

Title	Social media usage during disasters and social capital : Twitter and the Great East Japan Earthquake
Sub Title	
Author	Kaigo, Muneo
Publisher	Institute for Media and Communications Research, Keio University
Publication year	2012
Jtitle	Keio communication review No.34 (2012. 3) ,p.19- 35
JaLC DOI	
Abstract	This paper investigates the role of social media during mid-level disruptions by natural disasters through examining the case of the city of Tsukuba in Ibaraki prefecture during the Great East Japan Earthquake of March 2011. Tsukuba city was relatively unharmed in comparison to much of the devastation of northeastern Japan, however damage was widespread as Tsukuba lost electricity and water immediately after the initial earthquake. Due to heavy congestion, communications became inaccessible for the first few hours after. Power outages did not allow usage of traditional media other than portable radios, and Internet access through personal computers were also unavailable. In this situation, web-enabled phones and smartphones became the primary devices for media access after the initial March 11, 2011 quake. The municipal government of Tsukuba had been experimenting the usage of Twitter for communicating with the citizens of Tsukuba prior to the earthquake, and this platform played a significant role in disseminating vital information during the disaster. This paper also investigates how social capital may have been prominently formed through this interaction with Twitter during the disaster in Tsukuba.
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AA00266091-20120300-0019

慶應義塾大学学術情報リポジトリ(KOARA)に掲載されているコンテンツの著作権は、それぞれの著作者、学会または出版社/発行者に帰属し、その権利は著作権法によって保護されています。引用にあたっては、著作権法を遵守してご利用ください。

The copyrights of content available on the KeiO Associated Repository of Academic resources (KOARA) belong to the respective authors, academic societies, or publishers/issuers, and these rights are protected by the Japanese Copyright Act. When quoting the content, please follow the Japanese copyright act.

Social Media Usage During Disasters and Social Capital: Twitter and the Great East Japan Earthquake

By Muneo KAIGO*

Abstract

This paper investigates the role of social media during mid-level disruptions by natural disasters through examining the case of the city of Tsukuba in Ibaraki prefecture during the Great East Japan Earthquake of March 2011. Tsukuba city was relatively unharmed in comparison to much of the devastation of northeastern Japan, however damage was widespread as Tsukuba lost electricity and water immediately after the initial earthquake. Due to heavy congestion, communications became inaccessible for the first few hours after. Power outages did not allow usage of traditional media other than portable radios, and Internet access through personal computers were also unavailable. In this situation, web-enabled phones and smartphones became the primary devices for media access after the initial March 11, 2011 quake. The municipal government of Tsukuba had been experimenting the usage of Twitter for communicating with the citizens of Tsukuba prior to the earthquake, and this platform played a significant role in disseminating vital information during the disaster. This paper also investigates how social capital may have been prominently formed through this interaction with Twitter during the disaster in Tsukuba.

Introduction: The Great East Japan Earthquake through a personal recount of the event in the context of media access in Tsukuba, Ibaraki

March 11, 2011 14:46

Ibaraki had been plagued with minor earthquakes prior to March 11 and with a major tremor on March 9, 2011, earthquakes were becoming another routine nuisance of everyday life. At 14:46, I had returned to our living quarters to pick up some documents, when I began to hear a hum and started feeling small shakes. The shakes kept on getting bigger, as if some turbo-like mechanism kicked in, and

* Associate Professor at the Faculty of Humanities and Social Sciences, University of Tsukuba

everything in the room began falling off the shelves. Things kept flying onto the floor. The lights went off, meaning we had a total power outage, so this was no ordinary earthquake. As everything that can possibly fall out of cupboards was already on the floor, large shakes continued and then stopped. I looked around our flat and quickly checked what was damaged and evacuated.

March 11, 2011 14:50

Many other people living in our vicinity evacuated their homes as well. They joined each other around the bench I was sitting on. Mothers were trying to contact children on their mobile phones, and wives were trying to contact husbands at work, however no one was able to get through. Due to everyone trying to contact everyone else at the same time, all mobile voice calls could not get through on any of the mobile carriers due to the congestion caused by the heavy traffic. I tried accessing the Internet, but was unsuccessful as everyone else was also having trouble getting through to any mobile Internet access. Even SMSs were congested at the moment right after the first quake because everyone was trying to contact everyone else at the same time.

