Social Media Applications in Crisis Management of Natural Disasters
Lessons for the Arab Region

Abdulrahman Elsamni

Introduction
Throughout history, nations have suffered natural disasters that inflict damage, spread chaos, and claim lives. In contrast to anthropogenic or human-made disasters that are usually limited in scope, a natural disaster can impact a whole country, or even a continent. Earthquakes, volcanoes, floods, landslides, and hurricanes, to name a few, are natural disasters that differ in form but can be similar in magnitude and death toll. The new century has witnessed the costliest natural disasters in United States history, with Hurricane Katrina in 2005, Sandy in 2012, Irma and Harvey in 2017. Mexico was hit in 2017 with its strongest earthquake in a century, after Japan was hit in 2011 by Tōhoku, its most powerful earthquake on record.

The aftermath of a natural disaster can be deadly if governments and other stakeholders do not implement efficient crisis management plans that effectively employ mass media. The same applies to individual citizens, who need to utilize every possible opportunity offered by technology and mobile access to mitigate the damage. Studying social media applications and their role during natural disasters could draw various lessons in crisis management for the Arab region.

This article examines the role of social media in crisis management of natural disasters as it applies to both governments and individual citizens. It aims to determine whether social media applications can reframe the management of natural disasters and offer added value in comparison to traditional media. If so, how, and what, are its limitations? In so doing, this article outlines the strengths and opportunities of social media crisis interaction and weighs them against the weaknesses and potential threats of its use, in order to come out with recommendations on best practices for Arab citizens, governments, and organizations regarding the possible uses of social media in managing natural disasters.

Theoretical Framework
Crisis management studies employ different approaches pertinent to crisis communication. These five different approaches were summed up by Goldfine (2011, 7) as attribution theory, situational crisis communication theory, image repair theory, contingency theory, and best practices in crisis communication. This paper uses best practices theory as it investigates different case studies of crisis management using social media during natural disasters in order to develop ideas for Arab researchers and officials.
Methodology
This article adopts a qualitative research design, using the descriptive and analytical perspective and the desk study technique, similar to Adibe, Odoemelam, and Chibue (2012). In adopting the descriptive and analytical perspective as a method of inquiry, the strengths, weaknesses, opportunities, and threats of using social media to manage natural crises are analyzed with the SWOT analysis method. Using the desk study technique, an in-depth literature review of relevant scientific articles is presented, selected for their discussion of social media and its applications within the context of crisis management during natural disasters.

Based on the literature review, the study attempts to answer two main research questions: The first is what are the strengths, opportunities, weaknesses, and threats of adopting social media applications in crisis management and the second is how this could differ from a traditional media approach.

SWOT Analysis: Strengths
The strengths of using social media applications for management of natural disasters can be divided into two main categories. The first category includes strengths that reflect an advanced form of a known characteristic of traditional media, whereas the second category represents an advantage offered exclusively by social media.

A Voice for All, No Discrimination
Alexander (2014, 720) believes that social media offer a listening function as they give a voice to individuals who do not normally have one. This listening function enables currents of public need and popular preference to be gauged, and reflect how the public is reacting to events.

This advantage of social media allows for the inclusion of new and previously excluded discussants, as Al-Saggaf and Simmons (2014) argued in their study of social media use in Saudi Arabia during the 2009 and 2011 floods in Jeddah. Their study included examples of women who were speaking openly and confidently as private citizens on public social media, which is not common in Saudi Arabia. Another example was a previously jailed Saudi rapper, Klash, who documented Jeddah floods on YouTube, which found its way to traditional media.

By providing a platform for all citizens to voice their grievances and needs during hazardous times, social media can make victims better off and facilitate quicker recovery, helping to limit marginalization, a main problem of traditional media.

In an evaluation of media realities in natural disasters, Ali (2013, 128-129) discussed important research findings about international media reports during these crises, reflecting how stereotypes and institutional biases can affect coverage, especially in relation to minorities or developing countries. For example, the media coverage of the 2005 earthquake and 2010 flash floods in Pakistan. That is, media reports can normalize lawless behavior, leading audiences to believe that victims are criminals undeserving of help. In the aftermath of Hurricane Katrina, African Americans in New Orleans were consistently shown as looters, while White Americans were shown finding supplies.

