Role of New Media in Natural Disasters

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"The timely, accurate and sensitive communications in the face of natural hazards are demonstrated, cost-effective means of saving lives, reducing property damage, and increasing public understanding. Such communications can educate, warn, inform and empower people to take practical steps to protect themselves from natural hazards." – **Observation of World Conference on Natural Disaster Reduction and the Roundtable on the Media, Scientific Information and Disasters**

Over the last few years, the world has witnessed some of the greatest natural disasters (this paper uses the term "disaster" interchangeably with "emergency") of all times. Bushfires in Victoria (Australia) in 2009, floods in Pakistan in 2010, floods in Queensland (Australia) in 2011, earthquake in Japan in 2011 and Tornado in Tuscaloosa (USA) in 2011 are just few examples. Collectively, hundreds of human lives were lost and millions of infrastructure's damage was resulted by such disasters. Consequently, these types of disastrous situations have set new challenges for disaster managers and disaster management agencies. India ranks second in the world for natural disasters after China, The two rapidly growing countries in the world, China and India, rank first and second in the number of reported natural disasters in the year 2010. While China witnessed 22 natural disasters, India came second with 16. About 373 natural disasters killed over 296,800 people in the world. The estimated costs of natural disasters in 2010, in which an earthquake in Haiti killed over 222,500 people and the Russian heat wave caused around 56,000 fatalities, is around $ 110 billion. (Report of Margareta Wahlstrom, Special representative to the UN Secretary General for disaster reduction, 2010)

Disaster can be defined as a "source of danger, and its consequences can adversely affect humans in terms of life, property and environment when the level of danger, and the consequences, exceed the ability of the affected society to cope using its own resources (Alexander 1997). A disaster is a situation or event which overwhelms local capacity, necessitating a request to a national or international level of external assistance and an unforeseen and often sudden event that causes great damage, destruction and human suffering. Generally, disasters can be categorized into three main categories including (a) natural (such as earthquake, extreme heat or cold, fire, flood, hurricane, landslide, thunderstorm, tornado, Tsunami and volcanic eruption), (b) man-made (such as biological, chemical, nuclear and radiation threat) and (c) hybrid (for instance, extensive clearing of jungles cause soil erosion and subsequently heavy rain causes landslides; the location of residential areas, factories etc at the foot of an active volcano or in an avalanche area; and floodplain disasters).

Today disaster risk reduction is no longer optional and risk mitigation or risk management have become strategic and technical tools for helping national and local governments to fulfil their responsibilities to their citizens. Reducing the losses of life and property caused by natural hazards is a compelling objective now receiving worldwide attention. It is now being increasingly believed that the knowledge and technology base potentially applicable to the mitigation of natural hazards has grown so dramatically that it would be possible, through a concerted cooperative international effort, to save many lives and reduce human suffering, dislocation, and economic losses simply by better information, communication and awareness. Timely mass media communication about impending disasters can lead to appropriate individual and community action, which is the key to implementing effective prevention strategies including evacuation and survival of people. The role of media, both print and electronic, in informing the people and the authorities during emergencies thus, becomes critical, especially the ways in which media can play a vital role in public awareness and preparedness through educating the public about disasters; warning of hazards; gathering and transmitting information about affected areas; alerting government officials, helping relief organizations and the public towards specific needs; and even in facilitating discussions about disaster preparedness and response. During any emergency, people seek up-to-date, reliable and detailed information.

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"There is no calamity that right words will not begin to redress."
-- Ralph Waldo
Emerson