We had been shut out from any media or information for about twenty minutes due to the power outage and congestion on the mobile phones, so I walked over to my car and decided to get some information by the radio and television. Twenty minutes after the first shake, I very quickly learned through television that this was a very severe, big earthquake, but none of the radio stations nor television stations knew exactly what was going on at that moment. All they were saying was that the epicenter of the first quake was very close to the one that we had two days ago on March 9, 2011, but much bigger.

March 11, 2011 15:20

A person living in our neighborhood sitting on the bench had brought along a portable radio. We started getting real-time reports of the earthquake and aftershocks that had been continuing. The radio announcer mentioned that the initial earthquake in our area had a seismic intensity scale of four, to which everyone listening in my vicinity immediately disagreed – which was later upgraded to a scale of six. We also started receiving warnings of tsunamis of over ten meters along the northeastern sea line. My wife and I started sending out SMSs to our families. The SMSs sent out at 15:24 were properly received, but with a time lag of over an hour as we later learned.

March 11, 2011 16:00 – 17:00

As the earth continued to shake every few minutes, I went back into our flat and confirmed that the electricity, gas and water were all unavailable. Water was coming out of some of the faucets in the nearby park and the public washroom was also functional. However, later that day, this small supply of water also came to an end. My wife and I took refuge in our car because it was equipped with a heater, along with a radio and TV. Tsukuba municipal government was providing shelter at a local elementary school, which was being announced by a loudspeaker on a car driving around the neighborhood. (Due to the lack of earthquake fortification of this magnitude, every time it shook, they were having the people inside evacuated outside of the school, meaning people had to leave the building every few minutes. We later learned that many citizens were also not able to hear what was being said on the loudspeaker due to the direction of the speaker and speed of the car moving around.)

March 11, 2011 18:00

Internet on my smartphone was now functional and as my computer had become unusable after the initial earthquake, my smartphone became my main communication device. As we watched television coverage or listened to the radio in my car and starting getting some of the visual coverage of horrifying destruction, I began sending out emails to test if our Internet connection was functional. After receiving messages back on email, I began sending out emails and text messages and starting posting my status on Facebook. I received many comments and messages, asking me how I was, telling me others were doing well too. Encouraged by the good 3G Internet connection, I tried to Skype Out to my mother who I had not been able to contact because the mobile voice lines were overloaded. Voice over IP worked without many flaws.

March 11, 2011 20:00

Mobile congestion was slowly getting better, but considering how public transportation was being disrupted in Tokyo, it still seemed difficult to get a voice line to anyone. My wife sent an SMS to me to experiment and see if the system was working, and I received it with a time lag of about ten minutes.

March 12, 2011 04:00

Electricity came back on around 4AM, and soon we were able to get information about other areas through television. As our cable seemed to

be functioning, I quickly scavenged the mess caused by the earthquake and reconnected our cable modem and WiFi and got back our Internet connection. Later that morning I accessed the Tsukuba city website, however, very little information was available. Fortunately, information continued coming out of the Twitter account of the Tsukuba municipal government and the local community FM radio station was also transmitting local emergency information. The water system was down, so information on where to receive emergency water was being announced through these channels along with cars with mounted speakers. Television and radio stations were still reporting about the destruction in the northeastern area of Japan, so very little relevant information was available on the major media outlets. Voice communications were still disrupted although anything via the Internet had now become functional.

In this recount of the Great East Japan Earthquake in the context of media access in Tsukuba, Ibaraki, one can observe how in the event of failure of lifelines due to a severe natural disaster, 1) voice communication through normal telephone lines becomes difficult, however, Internet access through mobile devices is relatively robust and resilient in comparison to normal telecommunication channels, therefore VoIP (Voice over IP), SMS and email are quicker solutions for communication and overcoming telecommunication breakdowns in disaster situations, 2) in contrast to websites that require editing with computers, social media is more effective in disseminating information on the Internet. For example, SNSs like Facebook are convenient for efficiently communicating with friends and family, and micro-blogs like Twitter can widely disseminate information in short text messages, 3) radio is effective because of the portability of the device required for receiving radio waves, in comparison to televisions which traditionally need an electricity outlet for it to function.

Twitter was a valuable communication channel in Tsukuba during the Great East Japan Earthquake, therefore this paper will further analyze in detail how Twitter functioned in this disaster. Prior to the analysis, I shall first examine relevant perspectives in relation to social media and subsequently social capital in relation to social media.

