

**The role of ICT during the disaster –
A story of how Internet and other information and communication services
could or could not help
relief operations at the Great East Japan Earthquake**

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Introduction

The story that comes to my mind is, naturally, the things we are facing right now: the earthquake, Tsunami and their consequences, including, but not limited to the nuclear power station failure. This report tracks the role of the internet and other communications services during the disaster.

9.0 Earthquake, 40m high Tsunami and nuclear station damage

On 11 March at 14:46 pm, an unprecedented earthquake hit the eastern half of Japan. In less than 10 minutes, the first waves of Tsunami arrived on a scale that no one in Japan ever dreamed of. The magnitude of the earthquake was first said to be 8.4 and then changed into 9.0, the largest in the recorded history of Japan and the fourth highest in the world.

The maximum reach of the Tsunami was more than 40 meters above the sea level – at least three to four times higher than most experts had anticipated. Several waves of sea water washed away almost everything within 1 to 6 kms from the coast line, affecting over 30 cities and towns in six prefectures, spanning more than 500 km along the coastline. As of 5 August, the death toll reached 16,050 plus, and the number of missing more than 7,780. A total of more than 23,800 people were killed in the end, the highest loss of any disaster since World War II in Japan.

The Tsunami also hit Fukushima Daiichi nuclear power station and destroyed the regular and emergency cooling systems. On 12 and 13 March, explosions occurred at three of the four units due to the high temperature of the reactor's core, and a huge amount of nuclear contaminants was released into the air. More than 200,000 citizens inside a 30 km radius from the nuclear station evacuated with bare minimum belongings, hoping to return within a few days. They are still in shelters and temporary houses or staying with friends and relatives after four months.

Preparation was less than needed

Japan is well-known as the land of natural disasters, not only for earthquakes and Tsunamis, but typhoons, landslides and volcanic eruptions. All these happen frequently in any part of the archipelago. The central and local governments have disaster management divisions, armed with heavy equipment and conducting regular exercises. We thought we were prepared. Unfortunately, that was not the case this time.

To be fair, almost no one expected that an earthquake of this scale and magnitude would occur. There were predictions and warnings of a large earthquake within the next 30 years, but most expected less than 8.0 on Richter scale. The Kobe earthquake in 1995, which killed

more than 6,400 citizens, had a magnitude of 7.3. Simply put, the preparation was far less than needed.

The role of internet and information and communications technologies (ICTs) for disaster relief

Information plays a critical role in organising rescue, relief and reconstruction work for all social disasters. The so-called Great East Japan Earthquake was no exception. Yet the very information badly needed by the citizens in devastated areas was not available in the aftermath.

It is perhaps one of the first massive disasters that hit a well-developed country equipped with broadband and 3G mobile networks and other ICT infrastructure and services. Many citizens were using internet and smart phones in addition to the conventional mass media such as TV and radio broadcasting to find information or call for rescue. However, most telephone lines were inaccessible. Given the massive call demand from people immediately after the quake, the telephone operators blocked 90% of calls in most devastated areas – a standard practice to insure critical connections, such as those used by emergency services, could be made. However this also meant that many citizens could not talk to their families and friends for hours, and even days in some areas.

In coastal areas, the Tsunami waves destroyed most physical infrastructure – roads and railways, telephone and power lines and radio towers. These areas became “information black holes” and that continued for a week to a month or even longer.

The government rescue team had 1,500 radio and satellite mobile phones and other communication devices. But these did not meet the demand for communication, and many could not be delivered to local governments, whose city halls and buildings had been severely damaged or lost. Many people tried to use Twitter, or e-mail via mobile phones, social networks such as Facebook or Mixi (a popular service in Japan) to ask to be rescued, for foods, medicines or blankets – and some of these messages reached the people outside the affected areas who managed to provide the relief needed in time.

