Chapter 3

Lessons of the Great Earthquake and the Role of ICT

The FY 2011 White Paper on Information and Communications in Japan covered information and communications conditions in northeastern Japan until May 2011 after the Great East Japan Earthquake. Now that more than one year has passed, this chapter builds on the past surveys to once again compile what role ICT played in the Great East Japan Earthquake and what challenges surfaced through the disaster.

Section 1

Impact of the Great East Japan Earthquake on Information Behaviors

1. Information behaviors and ICT's role in disaster-damaged areas

The two parts of Section 1 analyze information behaviors in the disaster-damaged areas, based on interviews on disaster-affected people's information behaviors and ICT utilization between the March 11 earthquake-tsunami disaster and late April 2011.

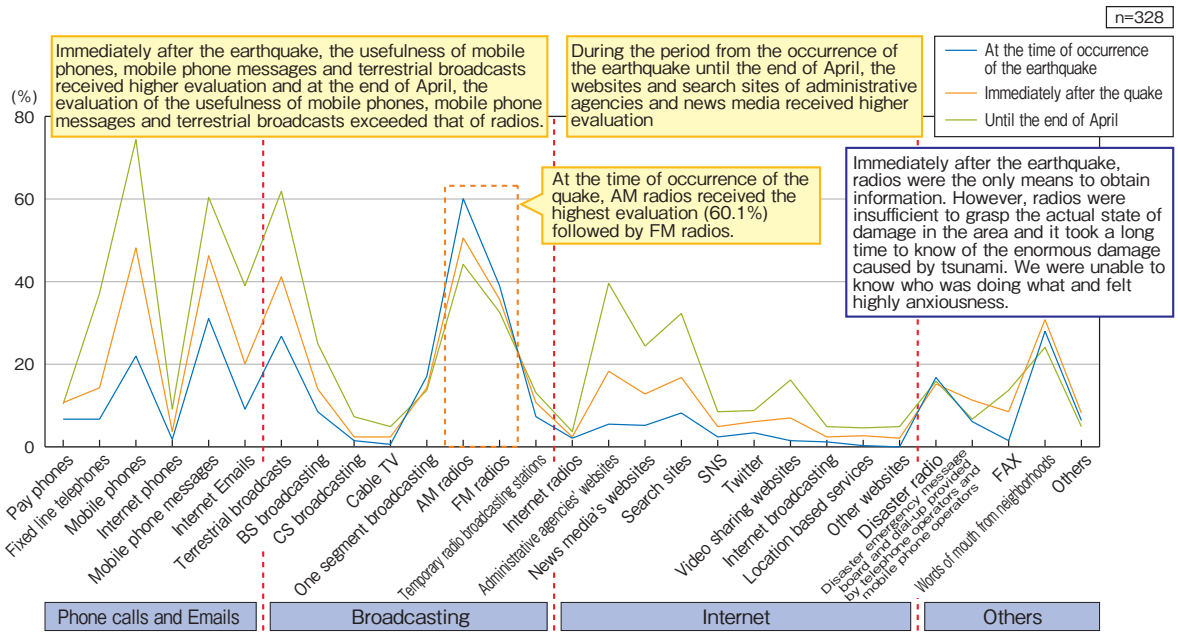
(1) Evaluation of media used upon the disaster

Radio, a nearly instantaneous information source, was given a higher evaluation than other media during the disaster, according to the face sheet (Figure 3-1-1-1). The AM radio was given the highest rating of 60.1%, followed by the FM radio. "But the radio failed to inform us of regional disaster conditions, leading us to lag behind in knowing how serious the damage from the tsunami was," an interviewee said, indicating problems with the radio. After the disaster, the evaluation rose for the interactive mobile phone and E-mail for safety confirmation purposes as well as for the terrestrial television broadcasting providing footage. In late April, the rating for the terrestrial TV broadcasting exceeded that for the radio.

(2) Alteration in methods of information-gathering

An analysis of interview comments regarding information-gathering media in the disaster-damaged areas indicates that highly instantaneous broadcasting tools such as the TV, radio and disaster radio were used more frequently than other media for collecting tsunami and other information just after the earthquake's occurrence. Particularly, the radio and TV turned out to be very useful. But comments about information-gathering media just after the earthquake occurrence and their evaluation indicate that the percentage share for interviewees viewing the radio as the most useful tool was limited to half the radio utilization rate. One comment said, "The radio, though being useful for obtaining information, failed to provide details." Mobile phones were given a lower rating. One comment said: "I had believed that wireless mobile phones would be useful upon disasters. But I was shocked at finding mobile phones not useful." The radio, for which the utilization rate just after the earthquake occurrence was the highest among information-gathering tools, was evaluated as useful by only 40 plus percent of interviewees, suggesting that providers of nearly instantaneous information should

Figure 3-1-1-1 Evaluation of media used during the disaster



(Source) MIC "Survey on Information and Communications upon Disasters (2012)"

use multiple information provision channels.