Social media

With the widespread diffusion of the Internet in Japan, many people now have the facilities to disseminate information very easily to a large population without requiring to pay any immediate monetary fees, simply by just posting information on a website or by using a social networking service. Information on the Internet is not edited like traditional media, so most information is not tightly controlled in Japan. Such information that is available may sometimes include false rumors, and

these may quickly turn into a problem if not quickly denied or negated. Due to this absence of tight control of information, a flood of irrelevant but new information is available daily on websites and social media. Furthermore, the source and credibility of information found on the Internet and social media are difficult to verify at first sight, especially if the information source is claiming to be someone or some organization falsely. Verifying the truth of these sources may be difficult or challenging, and these sources that are imposters, turn out to be often dangerous. Still, with all these dangers present, on the most part, a large variety of valuable information is available on the Internet and is very easily accessed, shared on social media such as social networking sites and mini-blogs. Such communication activities on social media can quickly popularize certain topics, and is convenient to use in certain instances.

Social media facilitates communication activities in ways that were not possible before. One example is the micro-blog Twitter and how followers of a certain account can continuously learn what each account holder is thinking in veritably real time, even if the follower has never met the person in real life. The social networking sites such as Facebook or the more popular Mixi among Japanese, allows one to manage one's personal connections much easier than before. Youtube allows for one to share digital videos with other people living far away through a network connection. These links are not all powerfully committed personal links, but rather weaker links (Resnick, 2001; Wellman et al., 2001) that allow for the existence of a connection without requiring a strong commitment among people using social media. If strong commitments exist among users regardless of social media, then such platforms can be utilized to mobilize people, as in the case of the 2010-2011 Arab Spring movements. In general however, just like websites, social media shortens distances between people efficiently and effectively connects people in modern society.

The pros and cons of Twitter

Among all the social media available, I will discuss in further detail about the problems and possibilities of Twitter use in Japan because the use of the platform in Japan may be allowing for new communication contexts that weren't present before. Twitter is beneficial in the following three general ways: Twitter 1) allows for people to easily create new personal networks and receive exposure to information that could not be available before this platform, 2) allows for a different channel for everyday online communication with acquaintances, and 3) allows for simpler information transmission on the Internet.

Aside from such sporadic incidents, following someone on Twitter allows for the follower to know what the account holder is thinking, and even though

these thoughts are being transmitted through a network, the follower feels these as being very real, and may constitute as the motivation for these followers to follow on Twitter. Following the Tweets of famous people, such as actors, artists or famous writers allows for ordinary Twitter users to see what such normally out-of-reach people are thinking at that moment indirectly (although sometimes directly communicate to ordinary citizens from time to time). Following a friend's friend on Twitter may start out as a virtual friendship, however, may evolve more easily into a real life friendship should there be an occasion to meet. In these ways, Twitter allows for people to create new personal networks and receive exposure to information that was not available to them before.

Communicating with people on Twitter that you interact with daily in real life can occur in Japan, as a more indirect method of interaction. For example, a phone call or email is direct one-to-one communication mode that requires a reply or a formation of synchronous communication whereas a Tweet is more indirect because it is directed from one-to-many. In other words, a Tweet is a message that may be intended for a certain person, however one-to-one communication is not being demanded. A Tweet does not require a reply, so interaction becomes in contrast, less obtrusive or informal. Communication is also effective and efficient, because communication is one-to-many. The follower of this type of a Tweet has the freedom to choose when and whether or not to respond, so there is less pressure in comparison to normal one-to-one interaction.

Opening a Twitter account and Tweeting are both simple and the current 140 character limit does not require for a lot of information to be transmitted in each. This actually is a benefit for it allows for account holders without much literary talent to express one's thoughts or ideas. Twitter is also friendly for the web-enabled mobile phone user (an optimized website for Japanese web-enabled mobile phones is available at <http://twtr.jp>), so account holders that do not have a lot of time, nor own a computer can still have access to Twitter.

In contrast to all the preceding possibilities of Twitter, some problems exist among Japanese Twitter users. A 1) dilution of personal relationships and 2) difficulty in verifying credibility of information are two problems that Twitter users face. As one is added as a follower to an account, two users are connected virtually. However, that may be all, in other words, the two users are only connected by a virtual link, and no other activity. Some text messages may be exchanged, but that may not contribute to a real relationship. For a solid relationship, communication and empathy is required. Such a diluted, weak network may give false images or may lead to various misinterpretations and problems.