In November 1970, a tropical cyclone, combined with a high tide, struck south-eastern Bangladesh, leaving more than 300,000 people dead and 1.3 million homeless. In May 1985, a comparable cyclone and storm surge hit the same area. This time, there was better local dissemination of disaster warnings and the people were better prepared to respond to them. The loss of life, although still high, was 10,000 or about 3 percent of that in 1970." When a devastating cyclone struck the same area of Bangladesh in May 1994, fewer than 1,000 people died. The dramatic was a new early-warning system that allows radio stations to alert people in low-lying areas. (IDNDR, Bangladesh Disaster Preparedness Centre). Hurricane Gilbert, which hit Jamaica in September 1988, was one of the worst storms in the island's history. The storm had been tracked, by the Regional Hurricane Center in Miami and by national meteorological services in the area. They predicted Gilbert's path and issued timely warnings to relief officials and the public. The result was a much lower death toll than when a similar hurricane struck in 1951, despite the fact that the population of Jamaica had doubled in the meantime. Fifteen years ago, there were advanced warnings for only 45 percent of tornados. Today, the figure is 89 percent and growing. In the United States, 1,400 people lost their lives from tornados between 1950 and 1959. Between 1983 and 1992, the death toll dropped to 521. The impact of a 1977 cyclone in Andhra Pradesh, India was devastating which killed 10,000 people, and a similar storm in the same area 13 years late killed 910 people. (World Meteorological Organization)

According to the World Meteorological Organization, this trend, which applies to hurricanes and cyclones as well, is the direct result of, among other achievements, "advancements in communications technologies." The above examples prove the point beyond doubt that "emergency preparedness" and "early warning measures" save lives and money, and communication plays a vital role in disaster mitigation and preparedness. Disaster response and mitigation require effective and coordinated communication to avoid confusion and mayhem. Institutional cooperation framework is required for channelling information across reliable communication systems and cascades of interfaces for better response during disaster situations.

Developing standard emergency plans (Alexander 2005), effective decision making under time constraint (Mendonca and Fiedrich 2006) and enhancing the performance of disaster respondents by using advanced technologies (Bowman et al. 2007) are some of the key challenges currently faced by disaster management agencies. This has led to increased interest of researchers and practitioners to deal with such challenges by various means. Proposing new disaster management models, adopting new technologies and utilizing computerized systems are few ways to meet such challenges. Knowledge management and packaging of information is critical for creating desired impact on the individual and community behaviour on disaster information shared. An early warning could be useless if it were not able to get the community alert in the event of an upcoming disaster situation, further if it creates panic it would do more damage.

The significance and the unique role of the media in natural disaster situations are unarguable. The media constantly act as a transmitter of valuable information throughout the disaster management life cycle (Perez-Lugo 2004). It is further argued that this didactic function of the media varies only in content across various phases of disaster management. Seydlith et al. (1990) suggest that during mitigation phase, the communication media provide factual information about the approaching disaster and remedies to immediately prepare for its impact. After disaster, the media focus their attention on the supposedly most affected areas, providing estimates of the damages and losses and helping communities in their recovery efforts. During the long term mitigation phase, the media act as disaster information provider through coverage of nonlocal disasters via movies, documentaries, news and special programs which eventually helps the community to raise disaster awareness and prepare for future events (Rodriguez 1997). It is evident from the above discussion that even the contents of the transmission changes during various phases of disaster management, the media are still perceived to serve a didactic function because it is assumed that people keep watching, reading, and listening to obtain information on disaster mitigation, response and recovery (Quarantelli 1996).

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While the disaster is on, the media can also play the role of relaying the measures that are being taken and monitoring them, cautioning the affected or to be affected people about the Dos and Don'ts, of scotching rumours and preventing panic and confusion, of establishing contacts, of identifying the needy spots and focusing attention on them, and generally by assisting the authorities, voluntary organizations and volunteers in reaching, informing and assuring the affected ones of the assistance and the measures taken, for their relief. During the onslaught of the disaster, what is of utmost importance is to keep the morale of the people high, to create self-confidence in them, to prevent panic and to maintain order by assuring and making available the necessary help readily and quickly. The media can help, in many ways in ensuring these conditions. The rescue, relief and rehabilitation measures need an integrated and co-coordinated approach and for that purpose all agencies, government and non-government, have to pool their resources together for efficient, expedient and effective work on all fronts. The collection of material resources and the enlisting of man-power are as much important as their efficient utilization. The depiction of devastation and of human misery through the media many times by itself acts as an appeal to the people to come forward to render help in various ways. In addition, the specific appeal made for relief through the columns and the time-slots of the media, brings in sizeable aid in the requisite form. At the same time, it becomes necessary to keep a watch and report on some anti-social elements who try to take advantage of such situations.

