

Sung, Sz Jie

Conference Paper

How can we use mobile apps for disaster communications in Taiwan: Problems and possible practice

8th Asia-Pacific Regional Conference of the International Telecommunications Society (ITS): "Convergence in the Digital Age", Taipei, Taiwan, 26th-28th June, 2011

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Sung, Sz Jie (2011) : How can we use mobile apps for disaster communications in Taiwan: Problems and possible practice, 8th Asia-Pacific Regional Conference of the International Telecommunications Society (ITS): "Convergence in the Digital Age", Taipei, Taiwan, 26th-28th June, 2011, International Telecommunications Society (ITS), Calgary

This Version is available at:

<http://hdl.handle.net/10419/52323>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

How can we use mobile apps for disaster communications in Taiwan

Problems and Possible Practice

Sz Jie Sung (Lilian)

lilianliebe@gmail.com

National Cheng Chi University, IMICS.

Abstract

The growth rate of global smart phone in 2010 is as high as 78.1%, showing that smart phone gradually becomes the mainstream in the mobile phone market. Smart phone has the function of installing applications, provides users with more diversified mobile value-added services and will change users' communication habits in the future. Mobile communication follows the development trend of 3G and WiMAX, make users can link with mobile software stores through internet, downloading all kinds of applications, which has provided human beings with more diversified information, and gradually changed people's living habits. With the widespread of smart phone in Taiwan and many mobile applications start to go popular in market, people are crazy about downloading mobile applications, and different applications create different types of communications.

Within a trend of smart phone and massive mobile apps go popular in Taiwan, what can we do to apply these tools for disaster communications? And compare to other infrastructure-level support, is mobile app a feasible route for disaster communications? What is the possible uses and challenges.

Introduction

The growth rate of global smart phone in 2010 is as high as 78.1%, and smart phone gradually becomes the mainstream in the mobile phone market. The burden of reaching users for mobile applications has been greatly diminished by the emergence of some channels, such as the Apple App Store, Android Market, Nokia's Ovi and a host of other platforms. According to ABI Research (May 2010), over 300,000 mobile apps have been developed in three years, and the demand for download mobile apps is expected to peak in 2013. A *Distimo report* in 2010 also showed that the average download price of a mobile app is falling rapidly on all vendor app stores, except Android (Mobi thinking, 2011).

Asia had the highest percentage of the download share and North America had the highest share of the apps revenue which accounting for over 50% of the total revenue. In Taiwan, a smartphone with Wi-Fi technology allows users to get online in public

locations such as cafes, hotels and airports. And in the domestic mobile handset market this year, smartphone could with the launch of midrange and low-priced smartphone. In the end of 2010, smartphone account for nearly 20 percent of the seven million mobile phones sold in Taiwan each year and could grab up to 40 percent of the total market this year.

Mobile apps have been developed with different demands and create a new approach for interaction and communication. As we know SMS alert system is useful in some cases for delivering alerts in emergency and GPS related mobile apps help to locate ourselves and potential danger, and there are some applications are developed as pre-disaster warning devices (Souza & Kushchu, 2010; Shan, 2011). Portable SNS on the mobile makes disasters as events and becoming part of what Brent Plate has called a vast “*apocalypse machine*”(Crawford, 2010). Moreover, these applications can be developed as personal-security tool to protect individuals from risks, payment-systems which speed up the disbursement in emergency situations, and health data applications (Souza & Kushchu, 2010).

Questions

Disaster communications has changed for people have more accesses to information and especially with the development of mobile internet, 3G broadband and WiMax, Many information about the disaster zone and images via mobile in a form of SMS message, photos and videos to publics and mass media (Chang, 2007; Ling and Donner, 2009), and everyone can be an “*information volunteers*”¹ for updating and sharing the demands and information about disaster to public. Mobile apps are flexible tools or platforms to provide some simple information and services or interaction with mobility. When a disaster comes, information on the go and direct links to others are important, there are some disaster apps in the market, and this paper is try to think about the possible usages and whether it is a feasible route or not. In other words, not only digging out how can we use mobile apps for disaster communications? But think that in Taiwan, what are the potential problems or advantages behind developing disaster mobile apps in Taiwan?

