Article

EARTHQUAKE PREPAREDNESS: A SOCIAL MEDIA FIT PERSPECTIVE TO ACCESSING AND DISSEMINATING EARTHQUAKE INFORMATION

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Abstract: The field of risk communications encompasses the bulk of the scientific literature on preparedness by focusing on various means and measures used by at-risk populations, to receive, access and utilize information that acts as both a warning and a cue for disaster preparation. As noted, one area where sound scientific evidence is lacking is that of SM and its impact on disaster behaviors, particularly with respect to earthquakes, and on how information through this media can be used to facilitate preparedness behaviors. Building on a pool of Israeli research evidence on earthquakes that includes thorough analysis of past studies on risk communications and earthquake behaviors across the globe, we introduce the "social media fir" model that considers a multi-level conceptualization of the use of social media for earthquake preparedness. We consider the extent that individual-level use of SM on the one hand (Kirshcenbaum, , 2017; Mano 2014b; Mano 2014c) and institutional-level use on the other (Mano, 2014a) shape earthquake awareness and preparedness.

1. Introduction

Strong earthquakes have occurred in the region every 80-100 years and minor to major seismic activity is likely to recur (Avni, 1999; Begin, 2005; Salamon, 2005). Past research has made it clear that increasing the population's awareness and preparedness for these future earthquakes is essential in preventing human and property loss. This same research has noted that a key component in achieving this goal is effective communications (Mileti & Sorensen, 1990). As in other crisis-related events, however, the difficulty lies in discrepancies between competing types of information sources, means of information distribution, trust in the source and impact on changing behaviors (Kirschenbaum et al., 2017). Here is where social media come into play. Social media have the potential to increase exposure to relevant information and effectively prepare information channels appropriate for various populations

(Theodoreskou et al., 2014). This potential has been recently noted for managing disasters (Van De Walle & Turoff, 2007), especially search and rescue operations and evacuations, but with little, if any, grounded evidence to support its effectiveness. There is even less evidence of the effect of social media as an instrument for disseminating earthquake information, and particularly its potential in shaping attitudes and behaviors related to earthquake preparedness and recovery.

Concurrently, public and financial institutions quickly recognized the potential of social media in disseminating information and engaging users in technology-based services and products. This potential could be harnessed to increase people's motivation to share information, opinions and experiences (Guadagno et al., 2013) and hence affect individuals' attitudes, predispositions and behaviors (Berger & Milkman, 2012; Mano, 2014b). The success of such media-based marketing in business settings (Kalus & Nguyen, 2013; Maity, 2014) has only recently extended into the area of disaster management (Kirschenbaum & Rapaport, 2014; Rapaport & Kirschenbaum, 2008), but there has been practically no empirical assessment of the level of social media use in accessing earthquake information and in promoting earthquake preparedness. This assessment void may stem from a failure to address the potential of a "dialogue" between individuals and formal and informal institutions in utilizing social media *(hereinafter SM)* -Twitter (Micro blogging); Facebook (Social networking); YouTube (Content communities); Virtual Social Worlds and Mobile Applications- to promote information dissemination for earthquake preparedness. Indeed, today, advances in mobile communications and media distribution have opened a new window of opportunity to attain this goal with respect to information (Abdulah & Ward, 2016).

Here we introduce the "Social media fit" model to understand and take advantage of SM as a tool to enhance earthquake preparation. We propose to examine the link between SM and a) individual/household access to and b) institutional dissemination of *earthquake information*. At the individual or *micro level*, we suggest that the extent and frequency with which individuals use SM to access earthquake information form attitudes regarding earthquake preparedness. At the institutional or *macro level*, we suggest that formal (public) and informal (nonprofit) institutions extent, frequency and diversity of SM use will affect the dissemination of earthquake information. As a result we need to evaluate the "fit" between individual access to (micro) and institutional dissemination use of (macro) SM and the effect of this fit on earthquake preparedness.

