Survey of Crisis Identification Using Social Media Interaction

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ABSTRACT

Social media have played integral roles in many crises around the world. Thailand faced severe floods between July 2011 and January 2012, when more than 13.6 million people were affected. This 7-month disaster provides a great opportunity to understand the use of social media for managing a crisis project before, during, and after its occurrence. However, current literature lacks a theoretical framework on investigating the relationship between social media and crisis management from the project management perspective. The paper adopts a social media-based crisis management framework and the structuration theory in investigating and analyzing social media. The results suggest that social media should be utilized to meet different information needs in order to achieve the success of managing a future crisis project.

Keywords : Social Media Analytics, Online Learning, Multiple Prototype Classification, Active Learning, Crisis Management

I. INTRODUCTION

Crisis managers today are increasingly confronted with more complex, hardly predictable crises involving large numbers of people, in which efficient emergency management is more challenging than ever and private companies as well as public organizations are facing almost identical problems. Whereas the procedures, as well as the coordination of internal resources in the case of crises, can be considered efficient already, the potential of improving the external communication is still significant. It is important to note that in this respect, the term "communication" does not solely imply the supply of the public with relevant information, but also the supply of emergency-managers with information from other involved stakeholders, for instance the disaster-stricken population.

Communication is a two-way street. Considering the concept of "dialogical emergency management" (Artman et al., 2011) it can be stated that eliciting information from the public is a substantial part of successful emergency communication, a component that has too long been neglected. Only if the crisis management has "strategic awareness" of what the affected stakeholders know, real communication and collaboration can exist (ibid.).One central challenge of emergency communication is that it needs to deal with rapidly changing factors such as different needs, abilities and characteristics of the involved actors (ibid.), thus making it difficult to receive reliable and real time data. At this point the analysis of social media content constitutes a new way to consider the affected population's information in an efficient way. In recent years the world has witnessed the remarkable popularity of Web 2.0 concepts and social

media, in which millions of users communicate, participate, and collaborate. Driven by these new concepts, technologies and features, the web has become more social and interconnected. Global participation platforms and social networks like Facebook, Twitter or YouTube and a mass of local blogs and web communities are an important source for next generation emergency management. O`Reilly (2005) summed it up by the buzzword "Web 2.0" and many others wrote about the phenomenon of social web and the wisdom of crowds [1].

According to a study of the American Red Cross (2011) nearly half of the entire population is active in one or more social networks. Also the importance of social media in disasters is increasing, thus it has become the third most popular information channel under these circumstances, right after television and radio. The same is true for other countries: In Austria almost half of the population with internet access is actively using social networks (STATISTIK AUSTRIA 2011), while even two thirds have already visited social networks at least once (Integral 2011). At the same time this soaring significance of social media correlates with heightened demands people pose to security and emergency managing organizations: Almost 70 per cent of the population expect the emergency managers to monitor and to react to social media content generated by the public in one way or another (American Red Cross 2011). But meanwhile the emergency managers are reacting very slowly (Currie 2009), their use of this new communication technology often being limited to manual reading of individual posts or to the unselective posting of information over the organization's profile. Yet there are examples of the successful and systematic social media usage in the crisis management by public, as well as private actors. The earthquake in Haiti 2010 was the prime example of successful social media usage in the case of emergency [1].