Interview comments on media for gathering tsunami information indicate that the utilization rate was as high as 25% each for the TV, radio and disaster radio.

Administrative information obtained through information-gathering efforts was described as "sufficient" by 30.2% of interviewees and as "insufficient" by a majority of 53.8%.

(3) Trends by media

a. Disaster radio

Of interviewees who were able to hear the disaster radio, 65.6% said they became aware that the tsunami was coming, indicating the recognition that the disaster radio played a key role in leading disaster-affected people to take evacuation actions.

b. Mobile phone

Questioned about information terminals that interviewees carried with them upon their evacuation in the disaster-damaged areas, 95.1% of respondents cited the mobile phone (Figure 3-1-1-3). But a specific interview comment said, "I think that if I were able to use the mobile phone, I would have been fortunate." Another comment said: "I had believed that wireless mobile phones would be useful upon disasters. But I was shocked at finding mobile phones not useful." After the disaster occurrence, particularly, mobile phones were left unusable for a long time due to network congestion, physical damage to base stations and other facilities, out-of-fuel standby power systems and other factors. Interview comments indicate that disaster-affected people even with mobile phones remained isolated, failing to confirm whether their relatives were safe.

c. Broadcasting

Many interviewees depended on the radio, TV and other broadcasting media. They gave high ratings to the provision of regional information using news tickers and community broadcasting. Among comments on needs for regional information through broadcasting media, however, one said, "The radio, though being useful for obtaining information, failed to provide details." Another said, "I am considering whether some community FM radio system for a limited region can be developed to improve the current situation where it is difficult to collect town information." They pointed to some constraints on the capacity of these broadcasting media for providing daily living-related and other detailed regional information.

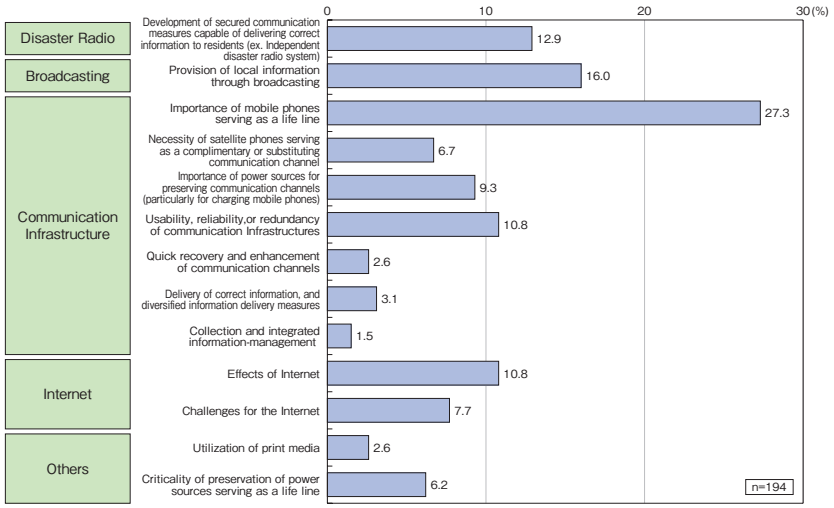
d. Internet

When voice communications and E-mails through mobile phones were unavailable just after the earthquake occurrence and when disaster-affected people completed their evacuation, people including advanced Internet users took advantage of blogs, the Google Person Finder, Twitter and other Internet services to confirm relatives' fates and collect detailed regional information. In the disaster-damaged regions, Internet users were generally limited. But those who effectively used the Internet for gathering daily living-related and other information gave a high rating to the Internet, suggesting the Internet's high potential as an information provision tool for disaster-damaged areas.

(4) ICT conditions

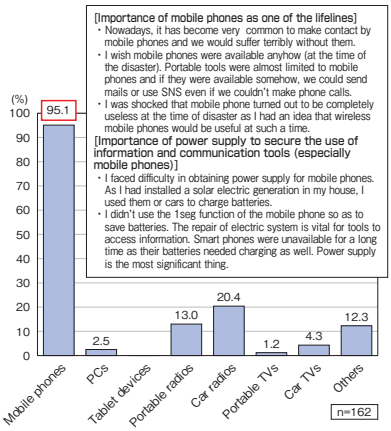
Interviewees' specific requests or needs regarding communications infrastructure indicate that many (10.8%) of them cited the secured usability, reliability and redundancy of communications infrastructure along

Figure 3-1-1-2 pecific requests/needs for ICT tools



※ Note: The parent group has a population of 194 selected out of the all interviewed (306), which consist of respondents who made specific comments or requirements. Each ratio is a percentage of the respondents who favored the corresponding item to the parent population.

