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Sharing Radiation Measurements Through Social Media:
A Methodological User-Oriented Proposal Set of Guidelines

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ABSTRACT

Radiation measurements are key information for risk communication in post-nuclear accident situations. Among the different social media platforms, Twitter offers automated accounts which have been used to share the readings, but often in an incomplete way from the perspective of data sharing and risk communication between citizen and radiation experts. In this paper, the authors investigate the requirements for radiation measurements, by analysing the perceived usefulness of several metadata items that may go along the measurement itself. They carried out a benchmark of existing usages, and conducted a survey with both experts and lay citizens. They thus produced a set of guidelines regarding the metadata that should be used. Furthermore, they created a prototype of a software tool to publish complete measurements and metadata containing suitable information for both experts and citizen based on the requirements.

KEYWORDS

Nuclear Disaster, Post-Accidental Phase, Radiation, Robots, Social Media, Twitter

INTRODUCTION

I started to be interested in measuring when I heard my friends, having three kids, were worrying about radiation ... [I] wanted to know if my neighborhood was safe enough or not. And [I also] wanted to have my own resource to make decisions (participant 1).
I am in Nagoya, far away from Fukushima, but I know that food travels, people travel, gardening soil travels, and I thought it is best to start testing things on my own (participant 2) (Kera, Rod, & Peterova, 2013).

These excerpts illustrate some Japanese citizens' testimonies after the devastating East Japan Earthquake and Tsunami that hit the three Fukushima Daiichi nuclear power plants in March 2011. The radioactive releases contaminated large areas and profoundly upset the life of several inhabitants, who do not have a sufficient knowledge of radiation safety. A large part of them decided to stay living in those territories and to rebuild their lives in those zones that the Japanese authorities had estimated as safe. On the contrary, a minority of them judged that the radiation measurements delivered by the

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emergency management officials were incomplete. For this reason, a few groups exploited some Web services, such as social media, to share some practical knowledge about radiation measurements and diffuse any practical tips for living in contaminated areas, with the help of international radiology experts.

In fact, after a nuclear accident, the knowledge of radiation levels is crucial for the people living in those areas: human senses cannot perceive any ionizing radiation, so the measurement is the only way to reveal the radioactive contamination of the environment. Producing and sharing radiation measurements are the critical steps to assess the health risk, to make any right decisions and to ensure the resilience process. To measure radiation, people need a set of minimal knowledge on radiation and an *ad hoc* device called radiation detector. For instance, they must know that radiation readings differ depending on natural environmental conditions and may vary over time.

To drive this process forward, we consider that a radiation detector can be linked to a social media platform, such as Twitter, and diffuse data through an automated program called *bot*. This system might be a suitable solution for sharing information between radiation safety experts and ordinary citizens, provided that it delivers any complete and reliable measurements. To tackle this problem, we have conducted a study to provide a set of guidelines ensuring the completeness of the measurements shared on Twitter. In the first section, we summarize some significant previous works on the use of social media during a disaster, and we draw the specific characteristics of a nuclear accident. Then we present our study and the guidelines we have created following a user-centered method. Finally, we describe a prototype of a tool we have designed to involve citizens in publishing measurements according to these guidelines.

RELATED WORKS

In this section, we firstly describe the crisis communication process, and how social media have become a major tool for communication in the past few years. Secondly, we focus on nuclear disasters and the associated risks. We highlight information that people need to deal with this type of crisis, and the critical role of radiation measurements in managing such situations.

Social Media and Crisis Communication

A situation becomes a crisis when "the perception of an unpredictable event … threatens important expectancies of stakeholders and can … generate negative outcomes" (Coombs, 2010). When such a situation occurs, any social system undertakes a crisis management process to bring back the affected organization to any standard operations (Coombs, 2009). Crisis communication then refers to all the activities required to create a fitting description of the crisis, a sort of situational awareness of the crisis (Coombs, 2010), shared by all involved actors (Sellnow & Seeger, 2013). These social actors perform a set of activities, such as collecting, processing and distributing information (Sarter & Woods, 1991). In other words, they create a "conversational space" (Denning, 2006) whose purpose is to give survivors any details about the procedures to follow in such a situation (Grabowski, 2010).

Until ten years ago, this space was mainly framed by a unidirectional top-down information flow: from authorities (top) towards victims (down). This flow had significantly changed since 2005 when, in the USA, Hurricane Katrina destroyed New Orleans and its surroundings. In this disaster, victims have overcome their unique status of information receivers to become information producers too (Bruns, 2008). For the last decade, people facing crisis have been relying on social media to share any valuable information. The bidirectional flow of information on these media can feed the decision-making process on the field (Fugate, 2011), during the peaks of a disaster (Starbird & Palen, 2011; White, 2011) and during the recovery phase (Semaan & Mark, 2012). Social media have been used to organize response during wildfires and floodings (Vieweg, Hughes, Starbird, & Palen, 2010), to broadcast the alert regarding an on-campus weapon threat (Hui, Tyshchuk, Wallace, Magdon-Ismail, & Goldberg, 2012), to identify the victims of the Virginia Tech shootings (Palen, Vieweg, Liu, &

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