A Voice Everywhere, No Required Preparation
There is a growing body of evidence suggesting that social media applications are the next resort, when and where mainstream media channels fail to function. According to Cho and Park (2013,
Twitter was a primary communication channel to report from affected areas, amid the lack of fixed or mobile phone service after Japan's 2011 earthquake.

The story of Iwate Prefecture, was recounted by Hashimoto and Ohama (2014, 103), when a communication failure occurred, blocking information about quake damage to the area. Local government officials were unable to warn of the tsunami on Iwate's website as all servers went down, so they created informational accounts on Twitter and Facebook using their private mobile phones. In contrast to television reports that the entire Iwate Prefecture had been wiped out; social media accounts had a large number of followers, and messages of gratitude from recovered victims.

In this case, social media applications represented a solution to a very complicated situation; where all other media outlets were either unable to present a full picture, or failed to function at all. The mobility and accessibility of social media applications could help overcome a large logistical problem that plagues traditional media. This shortcoming is described by Ali (126) as “disaster marathons”: Media rushing to the scene of a disaster and making large demands on communication sources and transportation facilities. This can create confusion for authorities who have far more pressing priorities, and can further delay rescue operations or effective management of the crisis.

Government Communication
Social media can facilitate better exchange of information between governments and their citizens. The interactive nature of social media can allow governments to communicate information and recommendations to citizens in a targeted way, as well as allowing citizens to contact the government directly.

Cho et al. (37) revealed how different Japanese ministries used Twitter during Japan's earthquake to inform the public of their relief efforts, for instance, the Office of the Prime Minister rallied the public and provided information on precautions to take, while the Ministry of Economy, Trade, and Industry posted special measures for controlling gas damage, preparing for aftershocks, and the risks associated with the Fukushima nuclear power plant.

Similarly, Ehnis, and Bunker (2012) showed how the Queensland Police Service (QPS) in Australia created an online community of followers to enable a new channel for two-way communication and collaboration between the QPS and the general public. During the 2011 flood disaster, they used Twitter and Facebook to pass information and warnings to the public, acting as a centralized clearing house for disaster-related information.

Through social media, citizens are also capable of reaching the government. One clear example of social media allowing citizens to contact government officials is presented by Al-Saggaf et al. in their study on the Jeddah floods. Saud Kateb, a Saudi citizen complained on Facebook to the Minister for Culture and Information Abdul Aziz Khoja about Saudi News Agency coverage of the 2009 floods. The minister responded to him through Facebook, and instructed the agency to fix the problem. In addition, Saudi Facebook users demanded an investigation into what happened, and prosecution of the responsible officials, which was quickly met by the government.
As the saying goes, "prevention is better than cure." Governments need to act preemptively. However, for preemptive action to be effective, tests are essential. One remarkable example of the readiness of a local government to a crisis was in Japan, specifically in Tsukuba City.

In 2011 Tsukuba city, according to Hashimoto et al. (106-107), was already testing Twitter as a method of transmitting information to the public. It was not surprising then that when the city experienced the earthquake, the first tweet (indicating the city was not affected) was posted within just 10 minutes. The city immediately announced the founding of a disaster prevention office, requesting citizens to provide information to their website, which successfully transmitted 600 tweets during the disaster.

**Identifying Survivors**

Another advantage of crisis management through social media applications is the ability to identify survivors or victims much more efficiently than other forms of media. In the case of Japan, people used Picasa to publish photos of people in evacuation centers, and resorted to Google Person Finder, posting more than 300 thousand posts in one week (Wendling, Radisch and Jacobzone, 2013, 22). Google Person Finder was launched directly after Haiti's 2010 earthquake, when Google decided to create a crisis response team to deliver tools to help disaster victims. In Japan's earthquake, Google search page displayed a tsunami warning, and allowed users to mark themselves safe (West and Valentini, 2013, 3).

**Sharing Experiences**

Social media applications could disseminate useful experiences and advice in response to different crisis circumstances. In their study of the Jeddah floods 2009, Al-Saggaf et al. provided supporting evidence that social media has an operational role in crisis management of natural disasters, using an example of a video taken showing a man being rescued by a winch driver.