Verifying the credibility of information is also a problem with Twitter. False rumors or false stories can be communicated very rapidly by Retweeting other Tweets without verification of the original information source. Retweets may be recreated, unaltered to followers, or be manually altered by adding RT in front of

the original Tweet. In either case, rumors or stories can spread at rapid pace, and may be dangerous if false or damaging.

Through reviewing the pros and cons of Twitter usage, one can observe various possibilities along with problems of this platform. Twitter can be used for beneficially supporting everyday life and communications, however can be hazardous in some other instances. As the Internet and social media usage is being quickly incorporated into the daily lives of Japanese, more time is spent on communication through these methods. Even with potential problems, the prevalent usage of social media such as Twitter allow for new forms of communication that are proving to be more beneficial than hazardous, in various ways. One aggregate benefit of social media can be the formation of social capital.

Social capital and social media

Along with cultural and economic capital, social capital with its human element is studied in the fields of politics, sociology, economics and management. As the Internet allows for greater civic participation, social capital is increasingly important (Putnam, 2000). In recent studies of social capital in relation to the network society, the majority of the results are claiming that the Internet encourages social connections and involvement rather than prior concerns of decrease of social involvement or social displacement (Valkenburg & Jochen, 2007). The case of social media is the same, as studies are indicating that social capital is greater among those that actively use SNSs (Ellison et al., 2011; Pfeil, Arjan, & Zaphiris, 2009; Steinfield, Ellison, & Lampe, 2008). Kobayashi and Ikeda (2005) have indicated that trust and reciprocity are the observed elements of social capital during ICT usage in Japan. Social capital is formed through the social contexts of trust, norms, and networks to make a more efficient society by promoting the resources that exist in the harmony among positive human relationships. The exchanges of ideas during times of difficulty build human relationships, and such are the communication activities that build social capital. Putnam (2000) has termed bridging and bonding to be the two ways of building social capital, however when viewing this idea in the perspective of communication activities of Twitter, these two separate types of social capital may both be present. The communication of bonding among close individuals may occur in Twitter, but the bridging of diverse individuals are equally possible with Twitter, so the intermix of the two types of building social capital need to be considered as well.

In the subsequent hours and days of the Great East Japan Earthquake, wider usage of electronic networks such as social media have been observed in areas of mid-level disruptions, accompanying greater interaction among individuals and the growth of a social support communication network. Information about lifelines

and support, that is always in great demand by disaster victims had been very difficult to transmit in previous earthquakes. In the Great East Japan Earthquake, social media may have been able to provide and supply information and knowledge to socially support many disaster victims.

Social support: Information sharing with Twitter as a backchannel during emergency situations

Among the various available social media in Japan, the diffusion of Twitter has been rapid, as the platform has good compatibility with web-enabled mobile phones and smartphones. Twitter is also easy to use. The 140 character limit is much more restrictive if using an alphabet based language, but the Japanese written language can condense a lot of information with this constraint, and actually promotes messages to be more simple and easy to understand.

Previous studies have indicated how social media can be a backchannel to communicate information that cannot be received through the traditional media (McCarthy & Boyd, 2005; Sutton et al., 2008). Twitter has been discussed as a possible platform for providing and sharing information during emergencies (Hughes & Palen, 2010; Mills et al., 2009). White (2010) has suggested how Twitter can effectively communicate the severity and range of a disaster, by linking documents and pictures and also being able to transmit location if using a mobile device. Information is posted almost real time, so logistic information can be retransmitted to rescue teams during crises.

During the Great East Japan earthquake, traditional media and websites could not provide information about lifeline disruption or other necessary information for the vast majority of victims in disrupted areas. The whole prefecture of Ibaraki had severe damage, however was almost completely ignored due to not having a local television station belonging to a network other than NHK and was not able to relay the destruction in the prefecture. The widespread destruction in Iwate, Miyagi and Fukushima also eclipsed most of the damage in Ibaraki. Therefore, the traditional media of television, radio and newspapers were highly ineffective in supporting the people living in Ibaraki prefecture in the early days of the disaster. In the city of Tsukuba, vital information was provided through the city of Tsukuba's Twitter account. The 2011 White Paper of Information and Communications in Japan concurs that Twitter played a major role in disseminating information during the disaster in many communities, as the number of followers and Tweets per day of 11 local government Twitter accounts affected by the disaster and 28 peripheral local government accounts each increased by tenfold after March 11, 2011. Many Twitter users also began following local newspaper and local radio and television stations in the disaster areas that had Twitter accounts.