Mobile apps here we mentioned are mainly focus on the apps on the personal mobile devices and cell phones, some national or regional wireless disaster sensor or

¹ In 1995 Kobe earthquake, there was some people carrying their portable computers, voluntarily came into disaster zone. They visited shelters, collected messages about survivors and sent out the specifics about needs. Also they obtained regional data about food, water, and hot bath opportunities, and put it on a regional map. They even offered information about jobs, schooling, and housing (Noam & Sato, 1996).

management systems or infrastructures are not included. Even these mobile technologies do make disaster management in a more efficient and controllable mode.

Mobile apps

With the advent of the mobile phone, the term “*app*” has become popular parlance for software applications designed to run on mobile phone operating systems (Purcell et al., 2010). Nowadays, cell phone has evolved as a “*Swiss army knife*” of media devices (Shim et al., 2007). With more and more people use Smartphone, mobile apps are not foreign to people. Unlike normal cell phones, Smartphone allow individual user to install, configure and run applications they like. Most standard cell-phone software offers only limited choices for re-configuration, forcing users to adapt to the way it set up, but Smartphone make their users conform the device in their particular way for doing things. The availability and diversification of cell phone functionalities, from Internet access, media player, text messaging, camera, video, games, email, and TV, are fueling users’ demands.

Mobile apps have been around since the late nineties and the apps stores have been available for a quite time as well. In fact, there is no a widely shared definition and usually the term “*mobile apps*” has been used for any software application which is designed to run on mobile phone operating systems. It can be roughly defined as end-user software applications or services that are designed for a cell phone operating system and extend the cell phone’s capabilities by enabling users to perform particular tasks (Sharma, 2010). John Blossom, CEO at Shore Communication, Inc. and the author of the book “*Content Nation*” said that it is easy to think that any content that runs on a mobile phone from ringtones to TV shows to browser-based apps, is part of the app market. But he also gave a narrower definition: “*the apps market as the universe of content and functionality made available via online marketplaces for use on specific platforms or for cross-platform use via open-standard technologies*” (Miller, 2010).

Mobile apps are being driven by mobile service providers seeking new value-add services to take advantage of 3G systems and other wireless data infrastructures. Location aware mobile computing, SMS message, social networking software, instant messaging software, and digital broadcasting are common basic applications. When a variety of mobile apps are flooding into market, the mobility and user-centered design have made mobile apps as tools to reach people. With a plethora of applications and usages constantly changing, there are increasing expectations of communication and entertainment functionalities. Also the flat free pricing of apps attracted users to

upgrade and try out new applications. Mobile apps are products and add-value service for users' multi-demands. It creates more links between users and industries; consumers and companies; employee and their organizations and individual users.

According to the Garner research which identifies the top 10 Consumer Mobile Applications for 2012, the top three it lists are Money Transfer by SMS, Location-Based Services and Mobile Search. In the three the location-based service with its ability to meet a range of needs, ranging from productivity and goal fulfillment to social networking and entertainment generate high user value. And mobile search is not only drive sales and marketing opportunities on the mobile phone, and make people have habit to "search on the go" and for keeping consumer's loyalty for the search service. The user experience of mobile search should be improved for persuading people keep using the search service.

Disaster communications

According to the definition of Susan Bulgawicz and Charles Nolan, a disaster is "*An event whose timing is unexpected and whose consequences are seriously destructive or simply an unfortunate event.*" Normally, there are four distinct phases of disaster management which is namely, mitigation, preparedness, response and recovery (Yodmani & Hollister, 2001). In the four stages, with different purposes and between different agents, communication strategies and principles may differ. Basically, during a disaster time, information sharing, collaboration and coordination are very important for the response and recovery stages.

