (felt intensity, potential damages,…) actively contributes to reduce anxiety (Bossu et al., 2018).

When navigating through LastQuake, users are offered the possibility to (1) view a list of earthquakes (Figure 2a), (with a colour code corresponding to felt intensity and potential dangerousness), (2) get information on a specific event (Figure 2b), and (3) leave a testimony and even a comment or visual document about an earthquake they felt (Figure 2c and Figure 2d).

[3] The number of app users is in constant evolution due to downloads and uninstallations. However, it is quite stable with around 340 000 users.

[4] It is important to insist on the fact that EMSC focuses on felt earthquakes, as it is assumed that these are the ones that matter most for the public (Bossu, Steed, Mazet-roux, Roussel, & Etivant, 2015)

Figure 2a. List of significant earthquake in LastQuake

Figure 2b. Earthquake details page in LastQuake

Figure 2c. Felt reports page for testimonies in LastQuake

Figure 2d. Collection of open-ended comments, pictures and videos for testimonies in LastQuake

Using the GPS position of the smartphone, EMSC is able to determine the area where the earthquake was felt and thus, which app users may need safety information. A notification system alerts users in the area when a significant earthquake has occured. When a potentially damaging earthquake of global interest happens, a notification is issued for all LastQuake users around the world.

Since its launch in 2014,EMSC had to deal with ELSI when developping the app. Indeed, as a global information tool, it had to suit with various cultural information needs or technological cultures. The app also had to be designed to function even with low internet access. Along with overcome cultural and technological barriers, EMSC always paid attention to only collect necessary data in order to respect users' privacy. Having all stakeholders involved in the design of disaster-related tools has been proven efficient to adress ELSI (Liegl, et al. 2016). EMSC has thus paid attention to consult users regularly as part of the development process.

After the deadly 2015 earthquake in Nepal, EMSC launched an online survey among LastQuake users living in Nepal, India and Bangladesh, as part of a feedback process. For convenience reasons (cost and analysis), the questionnaire was written in English and disseminated through EMSC's Twitter and Facebook accounts, but also through a notification on LastQuake app. Data was collected between 8th and 15th of June 2015, less than two months after the main earthquake. Users were asked about the way they used the app during the crisis, but also about potential improvement. 667 users responded to the survey. 44% of them asked to be provided with "Dos and don'ts", so that they would know how to act after an earthquake. This was the most common request. To meet this need, EMSC developed a series of safety tips, following a methodology described in the next section. It is important to emphasize that this advice does not cover the duration of the shaking itself. Indeed, LastQuake is mostly used right *after* an earthquake.

METHODOLOGY

This paper follows a two steps methodology. First is presented the empirical approach followed by EMSC to develop and implement the "safety tips" through the disaster app LastQuake. In a second part the effective use of this feature is monitored and analysed.

DESIGN AND IMPLEMENTATION OF "SAFETY TIPS"

EMSC undertook the following steps:

1. Benchmark of safety rules for post-earthquake behaviours from key players
2. Develop a way to represent the chosen "safety tips" on a smartphone
3. Assess the understanding of the "safety tips" via an online survey and twitter conversation
4. Redesign the "safety tips" based on feedback
5. Implement them on the LastQuake app

Benchmark

Developing the safety tips required finding universal ones, which would be accurate in all areas of the world. Post-earthquake safety tips were identified through a benchmark of commonly agreed upon safety rules. The benchmark included advice from official seismic institute, NGOs, and some national disaster management agencies. The five most commonly used were selected: (1) Do not stay inside, (2) Stay away from buildings (3) Call emergency services only for serious injuries (4) When possible text your relatives rather than call them and (5) Stay informed.

Design

Because LastQuake is used in 191 countries, it was necessary to implement the advice in a way that transcended national, geographical, linguistic and cultural "borders" and could be understood regardless of literacy level. It was of prior importance to be able to reach also under-represented populations, including the poorest and people who have limited access to mainstream media (Akhgar et al., 2017). The messages had to be shared in a user-friendly way and thus shouldn't induce fear (Bean et al., 2016).