Technology grows and changes rapidly. Tools that did not exist even five years ago are now primary modes of communication for millions of individuals. Tools like YouTube, Face book, Twitter and others were not created for the purpose of preparing for, responding to, or recovering from emergencies and disasters. But these tools can be effectively used for enhancing the ability to communicate with the individuals, families and communities during the times of the disasters. Social media is extremely valuable communication tool to increase public safety during disaster conditions.

New Media implications in Natural Disaster Management

Social Media refers to the applications that are either completely based on user generated content or in which user generated content and the actions of users play a substantial role in increasing the value of the application or service (Kaplan and Haenlein 2010). The term "social media" refers to Internet-based applications that enable people to communicate and share resources and information. Some examples of social media include blogs, discussion forums, chat rooms, wikis, YouTube Channels, LinkedIn, Face book, and Twitter. Social media can be accessed by computer, smart and cellular phones, and mobile phone text messaging (SMS). In contrast to the Print and electronic media forms these communication formats have been recognized as "New Media". The use of these new media is an evolving phenomenon. The past decade has witnessed rapid changes in communication systems as a result of new technologies that have enabled people to interact and share information through media that were non-existent or widely unavailable before. The use of social media has given rise to the phenomenon of "participatory culture" where in people are forming virtual communities and generating, disseminating, sharing information without any hindrances and barriers. Various sorts of New Media applications ranging from instant messaging to social networking sites offer an instrument for the audience to interact connect and communicate with each other and their mutual friends (Pine 2007). These applications are intended to generate, initiate and circulate new and emerging sources of online information about audience's experiences of using products, brands, services and/or issues by allowing them to "post", "tag" "digg" or "blog", and so forth on the Internet (Senior and Copley 2008). Recent trends in the use of New Media underline the fact that there is not only an increasing number of people opting for the use of these applications, but there is also a significant increase in the number of these applications (Dennis and Valacich 1999).

Packaging of disaster information in various modes of communication such as personalized devices such as mobile, telephone, email etc. mass media newspaper, radio, television and community media loudspeaker, hooter, alarm etc. is necessary to ensure that desired objective is met. But the communication systems are as effective as the quality of content they carry with them and most importantly the characteristics of the medium play an important role in dissemination of information during specialised or unexpected situations like disasters. Within the last five years new media have played an increasing role in emergencies and disasters. The potential of New Media applications such as Face Book, Twitter, Flicker and YouTube in disaster manage-

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ment process through their application by organizations in the countries like USA, UK and Israel is evident by various studies (Paton and Johnston 2001; Rodriguez 1997; Seydlith et al. 1990). Face book supports numerous emergency-related organizations, including Information Systems for Crisis Response and Management (ISCRAM), and The Humanitarian Free and Open Source Software (FOSS) Project. Moreover, numerous emergency and disaster-related organizations, including universities, the private and non profit sectors, and state and local governments use Face book to disseminate information, communicate with each other, and coordinate activities such as emergency planning and exercises (Connie White et al).The study commissioned by the American Red Cross in 2009 found that new media sites are the fourth most popular source to access emergency information. New media are also commonly used by individuals and communities to warn others of unsafe areas or situations, inform friends and family that someone is safe, and raise funds for disaster relief. A deliberate and intensive use of new media in situations such as the Haiti earth quake, Gulf of Mexico Oil Spill, Mumbai Terrorist attacks and Swine flu pandemic has set in a serious debate and necessity to use these new innovative media tools for disaster communication and for Disaster risk mitigation. Across the world authorities are realizing how valuable new media can be to help them quickly get information out to the public, to collect information on the extent of a disaster and help prioritize relief efforts.

The Importance of New media in Emergency

The use of new media for emergencies and disasters on an organizational level may be conceived of as two broad categories. First, new media can be used somewhat passively to disseminate information and receive user feedback via incoming messages, wall posts, and polls. A second approach involves the systematic use of new media as an emergency management tool like using the medium to conduct emergency communications and issue warnings, using new media to receive victim requests for assistance, monitoring user activities and postings to establish situational awareness and using uploaded images to create damage estimates, among others. Today, there is a growing awareness among Governments and various organizations for using new media tools in disaster management operations due to the following reasons.