II. Background

Social media and Web2.0 applications have become an integral part of everyday life. They create new possibilities for the advancement of security and crime prevention, for instance by the strategic collection and exploitation of information, communication and interaction of organizations for citizen-security, media and further crisis-management organizations. In the following section, the manifold possibilities of social media services and analytics as means of data gathering and analysis, information sharing, and interactive communication for different purposes will be described and key terms will be defined. [2]
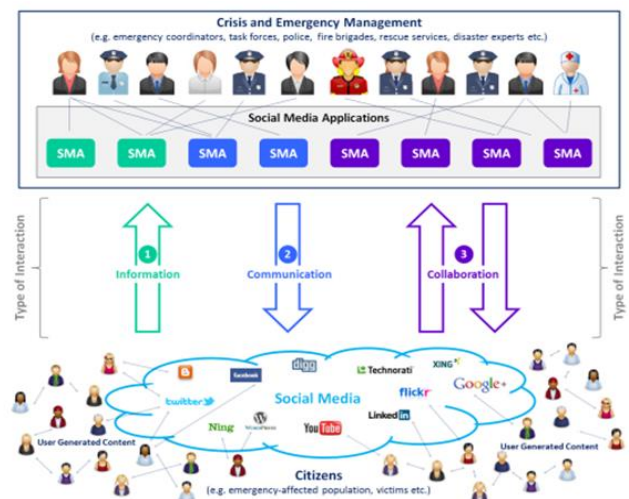

Figure 1: The major fields of social media services assistance to crisis managers

2.1 Definition and possibilities of social media & social media services

Sterne (2011) refers to the internet as a "many-to-many" communication channel in contrast to other media which communicate in the form of "one-to-one" or "one-to-many". Social media is defined as consumer-generated content that is distributed in easily accessible online tools (ibid.). The overall term "social media" includes various categories of websites like forums and message boards, opinion sites, blogs, bookmarking as well as social networks (Facebook, Google+, MySpace etc.), which are usually referred to as the main social media. For the purpose of this paper, social media can be defined as digital media or

technology which allow their users to share information and other contents individually or within a community [2]. As Prizeman (2011) states, "such tools, notably Facebook and Twitter, represent much more than vehicles of endless, banal updates on movie and dinner choices. They link individuals by providing a common platform for discussion in one centralized, easily accessible place. Such tools also create opportunities to move beyond information sharing and venting personal frustrations to real action by motivating, inspiring and organizing users". Therefore, Prizeman considers social media an important tool in human security research, which should not replace conventional media or research, "but rather provide a digestible and creative way to consume and explore mass information flows". The latter can be achieved via social media analytics (SMA), which is going to be further explored below.

To make the great amounts of user-generated content usable and exploitable for various purposes commercial software tools 2 soon appeared on the market that automatically collect and analyze the data from social media sources [3]. Next to SMA for the policy-decision-making context, different applications based on social media have been developed in recent years for emergency and crisis management as well as public services. So-called "social media services" include a wide range of applications or software systems that are integrated in social networks (like Facebook, Twitter, YouTube etc.) and allow to communicate or interact with citizens.5 The capacities and possibilities of social media applications or services are becoming increasingly acknowledged in different fields. In recent years emergency and crisis organizations have become aware of the importance of social media with regards to the amount of published information [4].

3. Fields of Application In Crisis Interaction

In the course of a crisis there are multiple ways in which social media can assist the management team. These can be grouped into the following, mutually non-exclusive, three categories of social media applications:

▪ **Information**

In this interaction form, relevant information from the social media cloud is gathered and used in the course of strategic and operative work of the security organizations. Usually this involves the collection, filtering, aggregation, and visualization of data. The most sophisticated methods use an automatic algorithm that allows for the treatment of large volumes of data, thereby enabling a valid prioritization and truthfulness of the information based on quantitative figures. These applications are known under the label "social media monitoring" and "social media analytics".

▪ **Communication**

Many emergency managing organizations or departments have started with a rudimentary use of social media. This is the most widespread application area, where social media is simply used as an additional communication channel, serving the mere dissemination of information. It is a channel that is especially important in times of crisis, since traditional infrastructures might be damaged and the advancement of the mobile broadband has made social media sites almost available from any place[5].

▪ **Collaboration**

The immediate bidirectional information-exchange between emergency managing organizations and citizens is the third form of interaction that is enabled by social media services. The services aid in making the interaction more systematic, but yet the collaboration activities are characterized by a comparable high demand for human resources, since the responses to individual entries cannot be automated and in many cases multiple feedback loops are necessary.