When discussing about disaster communications, both Communication Studies and Emergency Management scholars are aware of and demonstrate interests in some facets. For instance, technologies promise to facilitate discussion about mitigation efforts, identification of potential hazards, connectivity between response organizations of all types, warning messages to the public, and diffusion of important disaster information (Fischer, 1998). After the 911 attacks and Hurricane Katrina U.S., many researches and reports related to disaster communications and disaster managements sprang in the U.S. (Zeilzer & Allan, 2003; Kitch & Hume, 2008; Haddow & Haddow, 2009). Literatures and researches are often refer to the role of mass media during disaster and the media reportages of disaster, also the communication plans about disaster managements.

Especially Haddow & Haddow (2009) in their book "*Disaster Communication in a Changing Media World*" try to build a framework about how does disaster management personnel interact with media, and linked media to a public information delivering part.

In the framework, it show that communications are necessary for assessing damage and need; collecting information on supplies and other resources; coordinating rescue and relief activities; accounting for missing people; and motivating public, political, and institutional responses (Yodmani & Hollister, 2001).

The disaster communications have changed from a conventional thinking "*command and control*" type to a highly decentralized and perhaps multi-node network (Noam & Sato, 1996), effective communication links between emergency operation centers, broadcasting systems, front-line responders and affected communities are critical in the aftermath of a disaster. Information and communication technology (ICT) has expanded the reach of disaster sociology and brings new challenges to the empirical study about disasters (Palen et al., 2007).

After the September 11 attacks in 2001, Asian tsunami disaster in 2004, and Sichuan earthquake in 2008, there has been a burst of online activities from netizens across the world, not only have more people turned to the net to receive the most updated news, but the Internet has also played a large role in coordinating logistical efforts, raising funds, expressing views and locating missing people. In Taiwan, the Morakot Typhoon in 2009 showed the online social networking can be influential in disaster communications. During the disaster, web users began reporting the real-time situation on the forum PTT, one of the most popular internet social networks in Taiwan, and a group of internet users from the Association of Digital Culture Taiwan established an unofficial Morakot Online Disaster Report Center for coordinating information. During the disaster, these social networking sites help a lot to instantly update information, even earlier than government and mass media.

Feedbacks, sharing and active search behavior have become influential for disaster management. New genres of websites seemed to be developed for people to search more disaster information such as some sites providing information on missing persons. The Google Crisis Response team uses its strength to offer tools or content to assess the severity and scope of a disaster. The tools including *Google Person Finder* which connects those seeking information about loved ones, and *Google Resource Finder*, which helps locate medical facilities and other emergency services. Google also provide high-resolution satellite imagery to crisis responders and monetary donations to non-profit organizations that provide relief services. When mobile also had become a device for surfing internet and the SNS software are built in as an app on Smartphone, it has more functioned as a convergent service for multi-usages, mobile apps has become tools for deliver an alert or other notifications.

Mobile apps and disaster communications

Before probing the possible use of mobile apps on the cell phone toward disaster communications and disaster managements, I would try to find out some exist practices. Researches about mobile apps are limited and studies about mobile apps toward disaster communication are not many as well. Most of these researches I could find are case studies to a specific mobile software or service (such as Fajardo & Oppus, 2010).

But efforts to encourage creative approaches to emergency communications should be encouraged. The traditional or usual approach of disaster communications are operating in a top-down manner and share information with “*civilians*” only on a “*need-to-know*” basis, but as a lesson learned from Kobe disaster in Japan, Noam and Sato thought we should set up an open-access emergency system (Noam & Sato, 1996). The open-access emergency system may open to inputs from a wide variety of public and private participants and offer open accesses to that information. Not only would such that kind of system can be more efficient as a tool of information and organization, but it would also be more resilient to the shocks of disaster. Mobile apps could be mobile tools for information sharing, and that ability may contribute more to facilitate the flow of important information.