Social media applications could also be utilized to increase awareness of potential risks and provide survival recommendations. The informal and conversational communication style attracts audiences and represents one advantage over other more traditional channels of communication (Wendling et al. 19).

**Requesting Support**

At times of natural disasters, social media applications give citizens the ability to request support from places that traditional media may not be able to reach due to the lack of outlets, prohibition of access; or when other conventional communication methods are dysfunctional.

This was the case during the 2011 earthquake in Japan for the city of Iwaki, which sits adjacent to the Fukushima nuclear power plant. This proximity meant media and shipping companies avoided the city, fearful they may be exposed to radiation. As pharmaceutical products and stockpiled medicines began to run out, disconnected phone lines only made the situation worse. Citizens turned to social media to seek help and grab media attention, uploading videos to Ustream, which ultimately succeeded in bringing medical and other services to the city in need (Hashimoto et al. 109).
Mapping
One major advantage of social media applications is the ability to know where help is needed, particularly in areas where maps are outdated or have not been created. Crisis mapping platforms collect aerial images to document uncharted areas, and deliver information from impacted individuals to disaster relief teams. In Haiti's 2010 earthquake, applications such as OpenStreetMap and Ushahidi were effectively used (Goldfine, 20).

Crisis mapping is suitable for crowd-sourcing through social networks, where reports are compiled using information from many users. There are systems for disaster management that serve a similar purpose. Sahana, and its derivatives Eden, Vesuvius, and Mayon, are all open-source disaster management systems (Alexander, 723).

Fundraising
Social media applications can help with fundraising by encouraging donations via community pages and other platforms. One example from Haiti's earthquake in 2010 is an online game that collected donations by players purchasing virtual goods (Rainer et al. 2013, 117).

Similarly, Goldfine (30) analyzed Japanese organizations on Twitter and Facebook to find that social networks were used to collect donations, either by directing social media users to donation sites or by giving instructions on how to donate to disaster relief efforts in Japan, or to their organization, if they were fundraising.

Weaknesses
Although there are many strength factors for using social media applications at times of natural disasters, there are also weaknesses that are either applicable to the nature of the medium itself, or are a consequential result from media uses and different types of practice. Below is a list of weakness items that affect utilizing social media applications in crisis management.

Lack of Accessibility
One of the key disadvantages of using social media applications to manage a natural disaster is the lack of accessibility in some parts of the world. In many regions, social media applications are not as widely accessible as television. In some cases, poor infrastructure, budget deficits, lack of training, or lag of adopting technology cause these barriers. In others, parts of the population do not have access to the technology due to different demographic, educational, or economic factors.

The digital divide can deprive lower income segments of the population from receiving important information during times of crisis. The Organization for Economic Co-operation and Development (2002) defines digital divide as “the gap between individuals, households, businesses, and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs), and to their use of the Internet for a wide variety of activities.”

A case in point is Africa, which is generally limited by a low Internet penetration rate that reflects not only a case of digital divide in contrast to other continents; but an internal case reflective of an often extreme social gap within countries. According to International Telecommunication Union (2017), one in every four people in Africa uses the Internet. Only 18% of population have Internet access at home, and there is a gender gap, as the number of female users are 25% lower.
than men. Along these lines, the rural population in Africa is still largely excluded from the social media trend. In most African countries, Internet access is limited in rural areas where larger portions of the population tend to reside (Adibe et al. 12).

It is most often those in greatest need of support that have the least access to, and understanding, of social media technology. The scale of this inequity could be somewhat mitigated if those using social media applications could spread information by word of mouth (Alexander, 725, 727).

**Propagation of Rumors**
Social media can contribute to the propagation of rumors and falsified information. Although this may be the case in any other traditional form of media, this disadvantage is more intense in social media applications due to many factors, such as anonymity, digital manipulation, and multiplication effects. According to Adibe et al. (12), the anonymity of sources hinders regulation, monitoring, and prosecution of illicit acts. This makes social media applications vulnerable tools, and makes truth difficult to ascertain, especially when images and sounds are digitally manipulated.