It was found out that in case of disaster, language-independent communication helps to improve the understanding and reduces the ambiguity of messages (especially those linked to semantic interpretation) (Fitrianie & Rothkrantz, 2007). Moreover, not all languages use the same space frame. For instance words like "up" "across" or "between" don't always have equivalents in Himalayan languages (Margetta & Fitzgerald, 2016). It has also been found that an Australian Aboriginal language does not use any egocentric coordinates (such as on the left), but only cardinal directions ("to the East" for instance) (Deutscher, 2010). Because language and geo-spatial perception are strongly linked, this makes safety instructions difficult to translate (Margetta & Fitzgerald, 2016). Moreover, with between 100 and 115 distinct languages spoken within Nepal's borders alone, it would be impossible for EMSC to translate a document into so many languages. Using visual communication is thus a good alternative to textual communication. Moreover, cartoons have been found to be an efficient way to communicate in the aftermath of a disaster (Chae et al., 2014) and to be understood in a quite universal way. For these reasons, added to the previous success of visual thumbnails to collect felt reports mentioned above, EMSC opted for designing visual, cartoon safety tips.

EMSC collaborated with an illustrator who turned these five principles into cartoons. Despite the universality constraint (inlcuding the representation of a building for instance), the design was also dependent on the average screen size of mobile device which is rather small. It required drawing cartoons with few details so that they could appear clearly on small mobile screens. To ease comprehension, the safety tips were created following a "do & don't" opposition. This was also, as previously stated, the desire of LastQuake users. However, creating a culturally indifferent do & don't system is not feasible, as ticks and checkmarks have been found to be highly cultural and linked to the education system[5]. Colours were also found to have different meaning. They are not understood the same way everywhere around the globe, depending on cultural factors. For example, in Japan, red is associated with blood, passion, self-sacrifice and strength whereas it is associated with "communism" in Russia or with "love" in western cultures (Bortoli & Maroto, 2001). Despite the difficulties in finding universally accepted codes for "dos" and "don'ts", it was decided to follow the ISO standard for no, a red circle with a slanted cross[6]. While no such standard exists for yes, a green check mark was seen as a good opposition to the no. Red and green were chosen based on the universality of traffic lights for "stop" and "go". The assertion was that combining both the marks and the colours will help the user to understand which picture is what should be done, and which one represents the behaviours to avoid.

Evaluation

Data Collection

In order to evaluate the understandability of the visual safety tips, EMSC launched an online survey. Overall, between the 5th of September and the 2nd of November 2016, 776 answers were collected. Respondents come from 79 different countries (11% from Italy and another 11% from the United States of America). 75% of them use LastQuake. Due to the sample size and dissemination method, the sample is not representative of the world population. 63% of the respondents are men, and 76% are highly educated (University, college or higher). 93% of respondents have already experienced an earthquake and 66% feel exposed or strongly exposed to seismic risk.

[5] https://separatedbyacommonlanguage.blogspot.fr/2007/03/ticks-and-checkmarks.html
[6] http://www.iso.org/iso/graphical-symbols_booklet.pdf

For each set of "do and don't" images (Figure 3), respondents were asked to choose among a list of sentences which one corresponded to their first understanding of the picture.

Figure 3. First version of LastQuake safety tips

Results

Overall the safety tips were highly understood by respondents, between 97% ("stay informed") and 85% ("Call emergency services only for serious injury").

Two elements can partly explain why understanding rates were so high. First of all the respondents had, in their majority, already experienced an earthquake. We can then suppose that they are, to a certain extent, aware of this advice. Moreover, in order to facilitate the data analysis EMSC chose to propose some meanings, which may help respondents and guide their understanding. The safety tips were found to be understood universally among the respondents, even if 79 nationalities as diverse as Afghans, Austrians or American were represented. Due to these high rates, no significant difference was found depending on nationality, gender, age, education level, or felt exposure to earthquakes.

Still, few misinterpretations were identified. For instance, for safety tip #1 (first pair of images on Figure3), some people thought they had to run out of the building, and for safety tip #3 (third pair of images on Figure3), 12% of the respondents understood "I should call emergency services for any injury" instead of "I should call emergency services only in cases of serious injury".

Redesign

Thanks to the misinterpretations as well as to comments left in the open questions, EMSC and the cartoonist were able to improve the images. Moreover some members of the community helped through a Twitter conversation and gave their opinion and picture drafts for improvement. This led to a co-constructed and validated final version of the safety tips presented below (Figure 4).

Figure 4. Final version of LastQuake safety tips

Implementation

Once designed in partnership with the cartoonist and LastQuake users, the safety tips had to be implemented in the app. The five safety tips are displayed one by one, with the associated do and don't on the screen (Figure 5) and the user can swipe the screen to see another safety tip. Displaying the safety tips one by one, gives a sense of priority and increases the reading comfort for the user as they can see bigger images. It also emphasizes the fact that there are five tips.