In the recent Japan earthquake, as we have known mobile apps can be used for deliver alert, but it is not the ultimate use for these apps. In fact, there are many other kinds of practices that mobile apps can do for disaster communications.

The Possible Usages of mobile apps in disaster time

After Tōhoku earthquake and tsunami (Great Eastern Japan Earthquake) this year (2011) which later trigger crisis about nuclear pollution for the fire of reactors, some disaster-informed apps have moved to the top of the most downloading lists of mobile app and catalyze some related discussions in Taiwan, such as create mobile alert systems through cloud computing. Disaster mobile apps are not really new to the market, and it is the moment to think about its possible use.

What can mobile apps could do? Mobile apps can be applied for information, entertainment, social interaction, transaction. In daily life, mobile apps can help people find information they need and accomplish tasks (such as maps and navigation, weather, news, banking). As it has gradually become normal tools or service for some people, during disaster mobile apps can be applied in more ways and to different demands.

In recent practice, when a disaster is coming, the alert apps can be sent through a cell broadcasting system or mobile internet connectivity to every subscriber and grasp more valuable time for response. As soon as a disaster just happened, the dazed survivors, together with their families and public safety agencies, immediately have demands to gain more information about what's going on? How could help be organized? What was the fate of their loved ones? Obviously, the demand of constant communication is directly related to safety status reporting among people in emergency, their parents and friends.

But during a disaster emergency, communication traffic to the disaster-stricken area increases and is difficult to get through as well. When the phone lines were overwhelmed by people's panic for making sure of others' safety, mobile social network apps can help to keep the lines available for emergency crews, and help people to post and acquire important information. Location apps and maps on the cell phone can help users understand the geographical information about disasters inflicted area and the rescue situations. And other Interactive apps or mobile services, the mobile version of web news, and updated news of some charity or rescue organizations also could be references and information hubs for people to follow up the sequelae of the disaster, real demands of disaster-stricken areas and relief process.

Discussion

When the disaster is coming, the warning alerts for some potential or ongoing threats may be important. In spite of some social networking apps as message boards to convey information, apps for receiving news updating, and watch breaking news are make people get aware of the situation as well. In the 2004 Indian Ocean tsunami, as well as the earthquake in Haiti last year, the use of mobile for public alert and notification is often discussed.

Alert notification

During the early post-disaster phases, there are calls to immediately establish mobile text messaging (SMS) capacity to send out warnings and updates about disaster to the public (Sponberg, 2010). In the Tōhoku earthquake and tsunami this March, that mobile alert notification has been recognized by news media that it does help people to get awareness in time and respond to the disaster in a more caution manner. In fact, Earthquake Early Warning systems (EEW) in Japan :Three major mobile phone carriers in Japan, *NTT docomo*, *au* (KDDI and Okinawa Cellular) and *SoftBank Mobile*, have developed the simultaneous broadcast systems to receive EEW and provided phones with this service since 2007.

For 3G cellular phones that were put on the market in Japan after 2007 to receive EEW service by mandatory.² These kind of alert notifications in fact are not brand new service and some other countries also have this kind of service, the point is that through mobile broadcasting (cell broadcasting) to sent alerts to influenced population. The National Communications Commission (NCC) in Taiwan is also considering sending earthquake warnings via text message — as an instantaneous alert and plan to be implemented within the next six months (Chinapost, 2011), after the Japan earthquake . In fact, the SMS alerts is not only used as a forecast for the coming disaster, it had been apply in the SARS crisis in Hong Kong as a direct communication tool between government and people for eliminating rumorms(Souza & Kushchu, 2010).

In spite of SMS alerts, other apps such as an iphone apps- *Yurekuru Call* in Japan, distributes on App Store for free receives EEW and publish notifications to users when an earthquake happens. The number of downloads has increase quickly after the March 11 earthquake. Also many graphic applications like medic reference, navigation, and medical transportation has become top rank download applications. In spite of gaining awareness about the coming emergency, some mobile apps alerts can be used for detecting some dangerous materials such as the toxic leaks when confronting the radiological threats.