• Public is an important participant in the emergency management community and that they must be engaged in the disaster management as part of the team. The notion of treating the public as a resource rather than a liability is at the heart of using new media in the emergency management framework.

• Communication in and around a disaster plays a critical and life-saving part. New media provides the tools needed to minimize the communication gap and participate effectively in an active, ongoing dialogue. New media helps to facilitate the vital two-way communication between emergency management agencies and the public, and it allows us to quickly and specifically share information with state and local governments as well as the public. Through the use of new media, we can disseminate important information to individuals and communities, while also receiving essential real-time updates from those with first-hand awareness.

• Most importantly, new media is imperative to emergency management because the public uses these communication tools regularly. Hence all disaster management organizations, committees and must adapt to the way the public communicates by leveraging the tools that people use on a daily basis.

• Two-way communication is necessary to send important disaster-related information to the people who need it, but also because it allows us to incorporate critical updates from the individuals who experience the on-the-ground reality of a disaster. The exigent nature of emergency management makes time a critical resource. The sooner we are able to comprehend the full scope of the disaster, the better able we are to support our citizens and first responders. Hence the non-sensitive disaster-related information like evacuation routes and shelter locations available and accessible to the public. Hence New media can play a very vital role in the two way communication process. New media increases the public's ability to communicate with the government. While current emergency communication systems have largely been centralized via one-way communication i.e. from the agency or organizations to individuals and communities, new media could potentially alter emergency communication because information can flow in multiple directions One benefit of two-way communication is helping officials compile lists of the dead and injured, and contact information of victims' friends and family members

Case study of the Federal Emergency Management Agency (FEMA)

Federal Emergency Management Agency (FEMA) a disaster management and mitigation organization of United States of America uses the following new media tools in its operations.

•FEMA utilizes the resources of several non-governmental new media channels - such as YouTube, Face book and Twitter - as tools to communicate with the public. On FEMA's Face book page, more than 33,000 followers can receive updates on current situations and get preparedness tips through text, photos and videos.

• On FEMA's YouTube page, users can watch videos detailing FEMA's response and recovery efforts, along with clips on topics such as how to prepare a disaster kit, what to do and where to go in an emergency, and how to apply for disaster assistance. The same videos are available on www.fema.gov, the official website.

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• FEMA's Twitter account offers brief updates to those looking for disaster preparedness or situational updates, including tweets in Spanish. FEMA also uses sixteen different Twitter accounts.

• Twitter users can also follow topics of conversation that are of interest to them by following a "hashtag," which is the name given to a common topic of conversation on Twitter. The New media in Emergency Management hashtag (#smem), allows all members of the emergency management community to connect and talk, including emergency managers at the federal, state and local levels, technology volunteers, private sector entities and interested individuals.

• In order to facilitate further discussion, FEMA created the #imprepared and #kidsfiresafetyhashtags, and in partnership with the American Red Cross, created the #howihelphashtag. The #impreparedhashtag is used to encourage individuals and families to get prepared; the #kidsfiresafetyhashtag is used to encourage parents to practice fire safety tips; and the #howihelphashtag is used to encourage people to talk about how they help their neighbours and communities.

• FEMA signed an agreement with Google Books to make FEMA publications available in a free, online format. Many FEMA publications are also be available through Google Books to e-readers, allowing the public to read FEMA publications in a portable format.

• In December 2010, FEMA also created a blog (blog.fema.gov), which provides information before, during and after a disaster strikes, and highlights the best practices, innovative ideas and insights that are being used across the emergency management community.

• In 2010, FEMA launched its first-ever mobile website, which allows the public to view easy to load web pages directly on their smart phones. The mobile site features information on what to do before, during and after a disaster, along with the ability to apply for federal disaster assistance directly from your phone. The mobile website initiative was taken up after the responses to the Georgia and Tennessee floods in 2009 and 2010 in which the disaster survivors often have little with them but their phones which were used to communicate. As a result, providing the ability to register for assistance from smart phones enabled the citizens to immediately mobilize the appropriate assistance and support services needed during disasters.