Yet the actual usage of internet and ICTs in the devastated areas was very low. The reconstruction work on communications infrastructure started immediately after the disaster, but the sheer amount of damage placed heavy burden on the infrastructure providers. The pace of reconstruction was slow compared to the massive demand. There had been little policy co-ordination framework among ICT players for disaster management despite Japan’s frequent exposure to natural disasters.

Many actors started voluntary information-sharing services through the internet. Using Google, Yahoo and Mixi, lists of shelters and missing people, services that matched demand, and data on roads that were passable were set up. Teams went to the affected sites and started to help setup access facilities in shelters or local government offices and schools. Most of this work was *ad hoc*.

A number of concerned ICT professionals started a voluntary, and pro-bono information support platform called iSPP, drawing on industry, government and civil society. This multi-stakeholder platform coordinated and complemented official relief work. We asked ourselves “What can internet and ICTs do for the victims there?”. It was late, but we thought it was never too late.

In early April, a number of iSPP members organised a site visit to three prefectures to find out what kind of information and services were really in need. We spoke with local citizens, government officials and ICT professionals who are all seriously affected by the disaster.

The stories we heard were horrible, to be modest, especially in coastal cities. When we reached there, we lost our voices. We just could not imagine what to say. Then, one finds oneself challenged. You *must* say something. You must act.



Homes washed away and arrived at the foot of a hill where we stayed at my friend's house. No search and rescue operation was performed there yet - after three weeks, Apr 3, 2011.



A big ship landed 700m away from the pier. Apr 3, 2011. You can see the same ship from a Google Earth photo: 38°54'56.99"N, 141°34'51.10"E

After the visits, we identified several areas to organise projects around:

- ◆ Provide ICT solutions (packages) to recovery works – sending computers, communication devices and people
- ◆ Build Common Application Program interfaces (APIs) for informational support
- ◆ Information matching for relief work (goods and people)
- ◆ Co-ordinate NGOs
- ◆ Support local government - coordinate with Prefectural and Central governments to restore their ICT services for victims and citizens
- ◆ Survey of people's informational behaviors.

To be frank, it was not easy to organise all of this work with limited resources. However, iSPP managed to develop some of the projects.

How people used ICT services during the severe disaster?

There were mixed reports about the actual usages of the demand from people for the internet, mobile phones, Twitter and other social network services. In metropolitan Tokyo and the surroundings, where the earthquake also hit, shutting down most trains in the afternoon and evenings, many people used mobile phones and the internet: e-mail, Twitter, U-stream, YouTube, Google and Facebook. These were, we thought, mostly used in the Tokyo area, but not in the heavily damaged and devastated areas of the Tohoku region.

Later, in early April, when we organised a visiting tour to the Tohoku region, including the cities of Iwaki, Sendai, Natori, and Kesen-numa to see what exactly happened, many people we met told us stories that were different to those we had heard in Tokyo, confirming our expectations. These were some of their comments:

"None of the digital or analogue medium worked at all."

"Mobile phones were just useless. I tried to call my family members to find out if they were OK. But it didn't connect. When we got through, busy signals were the answers."

"Eventually we lost battery power. Since the main power lines were totally down for days, we could not recharge the power, and so within a few hours, we lost it."

"TVs? Come on! When there is no electricity, how come you get to see the TV programmes?"

"Twitter? Facebook? You are kidding! We were simply not in that mode. Just stunned by the horrible situation; watching the Tsunami waves, could not do anything".

To be fair, all the stories, both what happened in Tokyo and what happened in Tohoku, were largely true. But they were just many tips of a large iceberg, we felt.

A survey on people's informational behaviors proposed

Because of this, a survey on people's informational behaviors was carried out by iSPP in July. It was a combination of a web-based online questionnaire, which received 2,815 responses, and personal interviews with 186 interviewees, both in the devastated areas. The main questions were as follows:

- ◆ Which tools and media were useful? Which were not?
- ◆ Which information resources did affected people rely on?
- ◆ Were there any differences given the different locations of the disaster?
- ◆ Was internet or Twitter really useful?
- ◆ What kind of lessons can we draw from this?