Figure 5. Screenshot of safety tips as displayed in LastQuake app

For preparedness purposes and in order to gain visibility, the safety tips are permanently available for consultation through the LastQuake main menu. However, the goal of this new feature in the app was also to efficiently provide safety tips to users in need when a significant quake strikes. This was made possible thanks to a notification system.

Indeed, for all earthquakes of magnitude 4.5 and above, EMSC determines the area where the expected peak ground acceleration (PGA) was high enough to frighten the inhabitants, i.e. where the shake was the most violent. We only consider LastQuake users whose geolocation falls within this area and then send them the specific safety notification. This safety notification is to be distinguished from the regular LastQuake notification that alerts users in a wider area about the earthquake. For instance, after the M5.7 in Central Italy (18/01/2017), 51237 users received the regular LastQuake notification about the earthquake (magnitude, location) and only 19 users received the safety notification which enabled them to directly consult the safety tips. Indeed only users who potentially felt a violent shake are targeted for the safety notification. The others still have the opportunity to consult the safety tips directly via the earthquake detail page or the main menu.

The underlying idea of the notification range is that citizens feel the immediate need for safety tips when they have felt an earthquake that scared them and/or generated damage. Providing safety tips for every earthquake and all users could thus be counter-productive and become in itself a source of anxiety. This could also lead to an excess of notifications which would decrease the visibility of truly essential information and bother the user, potentially leading to uninstallations.

Regarding ELSI, EMSC adopted the privacy by design approach, using as little personal data as necessary (only the GPS location) and only in the interest of users, namely their own safety. Moreover, no data is shared with any third party.

MONITORING THE EFFECTIVE USE OF THE SAFETY TIPS

In order to monitor the effective use of the safety tips, EMSC collected data to get a more comprehensive overview of how both seismological factors and socio-cultural ones, impact LastQuake use. All data are (and will be) collected with respect to the legislative framework and users' privacy. For instance, for each consultation of the safety tips, EMSC monitors if the user accessed them through the main menu, the notification or the earthquake detail page. EMSC monitored safety tips use between 15 February 2017 and 30 May 2018. Overall, they were consulted 73 874 times by 32 198 unique users from 175 different countries**.** This confirms a general and global interest for the feature.

The vast majority (97.4%) of users who consulted the safety tips found them through LastQuake main menu. 2.4% accessed them through the seismic events page and 0.2% have taken advantage of a safety notification to consult this timely advice. This is partly due to the fact that few earthquakes met the safety notification launch criteria. Moreover, a high shaking zone statistically has a relative small size leading to a slim chance to have users in this zone. During the studied period, 539 earthquakes met the criteria to initiate a safety check, but only 57 actually issued at least one safety notification due to the small size of the expected high shaking area, to the low number of LastQuake users in the region or to the low density of population. In 89% of the cases no notification was sent. This coincides with the idea that safety notifications are designed for rare, potentially frightening or destructive seismic events. Overall, 1 382 users have received a safety notification including a link to the safety tips. 7.8% of them have actually taken advantage of this feature to get advice on good behaviour to adopt.

The monitoring system also enabled to evaluate if users were consulting the five pieces of advice. We consider as complete a visit during which the user actually went through the 5 safety tips and didn't close the page before seeing the whole content. Results revealed that among all the views, only 33% are complete. Users who access the safety tips through an event page were found to be more interested in this advice. 39.5% of them consulted the safety in a complete way, against 33.4% when accessing via the main menu. We can assume that most users who access the safety tips through the event page are potential witnesses and thus directly concerned by the earthquake. They have an immediate interest for information about safe behaviours to adopt.

The number of visits on the safety tips page is to be compared with the total number of uses of the app in the given country. On average, 3.7% of the sessions on LastQuake include a visit on the safety tips page (whether or not the visit is triggered by a felt earthquake). However, significant and interesting differences can be noticed.

Countries such as Iran or Mexico for instance have a much higher safety tips consultation rate than Italy or the U.S.A. (Figure 6.). This goes along with the fact that the USA generates 10% of the total traffic on the app, but only 4% of the visits on the safety tips pages. On the contrary, Mexico issued nearly 18% of the safety tips visits but contributes only 4.8% of the total traffic.