• In May 2011, the Federal Communications Commission (FCC) announced the implementation of a Personal Localized Alerting Network known as "PLAN," (technically the Commercial Mobile Alert System, or CMAS). The FCC is expanding the emergency alert system notifications currently sent over TV and radio to include mobile phones. The government will target the alerts in the form of text-like messages to the cell phones of people who need or have requested to be notified in the event of an emergency

Cell phones are data centres, capable of quickly accessing and storing a large amount of information. Cell phones are continually gaining new capabilities, providing internet access, the latest weather, and access to our favourite social networking sites. For these reasons, cell phones are a lifeline during and after an emergency. One of the major observations from the January 2010 earthquake in Haiti was that even if the physi-

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cal infrastructure of an area is completely destroyed, the cellular infrastructure may be able to bounce back quickly, allowing emergency managers to relay important disaster-related information and enabling the public to request help from local first responders. The fact that individuals are likely to have their cell phones with them in a disaster environment makes it highly relevant communication tool for coping with disasters. Hence the Governments Disaster Management Groups should create mobile versions of their websites that are easy to navigate from smart phones, allowing the public to receive localized information during a disaster. In particular, the text messaging was a key communication method adopted by survivors for sending information about their locations, which will be very helpful for search and rescue operations. Government must engage with the public via social networking sites. For example, in the aftermath of the 2009 flooding in Tennessee, USA, the Tennessee Emergency Management Agency (TEMA) and FEMA set up a joint Face book page that we used as a resource to provide the public with the latest information about ongoing disaster response and recovery efforts in Tennessee.

However the really interesting developments in disaster management are happening outside of government. Software engineers and disaster management specialists have spent the last few years developing better tools for addressing crisis situations - often without any support from the authorities responsible for managing emergencies. Two of these platforms are Ushahidi and Sahana. Both of these platforms are open source, free-to-use web-based platforms designed to be highly resilient during disaster situations and flexible to the needs of both developing and developed nations. Ushahidi, developed to report on violence during the 2008 Kenya election, has been deployed more than 20 times around the world to address situations such as violence in Gaza, the impact of the Gulf of Mexico Oil spills, Chile and Haiti's emergency responses to their respective earthquake, track crime levels in Atlanta, medical supply levels in pharmacies across Kenya, Uganda, Malawi and Zambia and track the swine flu pandemic. The system allows reports by mobile phone SMS and MMS and via the internet to be aggregated into a real-time map, and then used to identify priority areas for relief efforts or activities. While the system can be deployed simply for reporting by authorities, it has proven to be strongest where citizens have been able to report incidents directly, allowing emergency authorities to respond with a more complete picture of events. Ushahidi is entirely free to reuse and can be deployed within a few hours. The group behind the service is currently working on a second service, Swift River, designed to help manage the flood of online information about a disaster in the first few hours and help both emergency services and the public distinguish between rumor and fact.

Sahana is another free open source system developed to assist in disaster management. It is a web based collaboration tool, it is designed to help manage common coordination problems, such as locating missing persons, managing volunteers and aid and coordinating efforts between a variety of aid groups, government and those impacted by the disaster. It was originally developed in 2004 by Sri Lankan developers to support the response to the December 2004 Indian Ocean Tsunami and was deployed by the Sri Lanka government to support disaster recovery efforts. A second phase, funded through Sweden, saw Sahana expanded into a more generic disaster management tool with global application. Sahana was designed to cope with many of the infrastructure issues that frequently occur during disasters, such as intermittent power, loss of network connectivity and the need to deploy the service on low-end hardware and systems. In fact Sahana can be transported on and operated from a USB stick and is extremely flexible and easy to customise, reflecting the need to adapt quickly to the individual nature of every disaster. Sahana is in use for the Pakistan floods at the moment and it was also used for the Haiti earthquake. It has also been used in the Phillipines, the US, Peru, China, Indonesia and Pakistan for a range of disaster management needs.