Locationing sensing and harzard maps

Broadcasting the present location and provide the graphic harzard maps can make user have more awareness to the geographical information about the ongoing disaster and the potential threats in some adjacent areas. There are some mobile location apps in the market for social or safety demands. When disaster comes, the location records may be as a valuable information for rescue work, and your family and friends can directly know that where you may be at that dangerous moment, and is your location near the stricken area?For instance, recently in Taiwan, there is a new mobile phone application which named “*Mobile Savior*” has been developed, the apps is designed any individual trapped under a building, through transmit longitude and latitude information to the emergency services and the phone screen can turn into a flashlight.

² But overseas manufacturers (Nokia, Apple, HTC, LG, Samsung, etc.) are not forced to support the service in Japan.

Also, the functions of a hazard map are to know the phenomenon and to make it known to residents (Toshiaki & Awadh Kishor ,2002). Some mobile mapping apps can combine with hazard maps, not only keep updating the present ongoing situations of disaster but presenting potential dangers according some professional estimation.

Disaster message boards

If there is a disaster, the phone lines will quickly in jam. Mobile phone users in Japan can publish messages concerning their safety. People can check the mobile phone company's disaster message board to see whether your relative has registered a message. All things you need for the check is the mobile phone number of a relative who is in the affected areas.

Therefore, Japan's major phone providers (NTT, Vodafone, Docomo, and Au) have each established disaster message boards to be used in the time of an emergency. However, because the message boards are hosted online, a direct link to the actual disaster-hit area is not necessary. The boards can be accessed via roundabout channels within the larger telecommunications network, making it relatively easy for people to stay in touch.

Follow-up apps

Follow-up apps here I mentioned is about the some apps which could be used in the recovery stage of disaster, and it is longer period. These apps such as apps for donation, for news updating of disaster area or of some specific charity groups, can help people to know more and give help in the recovery of disaster.

There are some apps are used for donation or received update the information about the follow-up of recovery. Some industries, especially telecom operators often use mobile apps to keep the relations with their clients, mobile apps sometimes are channels and tools for PR and value-add service. After a disaster, these mobile apps can be design as games or some interactive activities for donations base on the rationale of Company Social Responsibilities. Through the app people were also able to donate money instantly.

Also, for some charity groups and rescue groups, the mobile apps can function as the micro-blogging or SNS and post the updated information to subscribers who care about the recovery after disasters. During the Haiti earthquake in 2010, the American Red Cross created an app to share real-time news and recovery update news.

Educational apps

Mobile apps are often in a form of entertainment. When it applies to education, with the intentional placement of educational content in the messages, may have more positive feed back. The kind of entertainment-education is not a theory of communication, but rather a strategy used to disseminate ideas to bring about behavioral and social change. Educational apps are just function as a strategy to make users be active to acquire some knowledge through interactive games, videos, or other material. Applying mobile apps to disaster education is also a strategy, to search a channel to be more close to people and make them get important messages in a directly reach.

When a disaster comes, alert system itself in fact is not sufficient to make people have timely reactions toward the emergency situation they confer, especially when they have no idea about how to do and where to go for finding a shelter. The education about the response to disasters is important. There are many apps designed for education, and the effect is positive for young people who was born in the information explosion ages and get used to use these mobile devices.

Develop mobile apps for disaster education, promoting correct concepts about disaster preparations and response may be an approach which is worthy to think about. Even there are apps offer tips or videos about what to do while confronting disasters, such as *Escape in Nuclear Disaster*, use graphic instructions to educate people about what should do in nuclear disaster. But as far as I know, there is no concrete research, comments or complete evaluations about that kind of apps.