The respondents were the residents of the three prefectures, Iwate, Miyagi and Fukushima in the Tohoku region: all have coastal areas where Tsunami hit heavily and inland where earthquake hit badly, and people especially in Iwate were also exposed to the danger of the nuclear contamination. There were 5.7 million residents in these three prefectures.

To our knowledge, this was the first attempt of a sizable survey conducted inside the devastated areas in terms of finding out the people's informational behaviors.

At the time of writing, we are still processing the data and writing the full report, but some of the early findings from the online survey have been released already. Here is the summary.

First, we asked which devices were actually available to affected people. According to the 2,815 people who responded to the online survey, a sharp drop is seen in the usage of most communication devices right after the quake: Only 37.5% said they could use mobile phones, from 63.6% usage before the earthquake/Tsunami hit them. Similarly, 33.4% could watch TV compared to 87.2% before the disaster, and 19.5% could use the internet compared to 81.3% before the event. The only exception was radio – 67.5% of respondents used radio within a few hours after the quake, a 20 points increase from regular use.

Up to one week after the earthquake, radio (75.0%) still remained the most available medium, while TVs (71.2%), mobile phones (54.7%), and internet (52.8%) showed good recovery, even though they did not reach the level of the availability before the quake.

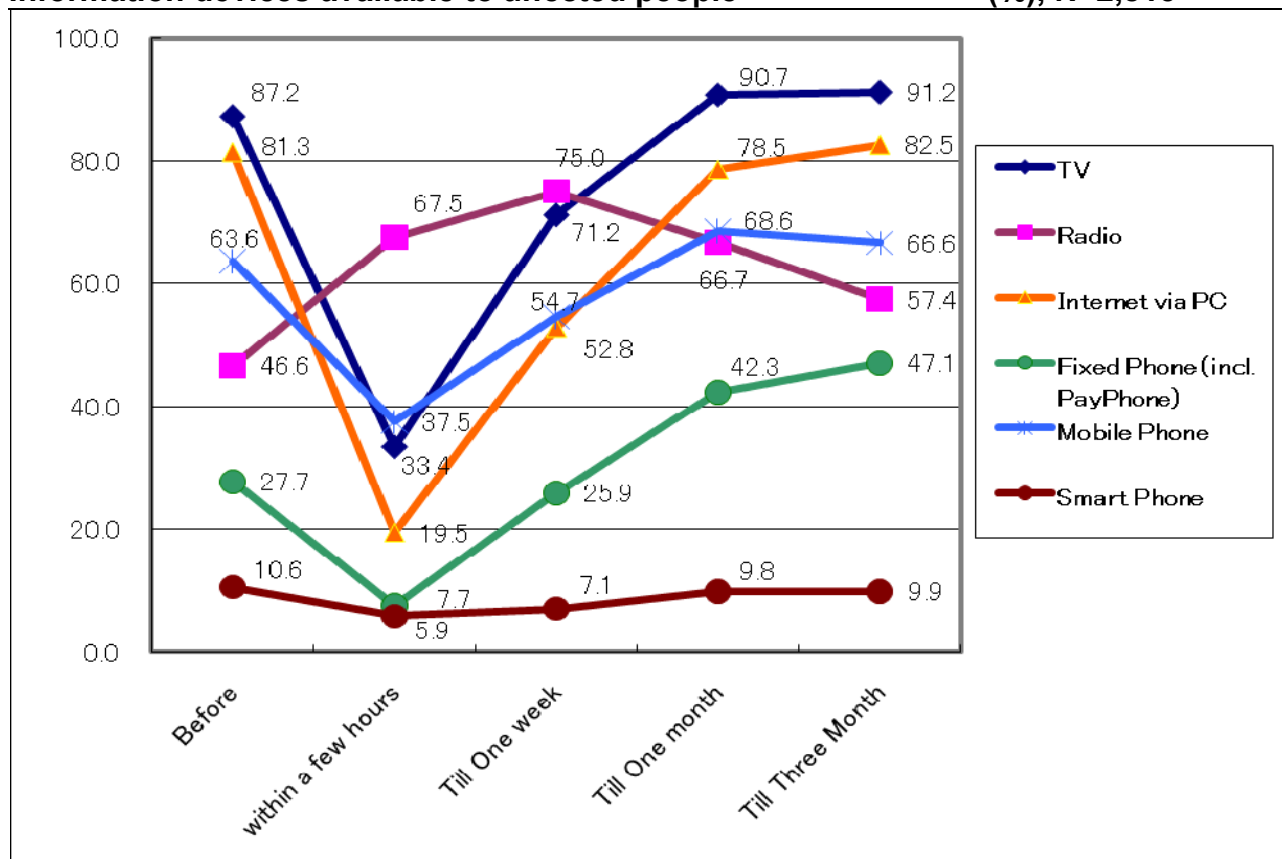
It is said that up to 72 hours is the most critical period to save the lives of people affected by disasters. Yet as the survey shows, most information channels were not functioning sufficiently during this time. It was extremely difficult to figure out what the exact degree of damage in the coastal areas, which span 600 kms, was. The police, army and fire and rescue departments all dispatched the first emergency teams, but we knew that the communication lines became more dysfunctional as you approached the affected areas.