3.1 Opportunities and capacities of social media crisis interaction

The opportunities that the inclusion of social media into the communication strategy brings along are manifold. They are associated with, but not automatically determined by, the three fields of application. The following taxonomy is a collection of the most important ways social media can contribute to a successful crisis management. Most of them are relevant for the private, as well as the public sector.

Risk analysis and prediction: The monitoring of real-time social media data increases the speed and the efficiency with which the emergency managers can react, because it fulfills a predictive function in both man-made and natural crises. By automatic monitoring activities the citizens are not merely used as information brokers, but quantitative processing allows to use social media content as social sensor that can with a certain probability predict mass behavior and get a better grasp of the potential risks.

Hazard analysis: The gathered information can aid first responders in assessing the danger of the situation and aid in the preparation of the task forces' mission, since many social media users share knowledge about sites of disasters, the extent of the damage, further hazards, number of casualties, etc. (Laad & Lewis, 2012). It is therefore an additional information channel that can be utilized in resource and task planning.

Force coordination: Often social media is used to coordinate task forces or individual helpers after a crisis has hit – internally (due to convenience or breakdown of other communication infrastructures), as well as externally (e.g. volunteers can be directed to the right places based on their available skills and resources).

Humanitarian aid (public crises only): As impressively laid down in several recent studies (e.g. Slagh, 2010; Kumar et al., 2011; Wich, 2011), social media has become an essential factor in organizing humanitarian aid. It contributes to facilitate and coordinate the work of the diverse existing relief organizations, as it has particularly been proven in the aftermath of the earthquake in Haiti in 2010, where a street map service helped to document the catastrophe, to save and publish data about missing people, or to concentrate aid activities in the areas that have been hit most severely

Psychological assistance (public crises only): By informing the affected people about a crisis it can help them to grasp the magnitude of the crisis and it can also signal the presence of the emergency managers throughout the crisis by keeping up the information flow.

Fundraising (public crises only): Social media has proven to be helpful in organizing and encouraging donations by allowing organizations with the means of an extra "app" to have users donate directly via their community pages. Facebook for example helped to accelerate donations in the aftermath of the earthquake in Haiti 2010 through an online game that allowed buying virtual goods and thereby proved to be an efficient and effective means to collect donations.

Information of the affected actors: The most straightforward function of social media is to quickly disseminate information (directions on where to hide from hazards, what to expect next, how long the crisis will last, etc.) by acting as a communication channel that is using its viral effects. In cases of disaster this additional information channel also has the advantage of reaching those that are cut off from traditional communication infrastructures and therefore can effectively fill the information void.

Cleanup planning: Finally, the intelligence gathered via social media can give hints to emergency managers about where to concentrate the post-crisis efforts (Laad & Lewis,2012). This is of importance

immediately after the emergency in the phase of latent danger, where the probability of further outbreaks should be minimized, as well as when no further emergency situations are to be expected and the primary task is disaster relief [4].

As can be seen in figure 2, the three fields of social media application are complementary and a holistic crisis communication strategy needs to incorporate all three. Nevertheless, it has to be mentioned that the information gathering function is the most fundamental one since it runs through each crisis stage. Unfortunately, it is exactly this dimension that is neglected in most cases. The activities performed here are unsystematic. Therefore the most significant improvement potential for most emergency managing organizations lies in automatic social media analytics software tools, since they can serve as a valid decision basis rooted in the analysis of a large amount of real-time data.