Possible Problems

Technical concerns

Most mobile networks are not designed to support mass public dissemination. The wireless connection and infrastructure are essential to make most mobile apps workable. Incorporate cloud computing skill, apps can be helpful in a situation where internet is still working despite no mobile connectivity. Mobile apps often work with an active internet connection, if the cloud goes down, so will the application.

When mobile SMS is proposed for public alerts and notifications, suggestions to ask local carriers to donate or subsidize messaging costs are often on the table. Mobile text messaging is cheap, easy to operate, and often very fast. Depending upon the users' subscription and sophistication of the infrastructure, it may even be possible to

geographically target recipients. But normal text messaging to large groups may spend hours. For disasters such as floods, storms, or tsunamis, such delays are unacceptable. Cell broadcast technology does provide a way to disseminate geographically targeted mass public alerts. Cell broadcasting is a more advanced technology than SMS text messaging, and it enables a government entity to securely transmit an emergency alert of natural or manmade disasters to cell phones in an affected area within minutes, regardless of the size of the area and regardless of the subscriber's carrier. The message through cell broadcasting has greater efficiency than a two-way call or a SMS text message, and without overloading the network.

After the earthquake in Japan this year, following Japan which has more well-down mobile alert mechanism, Taiwan government has also plan to develop a large-scale disaster management internet system, the Ministry of the Interior plan to offer total 10 billion NT dollars as a budget to develop Build construct a cloud platform for disaster prevention and management during 2012-2016. The platform is expected to coordinate information and enhance both the reaction efficiency of the central/local governments and the reporting mechanism. Through the platform people can instantly report the damage situation or call for help while central government and the local governments can obtain the real-time information as well.

In the part of the development mobile SMS forecasting alerts, the present system in Taiwan can send 2000 message per minutes by districts, and if try to reach to all area, it spend hours. In Japan, the alerts can be broadcasted to all districts receive the message in one minute. There are some technical problems need to be solved.

Taiwan promoted M-Taiwan project since 2005. The project mainly hope to use wireless and mobile communication technology, to build up and construct an omnipresent network environment, and hope to stimulate innovating the application service through market demands at the same time. The M-Taiwan program is working on creating several metropolitan broadband wireless networks for the provision of integrated mobile services. The omnipresent network environment can drive the development of the communication industry and Mobile Application service industry and these networks will serve for major launch and test for new technology development trials and application services.

Product feasibility

In the apps market, mobile apps can be developed to facilitate disaster communications or functioned as an approach for delivering content. Different from

other media, the emergence of mobile apps is expected to transform customer experience on a ubiquitous scale. As mobile apps are products which have easily been replaced by the new one, and whether it do influence people and the effect of the influence are also unknown questions. What can be speculated is that the downloading rates of apps may have relationship with the currently affairs and trends. But downloading rate doesn't show their feasibility. According to a study by Localytics found that many apps are downloaded, tried once and then discarded, one in four mobile apps once downloaded is never used again.

Some apps need to be support by strong data base, apps such as QuakeWatch and Mappity Quakes for iPhone, Earthquake Alert for Android all rely on data sources from the *United States Geological Survey* which put together a comprehensive website and list of tools over the years that is very good at reporting and describing earthquakes very quickly. The cost on the apps itself may not high, but the database or system would cost more. In other words, developing disaster apps may not the core problem, but how to make it useful is the key issue we need to consider. The principle of communication on mobile apps is different from the way on mass media and need to be researched for a long term evaluation to users' experience and habits. And in fact, there is no research for conducting evaluation of these disaster apps. There still have doubts about the feasibility and effectiveness of these apps.

The content

Different from normal websites and web apps, mobile apps are special for their mobility. The design of these apps, including the interface and content are user centered, some content even user generated. The content should be simple and easy to understand. Not just a link to some webpage which is filled with long paragraphs. And the information should be verified for precluding rumors, and if really try to make these apps as useful tools during disaster time or for disaster education, the correctness of information are important, and some need to keep updating. All in all, mobile apps could be a new kind of media, which give users more options but each with specific content.