It was only in late April, after more than a month, when most major telecommunication operators announced that the repair work on their trunk lines and telephone services was almost done.

The result of this survey corresponded with that. The use of most tools and services was recovered between one to three months after the quake.

Information devices available to affected people

(%, N=2,815)



Source: Survey on Informational Behaviours, iSP, July 2011

Useful information sources

Next, we asked which information sources people actually recognised as useful. By information sources, we meant not only TV, radio, internet and telephones, but also newspapers, e-mail and SMS, word- of-mouth, community notice boards, amateur CB radios, etc. We meant *all* forms of information sources.

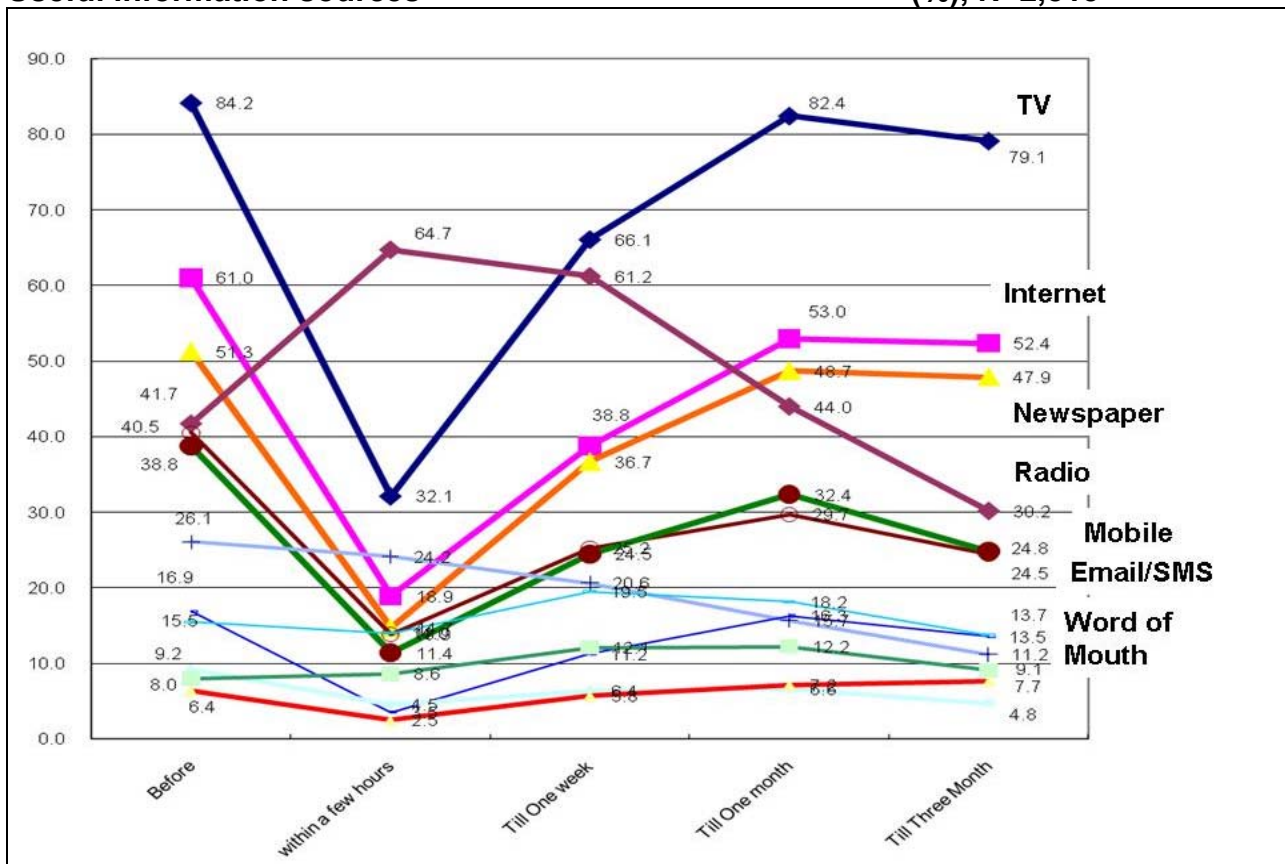
Here again we found that 67.4% of the people in the devastated areas responded that radio was most useful within a period of several hours after the quake. This was followed by TV (32.1%) for those who still had power supply, and then "one-segment" digital broadcast TV (a TV service that can be received from a mobile phone or car navigation devices using batteries). This is the reflection of the fact that electricity was not available to many. Word-of-mouth was ranked seventh, after newspapers.