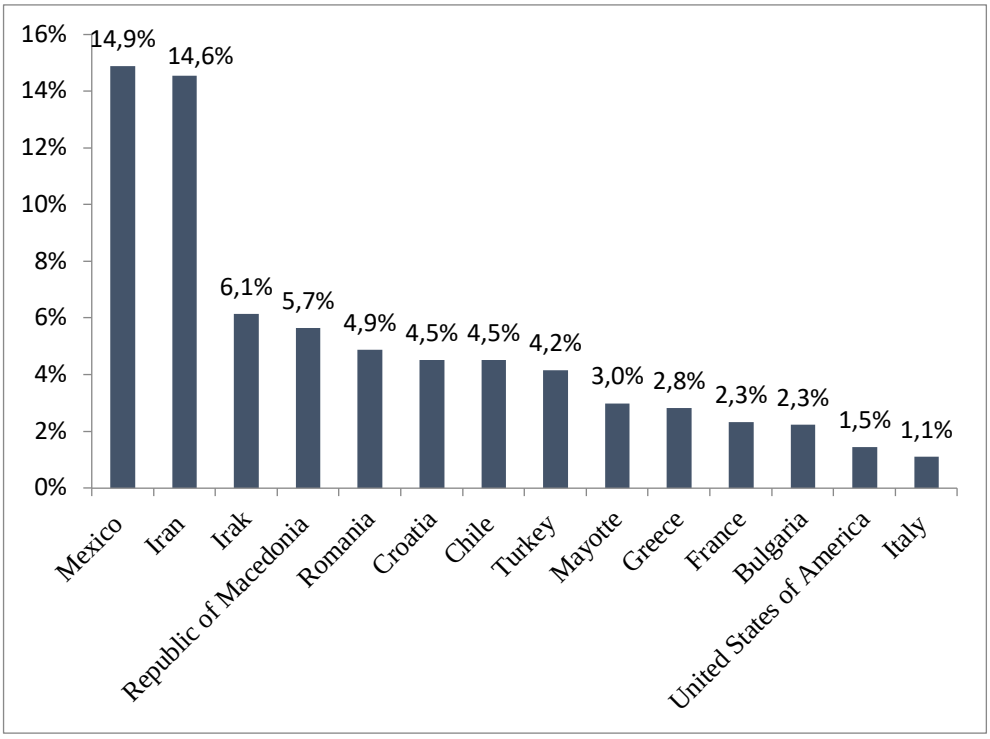

Figure 6. Percentage of connections to LastQuake which include a visit on the safety tips page, per country

DISCUSSION

The safety notification was designed to reach users located in the potentially affected area after a potentially damaging earthquake. Fortunately, few users are concerned by this type of alert. Nevertheless, during less frightening seismic events, many users still accessed the safety tips through the main menu and through the seismic event page. This proves that notifying users based on their localisation is useful but not sufficient to meet all users' needs and confirms that they should be accessible in various ways in the app.

Bossu et al. (2017) have already observed how LastQuake use varies along with seismic factors such as magnitude and felt intensity. Additional data would be necessary to study how these parameters impact on safety tips views. However, a cultural dimension can also explain these variations. Significant differences were found among the 23 countries with a high number of visits (500 minimum). Users from Iraq, Chile, Macedonia and Italy were found to proportionally visit more incompletely the safety tips, contrary to British, Bulgarians, Iranians, and French people living on the Island of Mayotte, found in the Indian Ocean. Mayotte and Great Britain are areas where seismic activity is rare, and thus where inhabitants are not used to earthquakes. This can explain a higher need for information. However, all the other countries are characterized by relatively frequently felt earthquakes. Risk culture and risk perception could thus explain variations of seriousness in the way people use this prevention tool. Depending not only on what other material of this type they can access in their language but also on general interest for risk prevention, users may not show the same involvement in their safety tips exploration.

The differences in the proportion of users' examining the safety tips in comparison to number of users' per country could also be linked to cultural factors, risk perception, and risk culture. For instance, perceived earthquake preparedness in Iran or Mexico may be lower than in Italy or Greece. Risk culture, may also vary between these countries and explain a different appeal for safety advice (Dressel, 2015). Moreover, nationality

has been found to influence expectations in regards to crisis communication (Petersen, et al. 2017). In countries where the needs for safety advice are high, EMSC safety tips help fill the expectation gap regarding prevention. Furthermore, Mexico and Iran, for which consultation rates are substantially higher, have both faced damaging and deadly earthquakes during the studied period. This may have raised the interest for safety tips more largely. More data is necessary to compare whether during earthquakes of this type, safety notifications are proportionally more used.