	Prodromal Stage	Acute Stage	Chronic Stage	Resolution Stage
Information	Risk analysis and prediction	Hazard analysis	Humanitarian aid	Cleanup planning
Communication		Information of the affected actors	Information of the affected actors, Humanitarian aid	Information of the affected actors, Fundraising, Psychological assistance
Collaboration		Force coordination	Humanitarian aid, Psychological assistance	Psychological assistance

Figure 2: Matrix of examples based on the field of application and crisis phase

III. Comprehensive multilevel approach for social media use in crisis

As has been developed, the opportunities of use for social media as a collaborative and far reaching information and intelligence system are plentiful but have yet to be critically estimated under the current and dynamic social developments. Already mentioned aspects of the rapid development of communication and information exchange in the field of emergencies

in general can open new paths to the necessary cooperation of governmental organizations and entities [6].

The possibilities of targeted and valid use of social media in its heterogeneous role as an information and data channel can be developed in addition to the commonly known and elaborate process streams of professional crisis and disaster management. As an example the traditional three-pillar-model for provisionary measures e.g. of the Austrian national crisis and disaster protection management (SKKM, 2006, p. 19) will be amended by the components of traditional and new/social media. In the traditional model NGOs (e.g. fire fighter, ambulance service), GOs (police forces, national disaster management organizations,) [7,8] and the citizens build the foundation for all provisionary measures and a stable crisis management. Figure 3 illustrates the prominent role of traditional media/crisis communication and the promising potential of the multilevel use of social media, applications, and services as a basic layer and channels of open source information in all phases of crisis and disaster management (critically discussed by Neal, 1997).
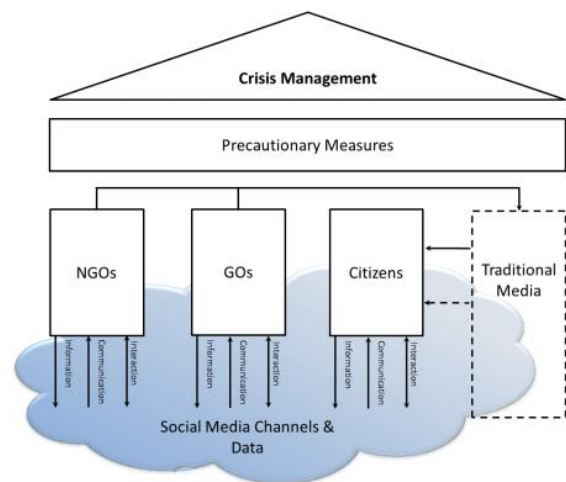

Figure 3: Traditional model for provisionary measures (following SKKM, 2006) enriched by the new social media information layer

In the traditional state of the three-pillar-model information flow is mainly provided due to a restrictive one-way system with rigid patterns and hierarchies involving common media channels. Traditional statistics and quantitative quality labels

seem not to be sufficient for this task as intentional and unintentional misinformation and forwarding of mass data such as those that Agichtein et al. (2008) try to generate in their experimental analysis algorithm. Thus besides the high potential of a multilevel use of social media in crisis the challenges for a reliable, cost effective and ethically as well as legally committable usage have to be tackled pro-actively from usability-focused research initiatives.

IV. CONCLUSION AND OUTLOOK

The through consideration of the potentials and risks of social media usage in crisis management yields the conclusion that if they are strategically employed they can be of assistance in all four stages of a crisis. But there are two things that need to be considered: First, the massive gains in effectiveness and efficiency go hand in hand with risks of unprecedented proportions, whether they are caused by intentional manipulation attempts or by the nature of the new media themselves. Second, social media are not a remedy for all problems that emergency management is confronted with. Therefore they need to be seen as an addition to the traditional information and communication channels, not as a substitution. As such, their integration into the overall communication strategy and operational processes is essential, especially with regard to the dangers that are constituted by the speed and dynamic nature of the new medium, since neglecting those might result in serious aggravation. But given the fact that the internet and mobile handheld devices are constantly pushing towards omnipresence, the incorporation of new media as an additional channel is only a matter of time, though their use will vary according to available resources, organization types, and other contextual factors (such as the cultural or the legal background). However, passing on an opportunity to use free data is something that almost no emergency management organization will do.

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Cite this article as :