Internet services, newspapers, e-mail, mobile phone and fixed-line phones were all under the level of usefulness before the quake.

After a week, TV came back to the first place followed by radio, the internet and newspapers.

Useful information sources

(%), N=2,815



Source: Survey on Informational Behaviours, iSP, July 2011

Action steps

Many people we interviewed have emphasised the importance of power supply in the emergency situation. As we have entered the digital age, almost all devices and services are designed to use power. But that could become the major source of vulnerability once a large-scale natural disaster hits a technologically advanced society. ICTs can only work when sufficient supply of electricity is guaranteed.

Of course, super-large scale natural disaster such as the 9.0 earthquake or a massive Tsunami could destroy almost all man-made infrastructure and devices/equipment once it hits land. However, there are always areas outside the devastated areas where people could start to do rescue and relief work. They can bring in resources needed. This time, what we found was a lack of preparedness for organising the rescue work using ICTs.

Though we have benefited much from the use of the latest technologies and services such as Twitter, Facebook, YouTube, to name a few, no well-structured information sharing mechanisms were ready. At best, it was *ad hoc*.

Japan is well-known for the heavy concentration of all kinds of natural disasters. As I said, it was predicted that at least an 7.5 to 8.0 level earthquake would hit Tohoku region with 99% probability within 30 years since around 2003. The Western part of Japan and South-west part of the country also received a formal alert for an earthquake and Tsunami. The Great Kanto Earthquake that hit Tokyo and killed more than 100,000 people mostly by fire occurred only 70 years ago. Preparation is the responsibility of policy makers and practitioners using ICTs. And Japan is not the only country subject to such large-scale disasters.

In this regard, we foresee a need for building an international alliance of disaster relief teams. We were told that several international activities were already in place and learned that ICT services for emergency rescue was organised in Thailand and Indonesia in 2004, in Haiti in 2009, and for the recent earthquake in Christchurch, New Zealand this year. We have not teamed up with these efforts in Japan, and because of this we had fallen behind, despite the experiences from Kobe earthquake and several other disasters in Japan.

Things are never too late. We should start now.

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