Conclusion

Like a special combo for different personal demands, everyone have their own combo on their mobile phone. From the alert for the coming disaster in the pre-disaster phrase to the information sharing about following recovery, they could give disaster alert notifications with different types, graphic locations information and hazard maps. Or they can function as information boards about disaster, tools for self-protection,

SNS connection and updating follow-up information as well. More interesting is that many mobile apps also be apply to education, commerce, entertainment fields and can be generated by users for simple programming skills there are more innovate way to make use them for disaster education.

Mobile apps can be used in many ways for disaster communications, wireless connection is important for the pervasive use of mobile apps, the information need to be updated and verified. With the research about the effect and the feasibility for mobile apps has not been conducted, there may have more factors need to be consider about the real implementations.

Reference

- ABI research, (May 6, 2010). "Smartphone Downloads from Mobile App Stores to Peak in 2013" retrieved from:
<http://www.abiresearch.com/press/1651-Smartphone+Downloads+from+Mobile+App+Stores+to+Peak+in+2013>
- Australia Government Disaster Agency, "Experience of cellular phone use in emergency situations" - Report / Research, retrieved from
<http://www.egov4dev.org/mgovapplic.htm>
- Crawford, K. (2010). Apocalypse Media Now: Disaster, Death and Disease in Social Media. ACS Crossroad 2010. 17-21 June 2010.
- CNA news, (2011.03.22). "Taiwan Plans to Build Multi-purpose Call-for-Help Cloud Platform", retrieved from
http://www.cna.com.tw/ShowNews/WebNews_Detail.aspx?Type=FirstNews&ID=201103220023
- Du, Y. (2010). Mobile Communication in Emergency: Motivations, influencing factors and perceptions from college students, a MA thesis for Global Journalism, School of Humanities, Education and Social Sciences, Örebro University.
- Fischer, Henry W., III. 1998. "The Role of the New Information Technologies in Emergency Mitigation, Planning, Response and Recovery." *Disaster Prevention and Management* 7 (1): 28-37.
- Fajardo, J.T.B., Oppus, C.M. (2010). Implementation of an Android-Based Disaster Management System. *EHAC'10 Proceedings of the 9th WSEAS international conference on Electronics, hardware, wireless and optical communications*, 126-130.
- Gartner Inc.: "Gartner Identifies the Top 10 Consumer Mobile Applications for 2012", a news release from Gartner, retrieved from
<http://www.gartner.com/it/page.jsp?id=1230413>
- Localytics, (2011.01.31) "First Impressions Matter! 26% of Apps Downloaded in 2010 Were Used Just Once", retrieved from
<http://www.localytics.com/blog/2011/first-impressions-matter-26-percent-of-apps-downloaded-used-just-once/>
- Leadbeater, K. Disaster Message Boards. Retrieved from
http://niigatajet.net/Documents/Disaster_Message_Boards.pdf