2. Background

The internet has led to the advent of several technological revolutions in the information age, constituting a major part of Cyber-society (Castells, 1978) and changing the way people connect with each other. Unfortunately, traditional collaborative models of emergency management include face-to-face meetings and (table top) exercises where organizations accumulate information relevant to their own needs in the decision-making process. As a result, little inter-departmental exchange of information occurs, resulting in minimal sharing and low levels of the preparedness (Turoff et al., 2011) needed to cope effectively and efficiently with the emerging issues arising during the actual event.

The lack of a "fit" perspective is evident in a variety of models dealing with disaster management, such as the Information Likelihood model (Petty & Cacioppo, 1986) that focuses on risk-related messages distributed by formal agencies, the Protective Action Decision model (Lindell & Perry, 2012) that focuses on the decision-making stages in facing an imminent or future threat (Alexander, 2014), and the Crisis and Emergency Risk Communication model

(Reynolds & Seeger, 2005). These models fail to take into account are the emergent social networks generated among people, where they meet and converse with friends, family and neighbors. Such socially generated networks not only provide information but also act as conduits for its distribution. As a result, the role that SM may play in this process may constitute a considerable step towards understanding why and how individuals are most likely to access information and be prepared for or possibly susceptible to the outcomes of seismic activity.

Social media (hereinafter SM) is defined as "web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and use the virtual networks made by others within the system" (Boyd & Ellison, 2007:211). In particular *Social networks (hereinafter SNS)* operating within SM are important because "….networked communication platform in which participants have uniquely identifiable profiles consisting of user-supplied content, content provided by other users, and/or system-provided data that can be viewed by others and can consume, produce, and/or interact with streams of user-generated content provided on virtual platforms" (Ellison & Boyd, 2013:158).

Indeed, since 2003 when LinkedIn and Friendster were introduced, the use of SM and SNS has increased constantly, and by late 2016 Facebook alone had already exceeded 1.86 billion users (Zheng, 2014) as a central means of instigating the efficient generation, dissemination, sharing and editing/refining of information (Constantinides & Fountain, 2008; Pi et al., 2013), especially among the younger age groups (Prybutok & Ryan, 2015). Over 1.7 billion active users spend more than 700 billion minutes per month using Facebook (Statistic Brain, 2014). More recently, Pew Center reports (2016) provide evidence that roughly eight out of ten online Americans (79%) now use Facebook, a 7 percentage point increase from a survey conducted at a similar point in 2015. Some 62% of online adults ages 65 and older now use Facebook, a 14-point increase from the 48% who reported doing so in 2015. In addition, women continue to use Facebook at somewhat higher rates than men: 83% of female internet users and 75% of male internet users are Facebook adopters. These networks are not exclusively based on individuals' socioeconomic and attitudinal predispositions.

Evidence indicates that the accelerated use of both SM and SNS (Pi et al., 2013) has increased the motivation to share information, opinions and experiences (Hung & Cheng, Guadagno, Rempala, Murphy, & Okdie, 2013, 2012) and has affected individuals' attitudes, predispositions (Mesch et al., 2012) and behaviors (Mano, 2014a; 2014c). Not surprisingly, SM have the ability to provide an influential conduit with the potential to serve as a powerful instrument to increase earthquake information access and earthquake preparedness (Kirshenbaum et al. 2017). Considering that earthquakes occur without warning, we argue that building such interactions and virtual relationships before the event is essential in lowering the risks of ambiguity, increasing the levels of awareness and preparedness and shaping the proper predispositions to comply with warnings (Kirschenbaum & Rapaport, 2009).

3. Individual level use of SM

Communication and media studies flourished, generating a search for the reasons and motives causing individuals to use a particular technology base as a means of communication and investigating the influence of SM on attitudes, behaviors and "misbehaviors". In recent years, SM as embedded in Facebook, MySpace, LinkedIn, and Google Plus (Moqbel, Nevo, & Kock, 2013) have captivated the attention of academic interest in the effects of SM (Błachnio, Przepiórka, & Rudnicka, 2013; LaRose, Connolly, Lee, Li, & Hales, 2014; Sipior,

Ward, Volonino, & MacGabhann, 2013). For example, the Uses and Gratifications theory (Brandtzaeg & Heim, 2009; Smock, Ellison, Lampe & Wohn, 2011) suggests that individuals have various personal needs, including access to information, entertainment, social interaction and personal identity. More specifically, according to the Technology Acceptance Model (Davis et al., 1989), these needs accurately predict the actual use of a new technology, especially when the perceived usefulness and ease of using the technology are high (Lu et al., 2003; Guo et al., 2010).