Figure 3-1-1-3 Information terminals carried by disaster-affected people and their relevant specific requests/needs



(Source) MIC "Survey on Information and Communications upon Disasters (2012)"

with or rather than a secure power source as a lifeline (cited by 6.2%) .

As for ICT tools available at evacuation centers, many comments said evacuees depended only on the radio when almost all other ICT tools were unavailable due to blackouts in the first week after the disaster. On ICT needs at evacuation centers, one interview comment said: "There were great needs for mobile phones. Although mobile phones gradually became usable, mobile communications were unstable. I wanted mobile phone communications to be more stable." Among information and communications tools, the mobile phone posted the highest popularity rating of 52.6%, followed by the TV and radio.

Opportunities to match the supply and demand of ICT tools were seen by 28.8% of respondents. Such opportunities were also seen by 41.2% of local governments and by 47.4% of residents at temporary houses Information-rich administrative organizations and residents of temporary houses during the post-disaster restoration/reconstruction period saw more opportunities to match ICT tool supply and demand.

(5) Handling of personal information and consideration to elderly people

As for handling of personal information in the disaster-damaged areas, 86.7% of residents said they saw no particular problems. Meanwhile, 45.4% of local governments said they had experienced considerable difficulty in collecting and disclosing personal information. There was a consciousness gap between residents feeling no particular problems and local governments making painful efforts.

People affected by the Great East Japan Earthquake included many elderly persons. Interviewees were asked about how consideration was given to elderly persons in information conveyance. A majority of 67.7% said they saw no special consideration given to elderly people. But 8.1% said multiple information provision means were used. This indicates that consideration was given to elderly people in some cases.

2. Information behaviors of metropolitan residents upon the disaster

We here would like to analyze "Joint Research on Anshin in Internet Usage," a joint study by the University of Tokyo, Toyo University, Kansai University and Nippon Telegraph & Telephone Co. on information behaviors of residents in the Tokyo metropolitan region. The study is based on an Internet poll of residents in Tokyo and the three neighboring prefectures of Kanagawa, Saitama and Chiba.

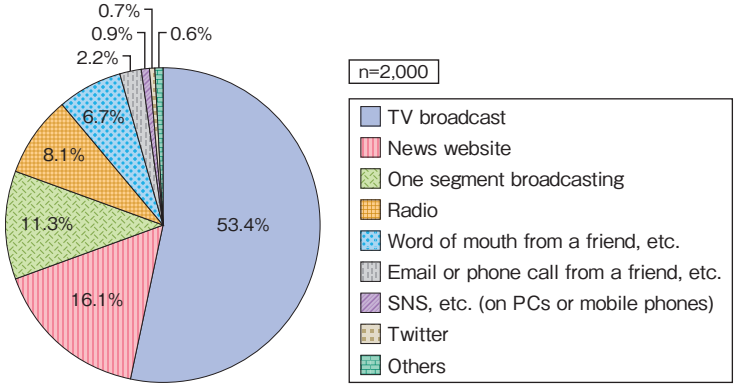
(1) Through what media or means did you initially know of the earthquake?

Looking at the media through which respondents first knew of the earthquake, the TV was cited by 53.4% of respondents, the highest percentage followed by 16.1% for news sites and 11.3% for one-seg broadcasting, indicating that mass media served as a main information channel (Figure 3-1-2-1). Percentage shares for respondents citing social media were lower, including 0.9% for SNS (social network services) through personal computers and mobile phones and 0.7% for Twitter.

(2) What communications means did you attempt to use on the earthquake day?

Nearly 80% of respondents attempted to use the voice communications of the mobile phone. A similar percentage of respondents were planning to use the mobile phone E-mail. We would like to check the availability of communications means on the earthquake day for respondents who attempted to use some means and found them unavailable. The mobile phone voice communications was the most difficult to be connected among communications means, cited by 65.4% as unavailable. Following this was the fixed-line phone communications

Figure 3-1-2-1 Through what media did you know about the earthquake first?



(Source) The University of Tokyo Interfaculty Initiative in Information Studies, *Research Survey Reports in Information Studies 2012 No. 28*, "Information Behaviors in Tokyo Metropolitan Area after the Great East Japan Earthquake"

cited by 55.1% (Figure 3-1-2-2). Far fewer respondents attempted to use the personal computer e-mail or the web service. But only 17.9% of them found the PC e-mail unavailable and 11.3% found the PC web service unavailable. Indications are that the PC E-mail and web service were far easier to be connected.

(3) Useful media for dealing with the disaster

The TV was cited by 86.3% of respondents as the tool providing information they wanted (sufficiently or to some extent) during the week after the disaster. Following the highest percentages were 71.8% for news sites, 54.7% for newspapers, 51.5% for E-mails or calls from relatives, friends and acquaintances, and 29.3% for the radio.