One example of rumor spreading came in the aftermath of Hurricane Sandy, which hit the United States in 2012. Although social media provided authentic channels for exchanging information between the government and the public, the latter widely used Photoshop to manipulate storm images and photographs. False news stories about which places in New York City were flooded spread from social media to television (Alexander, 725).

Another example is introduced by Hashimoto et al. (114) from Japan's earthquake, when a person posted on Twitter that a fire erupted at Cosmo oil refinery in Chiba City, warning a potential diffusion of harmful substances. This unfounded rumor was spread rapidly by well-intended tweeters, and although Cosmo Oil Ltd. and Chiba Prefecture officially denied it; few people retweeted the correct information.

This failure to counteract rumors or false information is attributed by Raine et al. (119) to one characteristic of the web, which is the extremely intertwined networks with numerous spreading points and multiplication effects. Therefore, it might be impossible to control or counteract misinformation after it reaches a certain threshold.

In all cases, the absence of official information in cyber space helps the spread of rumors. An example cited by Alexander (724) is observed after the 2010 earthquake in Chile, when information from official sources was scarce, and several Twitter rumors increased the sense of chaos and insecurity of Chilean people.

**Breach of Privacy**
Another weakness of social media is related to privacy concerns, whether the threat to privacy is from government analysis of data, or from individual outlaws. According to Hashimoto et al. (113-114) people might disclose personal information online at times of emergencies in order to seek rescue. This information remains online, for long periods after the disaster, and could be illicitly exploited by other parties to cause potential harm.
Big Data
A distinguishing characteristic of using social media applications is the challenge to deal with a huge amount of data. According to Wendling et al. (28), massive exchange of information via social media made it impossible to have a clear picture of what was happening during the crisis. This sheer volume of information is considered by Alexander (725) as the greatest challenge to social media during major events.

Goldfine (20) uses Haiti as an example, as thousands of impacted citizens used mobile technology, their disseminated information had to be collected, mapped, and translated from Creole, French, and English. Detailed information is critical for, but massive amounts of data can be overwhelming without comprehensive methods for data processing.

Opportunities
In the SWOT analysis, all opportunities are based on how capable technical processes and different initiatives are to overcome the weaknesses of social media, as well as to remove the restraints related to its nature, practices, and uses, thereby leading to an effective usage of social media applications at times of natural disasters.

Stopping Rumors
Rumors, as noted earlier, are one obstacle that can hinder using social media applications in crisis management. However, there are some processes that may help mitigate the effect of rumors. On the legal level, Wendling et al. (28) advised taking lessons from a Mexican bill that passed called the Veracruz Law, which prohibits citizens from spreading false rumors and information that may trigger panic.

On the technical level, Wendling et al. (27) emphasized the importance of labeling official channels as such. He cited examples from Japanese studies of the 2011 earthquake, and how it helped when every official service on Twitter had an icon to indicate from which official sources the tweets were coming, in order to help users to ignore rumors.

Similarly, it is important to label rumors for what they are. An American initiative launched a website called Truthy (http://truthy.indiana.edu), dedicated to spotting rumors and misuses of Twitter, and is monitored by researchers at the University of Indiana (Alexander, 729). Such initiatives can help identify and squash rumors in times of crisis.

Protecting Privacy
In response to the personal fear of governmental analysis of data on social networks, a law in the Netherlands permits only the analysis of metadata, and prohibits monitoring individual use of social media. Accordingly, there is a need to define what information should or should not made available online (Wendling et al. 29, 31).

Data Mining
In recent years, many software applications were developed for the sake of making the processing of big data easier, a process called social media monitoring. These social media analytics tools, which are software tools that automatically collect and analyze data from social media sources, are means for social media monitoring in all private, public, and governmental contexts. Examples from the public and governmental level include UniteEurope, a decision support instrument for municipalities and NGOs in the field of migrant integration (Rainer et al. 114).
Other examples of tools related to disasters are crisis management tools, which are designed to help communities in times of crisis, by connecting volunteers and open source technologies. An example is CrisisCommons.org, which gather volunteers in camps to solve problems through project management, translation, editing, and research (Goldfine, 20).

For Wendling et al. (29, 31), Google analytics can help emergency services trace existent trends between citizens, due to differences between regular and non-routine uses of social media during crises. However, emergency services must recall that social media users are not always representative groups of the larger population affected by a natural disaster.