Methodology

The aim of this study is to analyze the role of social media such as Twitter during natural disasters and examine the dynamics of social capital building through the interactions by usage. While the damage in Ibaraki Prefecture was relatively small in comparison to Miyagi, Iwate and Fukushima Prefectures, electricity, water supplies and transportation were all severely disrupted for an extended period of time. During the post-earthquake period from March 11 until March 17, the City of Tsukuba Information Systems Department continued to transmit information through their Twitter account, @tsukubais until normal computer systems were restored. In order to analyze the role of Twitter during this disaster in this area, I conducted a content analysis of all the Tweets during the seven days after the March 11 earthquake until March 17 to view the trends of Tweets and Retweets. I also conducted an interview on April 25, 2011 with the account holder of the Twitter account, @tsukubais.

Content Analysis of the Tweets and Retweets of the Twitter account @tsukubais

Frequency of Tweets and Retweets

Table 1 and Figure 1 indicate the frequency of Tweets and Retweets by the Tsukuba Information Systems Department (currently renamed the Information Policy Department) Twitter account.

As one can observe, the number of Tweets increase sharply after the earthquake and the frequency is continuously higher than the daily number of Tweets preceding the earthquake.

The result of term extraction and categorization

The total number of Tweets and Retweets after the earthquake on March 11, 2011 until restoration of the computers of Tsukuba City Information Systems on March 17, 2011 was 593. Through analysis by text analytics computer software, all terms that construct meaning were extracted from the Tweets and categories were built to measure frequency of common concepts in the Tweets. Table 2 indicates the frequency of terms that were relevant to the disaster and measures taken. (I have translated the Japanese terms into English equivalents.) Table 3 indicates the frequency of terms that are relevant to the function of the Twitter platform.

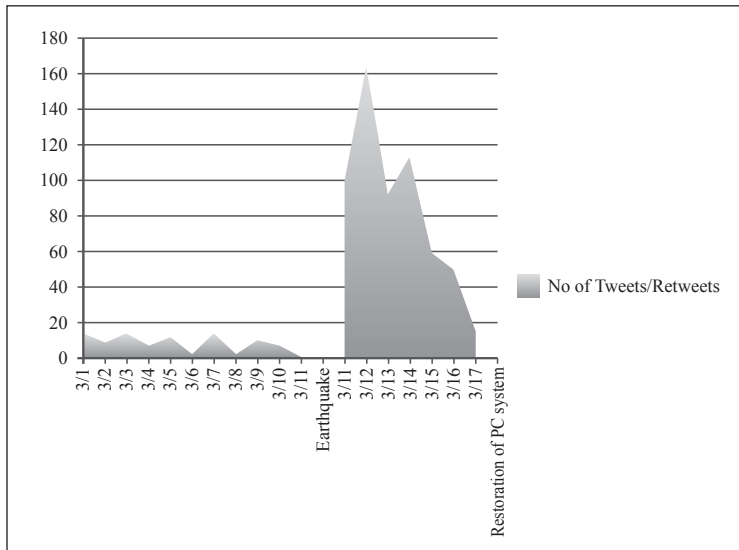


Figure 1: Number of Tweets and Retweets (March 1-March 17, 2011)

Table 1: Number of Tweets and Retweets by @tsukubais (March 1-March 17, 2011)

Month and Day	No of Tweets/Retweets
3/1	14
3/2	9
3/3	13
3/4	7
3/5	12
3/6	2
3/7	14
3/8	2
3/9	10
3/10	7
3/11	1
Time of Earthquake	
3/11	99
3/12	165
3/13	92
3/14	113
3/15	59
3/16	50
3/17	15
Time of Restoration of PC system	

Table 2: Frequency of terms relevant to the disaster and measures taken

High frequency terms in Tweets in relation to the disaster and measures	Count
Transportation (ie. tx, schedule, operation, bus)	137
Calling out to people (ie. please help, everyone)	118
Terms indicating time (ie, now, present situation)	102
Information on water (ie. water supply)	77
Information on electricity (ie. outages, schedule)	46
Expression of gratitude (ie. thank you)	44
Expression of cooperation	25
Tweets by a Tsukuba city council member	15

Table 3: Frequency of terms that are relevant to the function of the Twitter platform

High frequency terms in Tweets in relation to the functions of Twitter	Count
rt, Retweet (In response to Tweets)	247
Indication of smartphone software usage (ie. echofon)	94
Links to other websites	72

One can observe that terms related to transportation, water and electricity supplies were frequent, however, so were the terms related to calling out to people, expressions of gratitude and cooperation. The analysis results provide evidence that the Tsukuba City Twitter account holder was having interactivity and communication with its followers. The relatively high frequency of Tweets from smartphone software (echofon) indicates how Twitter was being used from a mobile device in this period.