Indeed, the "instrumental efficiency" of SM to access information and its "social facilitating" capacity to connect between people are key characteristics (Zhang et al., 2013; Loss et al., 2014; Merolli et al., 2013). Moreover, the rich content of SM as suggested by Media Richness theory enables SM users to derive value from user-generated content (Carr & Hayes, 2015). According to the Media System Dependency Perspective (Lee, 2012), this value increases users' motivation to use SM to access other information, for example earthquake information. Moreover, interpersonal exchanges through content-sharing links, videos and pictures (Kim et al., 2010; Merolli et al., 2013) are especially relevant in decreasing ambiguity, uncertainty or threat and in changing beliefs, values and even behaviors, especially when the content, whether positive or negative, is emotional (Guadagno , Bradley, Okdie & Muscanell, 2013). Risk-prone individuals using SM are therefore likely to have quick access to information and benefit from sharing experiences and expressing opinions (Sharma & Kaur, 2017).

The potential of SM is now evident in many areas including health behavior changes (Mano, 2014a, 2014b), social engagement (Mano, 2014b), civic involvement (Kim et al., 2010), "co-production" of products and services (Ritzer & Jurgenson, 2010) and more. The effect of SM on individuals is further amplified by the use of mobile *applications (apps)* designated for specific purposes (Mohapatra, 2015), such as health, travel, banking and traffic. The proven success of WhatsApp in supporting patients (Boontarig et al., 2012) is especially noticeable among health institutions (Ahad & Lim, 2014; Church & De Oliveira, 2013). These features certainly suggest SM are easily applicable means of disseminating earthquake information and enhancing earthquake preparedness at the institutional level as well.

Institutional level use of SM: For the most part, disaster-related information is spread through intensive media campaigns to bolster earthquake preparedness initiated by formal administrative institutions such as disaster and emergency agencies as well as by local authorities. Unfortunately, unlike private service provider institutions that now use SM actively and continuously to build and maintain "relationships" with stakeholders, disaster agencies view such efforts as simply providing information and less as an instrument to shape predispositions and mold individual behavior (Forbus & Snyder, 2013; Pettigrew & Pescud, 2012).This difference may help explain why such public-oriented campaigns have been unsuccessful.

SM, and Twitter and Facebook in particular, have garnered attention as innovative communication tools that supplement traditional websites (Serrat, 2010). According to PEW (2016), these media now cover nearly 80% of the US adult population because they are more likely to be discussed, retweeted and archived for future reference, thus increasing their levels of stakeholder engagement (Burton and Soboleva, 2011; Castronovo and Huang, 2012). These SM also create an environment that transforms individuals from the role of active recipients of messages into vocal advocates, as they share the message and discuss it with others (Bernhardt et al., 2012). The potential to utilize SM to enhance earthquake preparedness is evident in how various institutions use messages, for example as posts and blogs on Facebook (Saxton and Waters, 2014). Risk-prone individuals as "consumers" of information who are more likely to access SM to compensate for a lack of information and to cope with stressful situations, the emphasis should be on creating "dialogic connectivity" (Abeza et al., 2013) as a prime directive in forming and changing attitudes and behavior.

More important, the Relationship Marketing approach based on the use of websites and Facebook that has been successfully used in business institutions (Carver & Turoff, 2007), it has not been tested in earthquake preparedness. SM "targeting" of special community/public focus groups (Kaplan and Haenlein 2010) has the potential to significantly increase dissemination of disaster information in various dialogic forms and exchanges between different social units (Waters et al. 2009). The Relationship Marketing approach can be therefore easily transformed and applied to the area of disaster preparedness, and specifically to earthquake preparedness (Kirschenbaum et al., 2017; Saxton & Guo, 2014). There is, however, a possible downside to relying entirely on SM due to a lack of "dialogic connectivity" between individuals' access to and institutions' dissemination of information. While in general, SM is effective in promoting awareness and improving interaction it is not necessarily successful in enhancing message credibility, reliability and effectiveness (Sharma & Kaur, 2017). To this end, we draw upon the advantags of a relationship marketing approach to introduce the "Social media fit" model.