**Threats**
The threats related to effective social media use in crisis management mainly emanate from both the internal and external factors that may make governmental organizations refrain from using social media at times of natural disasters, or use social networks the wrong way.

**Internal Factors**
Inside any organization, there are many factors that may guide their decision not to use social media during a natural disaster. These factors may be economic, technological, or related to management decisions of what are the most efficient practices to reach the audiences. Examples from Goldfine (28-29), include the scarce of economic, logistic, and infrastructure resources in some governmental organizations. This also may include the dependency on other forms of communication, such as phone and e-mails, which may be seen by the organization as more effective for reaching its target audience, or merely due to habituation to specific practices.

Governmental organizations may embrace the technology, but simply do not use it in the right way. For sure, there are a lot of limitations to the usage of traditional methods in the advanced contexts, which is conducive to less effective implementation of social networks. For example, Cho et. al (38) conducted a study on governmental Twitter accounts, during Japan's 2011 earthquake. In which, these investigated Twitter accounts did not defer from traditional one-way communication strategies, a passive method of information delivery that by no means suits the online context. It reflects a dire need to adopt appropriate communications methods for crisis communication strategies through social media.

Matar, Matar, Balachandran, and Hunaiti (2016, 54), pinpointed how the Bosnian government lacked clear policies or plans regarding social media applications during the flood in May 2015. Government social media accounts were not verified, and only published PR activities and late reactive announcements.

**External Factors**
Outside the governmental organization, there are a set of factors that may influence its decision of what types of media the organization is to use at times of natural disasters, this include cultural, demographic, environmental, and geographical contexts. For instance, Cho et al. (38) pinpointed the cultural traits of Japan when addressing the absence of Twitter accounts. The Japanese tend to avoid sharing personal information in order to prevent potential conflicts, as influenced by Meiwaku culture and Confucianism; the main sources of collective perception in East Asia.
Discussion
The SWOT analysis reflected distinctive advantages of using social media applications at times of natural disasters, if compared to its traditional counterparts. These advantages could help Arab researchers to either project how social media could mitigate the impacts of the coming hazards, or simply be used as guidelines on how the events of the past would be changed had there been social media as a crisis communication tool.

In the case of Egypt, if the social media had been around during the 1992 earthquake, the consequences of the seismic disaster may have been lessened. According to Ambraseys, Melville and Adams (2005), many of the casualties in Cairo were victims of panicked stampedes of citizens rushing from buildings. In addition, there were indirect deaths and injuries as buildings remain vulnerable to aftershocks (EERI, 1992). The aftermath of the 1992 earthquake reflected a lack of awareness among people, as well as a lack of crisis preparedness measures from the government.

On one hand, social media applications would be utilized to mitigate both problems by spreading instantaneous, live, and up-to-date information clarifying the situation and advising people on what to do immediately after. On the other hand, although local area residents helped in search and rescue operations, social media applications were to be very helpful as in the cases of Japan and Haiti earthquakes with the likes of Google Person Finder and other applications presenting more efficient rescue. Data mining applications would be useful in analyzing social media posts, to present emergency help and direct assistance to victims in impacted areas, preventing further deaths or building collapses.

Conclusion
The strengths of using social media in crisis management worldwide include presenting a platform for all citizens, lessening required preparation, enhancing governmental communication, as well as helping identify survivors, sharing useful experiences, requesting support, mapping, and fundraising. The weaknesses encompass lack of accessibility, propagation of rumors, breach of privacy, and dealing with sheer amount of data. All these weaknesses could be mitigated by opportunities, whereas the threats emanating from internal factors, such as management, and external factors, such as salient culture, would in many cases be relatively easy to overcome.

In conclusion, the analysis of social media applications at natural disasters showed that its strengths would outweigh weaknesses, and its opportunities could exceed expected threats, implying a clear advantage over the other means of traditional media, which indicates a potential effective role for social media applications in the Arab region, allowing for an efficient crisis management of natural disasters.

Abdulrahman Elsamni teaches in the Department of Media and Communication Sciences in the Faculty of Arts at Ain Shams University.

References

Social Media Applications in Natural Disasters