Interview with Mr. S., the Tsukuba City Information System Department Twitter account manager at the time of the earthquake

For further examination of the actual interactions of this Twitter account, on April 25, 2011, I conducted an interview with the Tsukuba City Information System Department Twitter account manager Mr. S. at the time of the earthquake, approximately six weeks after the March 11, 2011 earthquake in Tsukuba City. The following is a summary of the content of the interview.

The Tsukuba City Information Systems Department (currently renamed the

Tsukuba City Information Policy Department) had been conducting an experiment to examine the effectiveness of using Twitter to communicate with its citizens from the latter half of 2010 through the account @tsukubais. In result, with the ongoing experimental period prior to the March 11, 2011 earthquake, @tsukubais had approximately 2000 followers before the earthquake hit Northeastern Japan. Immediately after the earthquake, Tsukuba City created a disaster countermeasures headquarters in city hall. The damage to the computer and communications infrastructure in the city hall building was extensive, so updating the Tsukuba city website had become impossible for several days. The Tsukuba City Information Systems Department decided to transmit any information that was being aggregated at the disaster countermeasures headquarters to the citizens via Twitter and also started collecting information from citizens through Twitter. Several members of the Tsukuba City Information Systems Department were on a business trip outside of Ibaraki, so Twitter was used to communicate with these members. The account manager also started communicating information to citizens who were unable to return to Tsukuba due to the wide disruption of public transportation.

Information and updates on the electricity and water outage situation was continuously transmitted along with information on public transportation and major routes in and out of Tsukuba city. The water outage was predicted to take a longer time to repair in comparison to the electricity power facilities, therefore information and know-how on emergency drinking water and toilet facilities from disaster victims of previous earthquakes began coming in. Such information was being relayed out through the Twitter account.

Any useful information coming into the disaster countermeasures headquarters was quickly distributed out to the citizens through Twitter from the start of the disaster. The department head of the time took full responsibility of bypassing the sending of circulars around for everyone's stamp of approval in the government, therefore, emergency related information was being communicated at rapid speed. As aftershocks persisted throughout the following week after March 11, 2011, the anxiety levels of government workers and citizens were high, so the account manager took extreme care on using language expressions not to further heighten anxiety. The 140 character upper limit required the account manager to carefully think out how to transmit easy to understand information in normal language, without using any technical terms. Other information about Tsukuba was being Tweeted through other accounts, so the #tsukuba hashtag was being used to facilitate those following the topics in this context. The use of normal language enhanced the feeling of affinity towards to the account manager among many followers, so an interactive environment for communication with the citizens using Twitter was created in the days following the earthquake. Twitter also allowed one-on-one communication or one-to-many communication depending on the situation. When the account manager needed to answer the same inquiry asked by

many people (ie. questions on the predicted time of recovery of the water supply), Twitter allowed for efficient and effective communication.

After three days, the account manager had other workers in the Tsukuba Information Systems Department help him Tweet to the citizens, as the Twitter account became the main channel of communication until the website could be updated. The number of followers increased from 2000 to over 10,000 after the first quake on March 11, 2011, and many followers were able to contribute information and know-how on ways of coping with this disaster. For example, knowledge on building makeshift toilet facilities or other techniques that can be used during water shortages were shared through Twitter among the followers. A member of the city council created a volunteer group to translate the Tweets into English, Chinese and Korean to the large foreign population living in Tsukuba. Cooperation among citizens, promotion of volunteer activities and other information sharing was made through Twitter to help the disaster countermeasures effort of the city. Many messages of gratitude and communication helped boost the morale of the Information Systems Department and City Disaster Headquarters. In reflection, the account manager also pointed out how it was important to always include a date and time into the Tweet to make sure that people wouldn't confuse older Tweets as being real time, such as information dealing with the emergency water supply vehicles for distributing water.