- Mobi Thinking, (May 6, 2011). "Global mobile statistics 2011: all quality mobile marketing research, mobile Web stats, subscribers, ad revenue, usage, trends...", retrieved from <http://mobithinking.com/stats-corner/global-mobile-statistics-2011-all-quality-mobile-marketing-research-mobile-web-stats-su>
- Miller, Ron (2010). Apps: Exploring the Next Content Frontier. *EContent*, June, 18-22.
- Noam, E.M., Sato, H. (1996). Kobe's Lesson: Dial 711 for "Open" Emergency Communications *Science* 1 November: 739-740.
- Palen, L., Vieweg, S., Sutton, J., Liu, S., Hughes, A. (2007). Crisis Informatics: Studying Crisis in a Networked World. *Proceedings of the Third International Conference on E-Social Science*, Ann Arbor, MI, Oct 7-9, 2007.
- Simon, C. (2004) Experience of cellular phone use in emergency situations - Report / Research, retrieved from: <http://www.egov4dev.org/mgovapplic.htm>
- Souza, F. & Kushchu, I. (2005). Mobile Disaster Management System Applications - Current Overview And Future Potential –Proc. Of the First European Mobile Government Conference MGOV2005, Brighton, UK, 10-12 july, pp. 455-466. mGCI publications, UK.
- Shan, S. (2011.04.05). "FEATURE: Disaster prevention specialist highlights importance of early warning systems", *Taipei Times*, retrieved from: <http://www.taipeitimes.com/News/taiwan/archives/2011/04/05/2003499974>
- Shim J. P. (2007). Wireless Telecommunications Issues: Cell Phone TV, Wireless Networks in Disaster Management, Ubiquitous Computing, Adoption of Future Wireless Applications. *Communications of the Association for Information Systems*, 20, 442-456.
- Saltzman, M. (2011.03.20). Japan quake popularizes disaster apps. *USA Today*, retrieved from <http://www.usatoday.com/tech/news/2011-03-17-disaster-apps.htm>
- Sponberg, K. (2010. 04. 03). Issues Affecting the Use of Mobile SMS Alert and Notification Services Post Disaster, from <http://www.ranetproject.net/index.php?q=Use-of-SMS-Alert-and-Notification-Services-Post-Disaster>
- The Yomiuri Shimbun. (Mar. 25, 2011). "Social networking sites ease communication knots in disaster zones". Article is retrieved from <http://www.yomiuri.co.jp/dy/national/T110324004117.htm>
- Toshiaki, U. Awadh Kishor, S. (2002). Hazard Mapping and Vulnerability Assessment. Regional Workshop on Total Disaster Risk Management, 7-9 August 2002
- Tan, J. (Feb 21, 2011). "Mobile application market to boom, iSuppli forecasts", business, *Taipei Times*. <http://www.taipeitimes.com/News/biz/archives/2011/02/21/2003496389>
- Yodmani, S. Hollister, D. (2001). Disasters and Communication Technology: Perspectives from Asia. Paper Presented at the Second Tampere Conference on Disaster Communications, 28-30 May 2001.

Zhong, H.L. (2010-12-14). Smartphones Could Double Taiwan's Market Share in 2011: Industry, retrieved from <http://www.wantchinatimes.com/news-subclass-cnt.aspx?cid=1204&MainCatID=12&id=20101214000009>

Zheng, P., Ni, L. (2006). Introduction to Smart Phone and Mobile Computing. *Smart Phone and Next Generation Mobile Computing*, 1-21.

Other internet articles and apps examples:

“Japan Quake: The importance of mobile and data”

<http://www.popwuping.com/culture/technology/japan-quake-the-importance-mobile-and-da.php>

“Study: Mobile Entertainment, Education and Gaming Apps are Really Catching on with the Kids”. Article is retrieved from

<http://tommytoy.typepad.com/tommy-toy-pbt-consultin/2010/09/study-mobile-entertainment-education-and-gaming-apps-are-really-catching-on-with-the-kids.html>

“U.S. Geological Survey: Twitter Earthquake Detector (TED)”, September 2010.

<http://recovery.doi.gov/press/usgeological-survey-twitter-earthquake-detector-ted/>

Yurekuru Call: <https://market.android.com/details?id=jp.co.rcsc.yurekuru.android>

Goole crisis response(for the 2011 japan earthquake):

<http://www.google.com/crisisresponse/japanquake2011.html>

Google Person Finder(for the 2011 japan earthquake):

<http://japan.person-finder.appspot.com/?lang=en>

Disaster message broads (docomo) : <http://dengon.docomo.ne.jp/Einoticelist.cgi?es=0>

Escape in Nuclear Disaster:

<http://apps.su/program/32459/escape-in-nuclear-disaster.html>

Mobile savior: <https://market.android.com/details?id=aame.mobi.helper>