The "Social media fit" approach to earthquake preparedness. The relationship marketing approach emphasizes the cultivation of relationships with various consumers and highlights the mutual benefits derived from each member in the relationship (Abeza et al., 2013; Copulsky and Wolf, 1990). The Relationship Marketing approach may play a crucial role in the dialogic engagement and interactive information exchange process in which consumers and information providers seek mutual benefits based on individual preferences (Hunt et al. 2006). The effectiveness of relationship marketing is confirmed when "it creates additional value for products and/or services and consumers" engaged in an ongoing loyalty relationship with another social entity (Sheth & Parvatiyar, 1995). This same process could also be applicable to individuals and institutions whose task is to prepare populations for earthquakes, thereby affecting earthquake preparedness by impacting the shape of a) [risk] evaluations and b) preparedness (Mileti et al, 2006). Indeed, online SM providers may increase the potential of the "social media fit" model for earthquake preparedness.

To achieve a competitive advantage in novel technology platforms and optimize the design of online information systems require a clear understanding of the elements that affect the use of SM for online access to essential information (Abdullah & Ward, 2016). This understanding must take into consideration the extent to which the following characteristics improve personal behaviors: a) user characteristics, including gender, age and socioeconomic status (Prybutok & Ryan, 2015); b) social support, information acquisition, information exchange, and the sharing of updated information (Hung &Chen, 2013); and c) online campaigns (Mano 2014c). The relationship approach can in fact reverse existing critical points related to the flaws of warning and information systems that may be open to disruption and breakdowns, thus potentially passing wrong, distorted and even malicious information to others (Alexander, 2014). Taking these arguments into account, we strongly suggest that if SM is understood within a framework for preparing individuals and households for earthquakes, it can be a potent means not only of heightening risk awareness. In this study we present the *social media fit* model (see Figure 1) and suggest that more intensive and diverse use of SM among individuals and institutions will increase the fit between individual-level access to and institutional dissemination of earthquake information and promote a higher level of risk awareness to earthquake preparedness.
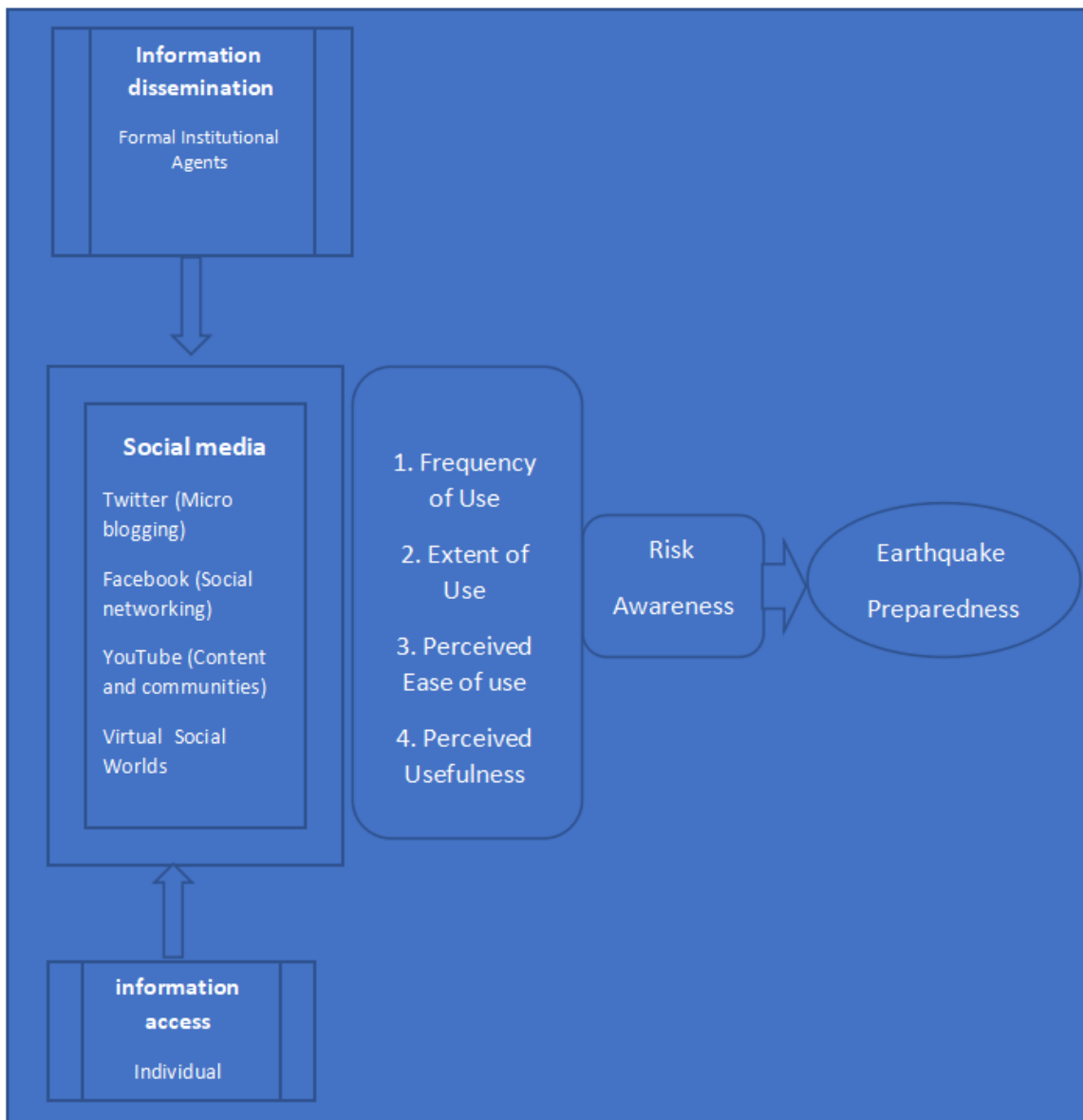
Figure 1. The "social media fit" model for earthquake preparedness