The possibilities and problems of Twitter: Contagion of false rumors by Twitter

Although the prosocial effects of Twitter usage have been verified in the Tsukuba city case during the Great East Japan Earthquake, social media contributed to the dissemination of false rumors as well. In the case of the city of Tsukuba, the government Twitter account manager worked hard to negate any false rumors during the crisis, however, because information is communicated rapidly among Twitter users, false rumors do spread and subsequently, this information is slowly spread throughout by email. One noteworthy and highlighted rumor that spread immediately after the earthquake dealt with the fire that broke out in the industrial complex of Cosmo Oil Co Ltd. The essential content of the rumors were that hazardous materials would begin to fall from the sky with the rain, and that the information source was from employees working at the complex. Tweets and Retweets of this information quickly spread during the hours after the earthquake. On March 12, 2011 the disaster headquarters officially negated such rumors through the prefectural government (Chiba Prefectural Government, 2011).

In the 2011 White Paper of Information and Communications in Japan, a keyword analysis using Google Realtime Search was employed to investigate

false rumors during the Great East Japan Earthquake. The study averaged out the number of emergence of a keyword per minute throughout the duration of the false rumors of Cosmo Oil Co. Ltd. The keyword “Cosmo Oil” begins appearing in Tweets right after the initial March 11, 2011 earthquake and continues increasing from evening until midnight, at which the number of Tweets reaches a peak and begins decreasing. From around 11AM on March 12, 2011, the number of Tweets begins to increase again, however from around 3PM, Tweets negating the rumor begin to increase as well and by March 13, the false rumors decrease rapidly. From this analysis, one can observe that the contagion of false rumors was very rapid through Twitter, but once Tweets that negate the false rumor begin to appear, the false rumors decrease quickly on Twitter. The problem lies in the fact that these false rumors continued to spread by email, which took a longer time to negate.

Although the Cosmo Oil rumor was a false rumor that began contagion in the wake of the disaster when people were still in panic, even after several months, many kinds of rumors, such as those related to radiation contamination continue to appear. Right after the March 11, 2011 earthquake, drinking water, foods with long shelf life, gas cartridges, gasoline fuel, toilet paper and tissue paper were in shortage because people began receiving false information. This led to people hoarding these items until it eventually created a chain reaction. Such chain reactions are said to occur in urban areas, however the reporting of this behavior on mass media and Twitter aggravated this problem right after the earthquake. This unnecessary hazard occurred due to human behavior and incorrect communication sending a sentiment to the population that these supplies would be in shortage due to the earthquake and many assumed a possible problem with commercial logistics in the weeks to come. Twitter account holders would Tweet or Retweet this type of information without verifying the truth of the information being communicated. The account holders did not perceive the consequences of transmitting this type of information, so no malicious intent could be perceived in them, however in result caused a breakdown in these supplies temporarily during the month after the earthquake. In other instances, some Tweets had malicious intent, such as those that swindled relief donations for the disaster victims. Twitter in some instances like these which were observed after the Great East Japan Earthquake, may cause unfavorable consequences for society.

Twitter, social capital and effectiveness during disasters

During the Great East Japan Earthquake, voice communication through normal telephone lines was reconfirmed to be difficult in the affected areas, however Internet access through mobile devices was found to be relatively robust and resilient in comparison to normal telecommunication channels. VoIP, SMS and

email are quicker solutions for communication and overcoming telecommunication breakdowns in such disaster situations. Radio is more effective due to portability in comparison to televisions. Social media such as Facebook and Twitter was more effective in disseminating information on the Internet than websites early in a disaster. Twitter was found to be most effective for quickly spreading information whether good or bad.

This study has examined how Twitter has the potential to transmit false rumors very rapidly during disasters, therefore it requires some further consideration on how to avoid some of the unfavorable consequences that were observed during the Great East Japan Earthquake. On the other hand, the main portion of this paper provides evidence that Twitter is greatly beneficial during disasters. Through the quantitative content analysis of Tweets of the Tsukuba City Information Systems Department and interview with the account manager, I conclude that Twitter became a foundation of building social capital and played a prosocial role during the disaster. Even as many of the lifelines in Tsukuba were not functioning, social media such as Twitter functioned and the communication backchannel until March 11, 2011 became the main communication channel among the citizens of Tsukuba and the disaster countermeasures headquarters of the city.

Through social media, a communication network of social support was formed, and social interaction was made possible in a wide region. Twitter became the supplier of information and knowledge for the citizens of Tsukuba in the early days of the disaster and also the basis for building social capital. The means of transmitting and receiving information that have been observed in this paper, are effective, and can be applied to other disasters.