There are other open source tools available for disaster management purposes. It is also possible to rapidly build a custom system for a specific need using free and low cost tools such as Word press (for content management), Google Maps (for geospatial representations), YouTube (for video), Flickr (for images), Slide share and Scribd (for presentations and documents), Twitter (for real-time updates), Widget Box (for embeddable widgets), Facebook (for group coordination), Wufoo (for forms) and services such as Yahoo Pipes to integrate and process information and news feeds. In most cases the time required to put together these types of custom systems is significantly less than that required to have systems developed within high-end content management systems - as are normally deployed for normal business needs by government agencies. In most cases

these third party services are also cheaper, more scalable and have greater network resilience and peak usage capability - reflecting their need to cater for millions of simultaneous users, more than most government sites are engineered to handle.

Today's challenge for governments is to use new media and online tools to improve their own disaster management capability, organize the flood of information and provide better outcomes - deploying disaster management systems or throwing together custom solutions in a matter of hours rather than months. While there may be some potential advantages to using new media for emergencies and disasters, there may also be some potential policy issues and drawbacks associated with its use.

Instances of inaccurate and false information may be an inherent problem, given the nature of new media platforms and the number of people disseminating information. Studies have found that outdated, inaccurate, or false information has been disseminated via new media forums during disasters (Tim Tinker and Elaine Vaughan). In the case of the March 2011 Japanese earthquake and tsunami, tweets for assistance were "re tweeted" after the victims had been rescued (Adam Acar and YuyaMurak). Information that is false, inaccurate, or outdated could complicate situational awareness of an incident and consequently hinder or slow response efforts. Inaccurate information could also jeopardize the safety of first responders and the community. If the federal government were to adopt new media as a tool for emergency and disaster response, it might also consider doing so within a comprehensive initiative that would include adopting methods and protocols that help officials interpret incoming information and help to eliminate or reduce misinformation. Another concern is that some individuals or organizations might intentionally provide inaccurate information to confuse, disrupt, or otherwise thwart response efforts. Malicious use of new media during an incident could range from mischievous pranks to acts of terrorism. New media could be used as a tool for such purposes by issuing calls for assistance to an area, or notifying officials of a false hazard or threat that requires a response.

Although new media may improve some aspects of emergency and disaster response, overreliance on the technology could be problematic under prolonged power outages. Thus emergency managers and officials might consider alternative or backup options during extended power outages, or other occurrences that could prevent the use of new media. Another major problem is the number of personnel required to monitor multiple new media sources, verify the accuracy of incoming information, and respond to and redirect incoming messages is also uncertain. In addition, the Government and organizations may experience a large volume of incoming messages from the public during a disaster. Responding to each message in a timely manner could be time consuming and might require an increase in the number of employees responding to incoming messages. Privacy concerns exist about the potential for the collection, retention, and data mining of personal information with respect to its use of new media for disaster recovery purposes. Specifically, the use of status alerts and the creation of personal pages to establish situational awareness may raise privacy concerns (Keim ME, Noji E).

Conclusion:

New media appear to be making inroads into emergency management for a variety of reasons. For one, accurate, reliable, and timely information is vital for public safety before, during, and after an incident. As people continue to embrace new technologies, use of new media will likely increase. Moreover, as its popularity grows, a significant number of people will likely choose new media as their main source of information. They may also increasingly expect that agencies will also use new media to meet their informational needs. Many emergency managers and agencies have already adopted the use of new media to meet this expectation. However, they also started using new media because they believe it provides another tool to disseminate important public safety information. In addition, beyond informational purposes, the use of new media not only allows people to interact and communicate in ways that are not possible through other media, but in some cases it has allowed response organizations and victims to interact and communicate with each other when traditional media were unavailable. Some would say that new media can be used to improve emergency management capabilities and that the promise of such positive results merit further use of new media for emergencies and disasters. It could be argued that the positive results of new media witnessed thus far have been largely anecdotal and that the use of new media is becoming imperative for the Government as well as disaster management authorities.

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