Expected contribution of the social media model to earthquake preparedness. Existing studies have gravitated toward non-binding "predispositions" to earthquake preparedness and focused on how the "message" is delivered, either through "technical" or standard "mass media" conduits but seldom through SM (Sutton et al., 2008). Online SM technologies now have immense potential for delivering and disseminating information in online communities. The open and free information exchange available on SM channels allows for immediate, interactive, time-saving and cost-effective communication among individuals and online communities (Prybutok & Ryan, 2015; Sun et al., 2015). Concurrently, SM channels can be used effectively to disseminate earthquake information. The impact of SM operates on at least two levels: a) extent of SM use among individuals that increases exposure to earthquake information, and b) extent of use among institutions to facilitate dialogic engagement with potential risk-prone groups to enhance earthquake preparedness (Kirschenbaum et al., 2017). Considering the massive use of SM (Pi et al., 2013, Prybutok & Ryan, 2015) and its tremendous impact on shaping attitudes and predispositions and molding individual behaviors (Mano, 2014a), we expect that SM use is highly likely to be relevant to accessing and

disseminating earthquake information and instrumental in achieving earthquake awareness and preparedness while minimizing the reported "flaws" in formal communications (Mileti & Sorensen, 1990; Goltz, 2002). Indeed, SM may at least supplement (or even substitute) communication media traditionally used to prepare the population for earthquakes.

We draw upon theoretical and empirical findings as springboards in formulating the hypotheses, delineating the research design and methodology and highlighting the potential impact of virtual platforms and SM on earthquake awareness and preparedness. We also expect that a good "fit" between individual and institutional use of SM should be considered as possible leverage in earthquake preparedness because it will help disaster managers and field operational personnel evaluate the quantity and quality of earthquake information disseminated to the public. A good fit could be especially valuable among risk-prone individuals and vulnerable social groups and at geographic locations marked by high seismic risk. The results will also provide policy makers and practitioners with a set of tools that can be implemented and evaluated at different time points during the earthquake preparedness cycle in order to determine whether different segments of the population are actually prepared.

4. References

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