The experiment of using Twitter for communicating to the citizen of Tsukuba initial was received with little enthusiasm and mostly negativity among the heads of Tsukuba City Hall. In retrospect, thanks largely to the fact that the Information Systems Department of Tsukuba city stepped out of its bureaucratic bounds and embarked on the experiment, the Tweets of the account manager became a major source of providing vital information on lifelines and infrastructure until restorations were made after the disaster.

NOTES

1. The author would like to thank the head of the Tsukuba City Information Policy Department, Mr. S who declined to reveal his identity in this paper. The author would also like to express the deepest condolences to all the victims and survivors of the Great East Japan Earthquake.

REFERENCES

- Ministry of Internal Affairs and Communications, Japan (2011). *Heisei 23 Nendo Johou Tsuushinn Hakusho* [2011 White Paper of Information and Communications in Japan]
<http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h23/pdf/23honpen.pdf>
(Accessed July 1, 2011).
- Chiba Kencho [Chiba Prefectural Government] (2011). “Kosumo Sekiyu (Kabushikikaisha) no tank kasai niyoru fuuhyou nituite[Concerning the false rumors of the Cosmo Oil Tank Fire]”
<http://www.pref.chiba.lg.jp/shoubou/20110312-fuuhyou.html> (Accessed July 1, 2011).
- MILLS Alexander, CHEN Rui, LEE JinKyu & RAO H. Raghav (2009). “Web 2.0 Emergency Applications: How Useful Can Twitter Be in Emergency Response?” *Journal of Information Privacy & Security (JIPS)*, 5(3): 3-26.
- HUGHES Amanda Lee & PALEN Leysia (2010). “Twitter Adoption and Use in Mass Convergence and Emergency Events.” *International Journal of Emergency Management*, 6(3-4): 248-260.
- KOBAYASHI Tetsuo & IKEDA Kenichi (2005). “Onrain komyunitii no Shakaikanekishihon [Social Capital in Online Communities]”. In IKEDA Kenichi (ed.) *Intanetto komyunitii to Nichijosekai [Internet Communities and Daily Life]*. Tokyo: Seishin Shobo. 148-184
- McCARTHY Joseph F. & BOYD Danah M. (2005). “Digital Backchannels in Shared Physical Spaces: Experiences at an Academic Conference.” *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '05) Extended Abstracts*. New York: ACM Press 1641-1644
- ELLISON Nicole B., STEINFELD Charles & LAMPE Cliff (2011). “Connection Strategies: Social Capital Implications of Facebook-enabled Communication Practices.” *New Media & Society*, 13 (6): 873-892.
- PFEIL Ulrike, ARJAN Rajiv, and ZAPHIRIS Panayiotis (2009). “Age Differences in Online Social Networking - A Study of User Profiles and the Social Capital Divide among Teenagers and Older Users in MySpace.” *Computers in Human Behavior* 25(3): 643-654.
- PUTNAM Robert D. (2000) *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.
- RESNICK Paul (2002) “Beyond Bowling Together: Sociotechnical Capital.” In CAROLL John M. *HCI in the New Millenium* Boston: Addison-Wesley. 247-272

- SUTTON Jeanette, PALEN Leysia, & SHKLOVSKI Irina (2008). "Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires." In *Proceedings of the 5th International ISCRAM Conference* (May 2008) 1-9.
- STEINFIELD Charles, ELLISON Nicole B., & LAMPE Cliff (2008). "Social Capital, Self-Esteem, and Use of Online Social Network Sites: A Longitudinal Analysis." *Journal of Applied Developmental Psychology*, 29: 434-445.
- VALKENBURG Patti M. & JOCHEN Peter (2007). "Online Communication and Adolescent Well-Being: Testing the stimulation versus the displacement hypothesis." *Journal of Computer-Mediated Communication*, 12(4): 1169-1182.
- WELLMAN Barry, QUAN-HAASE Anabel, WITTE James & HAMPTON Keith (2001) "Does the Internet Increase, Decrease, or Supplement Social Capital?" *American Behavioral Scientist*, 45 (3): 436-455.
- WHITE Connie (2010). "Social Media and Meta-Networks for Crisis Mapping: Collaboratively Building Spatial Data for Situation Awareness in Disaster Response and Recovery Management." Paper presented at *2010 Specialist Meeting Spatio-Temporal Constraints on Social Networks* (University of California, Santa Barbara, Center for Spatial Studies, December 14-15, 2010). <http://www.ncgia.ucsb.edu/projects/spatio-temporal/docs/White-position.pdf> (Accessed July 1, 2011).