The fact that most users visit the page simply when navigating on the app implies that safety tips are also useful to raise preparedness. Results suggests that after a felt earthquake, there is a window for prevention, whether for locals who need timely information, or for other users who showed interest in the event. These teachable moments are strong opportunities for efficient prevention (Reynolds and Seeger, 2005; Tan and Maharjan, 2018). Indeed, after a destructive earthquake largely reported in the news or on social media, communities may experience what Gerome Truc calls *concernment* (Truc, 2017). This refers to the strong interest and emotional sharing that a person can experience after a disaster even if he or she wasn't directly involved into. During and after the event, concerned people focus their attention on disaster related news and are willing to get information and take action.

Overall, to better consider ELSI and technological cultures[7] but also the different phases of disaster management, a multichannel approach is necessary. Disaster apps must be considered as part of an ecosystem formed with other technologies such as social media, websites and messaging apps. Indeed, only a fraction of the local audience reached by EMSC launch LastQuake after an earthquake, and reach rates are higher on other tools such as the Twitter account and websites (Bossu et al., 2018). To efficiently address information allocation challenges, it is vital to spread information on various platforms, to push them through notifications when necessary, but also to have them available at all time for preparedness purposes. Thus, future work includes the expansion of the publication of safety tips on EMSC Twitter feed. The work undertaken by EMSC, along with the lessons learned, will also be carried on with the design and implementation of tsunami safety tips.

The example of the safety tips implementation illustrates that ELSI have to be adressed when conceptualizing and designing the tool. For instance, it enabled the EMSC to set up understandable visual advice. However, monitoring the use after the implementation is also essential in order to identify other ELSI linked to the effective cultural use. The challenges identified above will be reflected upon by the EMSC.

Limitations

True universality of EMSC's safety tips was not able to be determined due to limitations of questionnaire-based research. Indeed, when responding to a questionnaire, people often use snap judgement and may be influenced by emotional or contextual factors (Schwarz & Stack, 1999). It should also be noted that the use of Facebook, Twitter and the LastQuake app to distribute the questionnaire was likely to have skewed the sample in favour of those who used the Internet, social media and EMSC's app on a regular basis. EMSC does not collect demographics about its users, leading to a lack of knowledge about the typical user profile. However it is highly possible that users are not representative of the general population in terms of gender, age and social standing, adding to the questionnaire limitations. A qualitative survey on how users actually used the safety tips could help complement the analysis and give insights on how various factors such as education level, income level or quality of the internet access can influence the understanding and assimilation of this tool. Whether the user lives in a rural or dense urban area could also impact its perception of the advice relevance.

Finally, the efficiency of safety tips is complex to approach as inappropriate behaviors are hard to measure when they are avoided. Further, even if the safety tips have indeed been consulted, one cannot tell if lives were indeed spared or if the appropriate behaviors were taken.

CONCLUSION

In order to address both the safety information allocation problem, and a strong users' request, EMSC designed universal visual safety tips and implemented them in its mobile app LastQuake. The design process included a benchmark of safety rules for post-earthquake behaviours from key players, a reflection on how to convey this

[7] This is further developed in CARISMAND D3.1, available at : http://s.carismand.eu/p/c/a/carismand-d-03-01-ls2017-01-770.pdf

advice in a visual and culturally neutral way, and finally an assessment of the comprehension of the first version. Through this co-constructed material, EMSC took up the challenge to design totally understandable safety tips, using no words. They were then implemented in the app, carefully taking into consideration ELSI. Thanks to these safety tips, LastQuake efficiently allocates the right information to the right person at the right time. Users are reminded of the most important safety guidelines to be followed, in order to minimize additional damage and risky behaviours. Visual communication proved to be an efficient way to overcome language barriers, which is crucial in the era of mass tourism and especially for earthquakes, which strike without regard to geopolitical and cultural borders. In over a year, more than 32 000 users have been reached and educated about good practices.

Regarding ELSI, it demonstrates that it is possible to use as little personal information as GPS position to provide useful information to the person in need. By designing universally understood safety tips it prevents one from needing to collect additional personal data which would be necessary to have a more personal, adaptable message. However, after such earthquakes, there is also a window for prevention and it is not only affected citizens who are interested in safety advice. This, along with EMSC empirical experience with providing safety tips reveals the crucial necessity for a multichannel approach when providing critical information after an earthquake.

Overall, developing universal visual post-earthquake safety tips and efficiently allocating them to people in need actively contributes to risk reduction. But apps are not the panacea in terms of alerting and providing critical information. Lessons learnt from LastQuake experience about the multichannel system could be extended to other types of disasters and actors, including official institutions.

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