The TV was the most popular information source for collecting disaster information, cited by 63.1% as the most useful information source for obtaining such information. The next highest percentages were 12.1% for news sites, 5.8% for the radio, 4.8% for E-mails or calls from relatives, friends or acquaintances, and 3.7% for newspapers (Figure 3-1-2-3).

Section 2

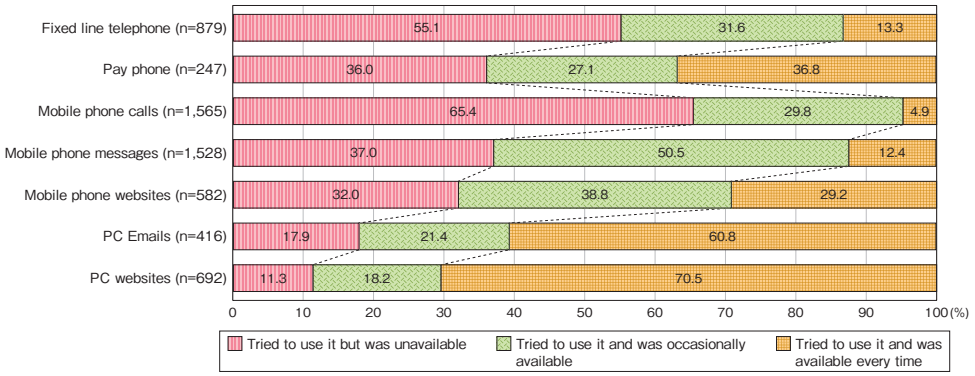
The Great East Japan Earthquake and Business Continuity

We conducted a survey of local governments and enterprises in disaster-damaged and other areas in Japan concerning the Great East Japan Earthquake and business continuity, looking into how business operations were continued on the occasion of the disaster and what challenges emerged then.

1. Business continuity in disaster-damaged areas

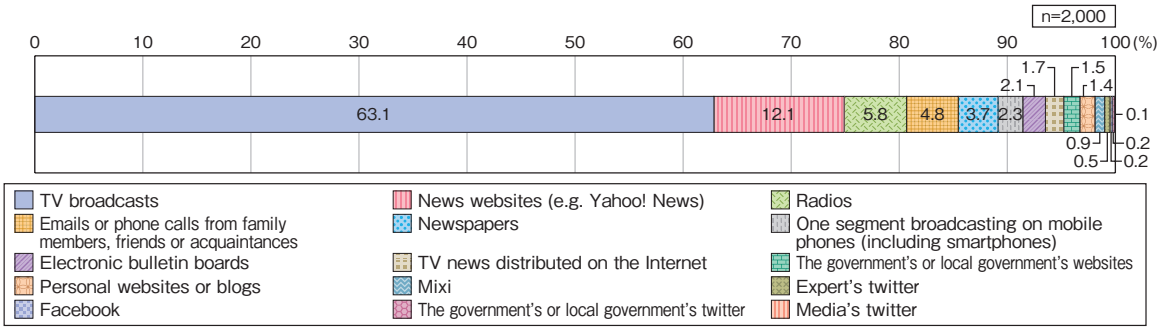
Our interview survey on data losses at hospitals and schools through the Great East Japan Earthquake in the disaster-damaged areas indicate that 27.3% of hospitals and 40.0% of schools lost data. One interview comment at a hospital said: "We failed to recover the reception computer and electronic health record data that had not been backed up." Another said, "USBs were dropped and data lost." Multiple interviewees at hospitals reported substantial data losses. In some cases, hospitals mini-

Figure 3-1-2-2 Availability of communication means



(Source) The University of Tokyo Interfaculty Initiative in Information Studies, *Research Survey Reports in Information Studies 2012 No. 28*, "Information Behaviors in Tokyo Metropolitan Area after the Great East Japan Earthquake"

Figure 3-1-2-3 What was the most useful information source?



(Source) The University of Tokyo Interfaculty Initiative in Information Studies, *Research Survey Reports in Information Studies 2012 No. 28*, "Information Behaviors in Tokyo Metropolitan Area after the Great East Japan Earthquake"

mized data losses through data backup measures. One interviewee said: "We lost all paper health records and reception data. But we recovered some receipt data by matching data sent to the center." An interviewee at a school with the school administrative system said, "All data was lost due to flooding."

2. Local governments' change in thinking after the Great East Japan Earthquake

(1) "What are challenges with information provision to residents upon disasters?"

Given the Great East Japan Earthquake, we conducted a poll of local governments concerning challenges related to information provision to residents during disasters. The biggest challenge was the prompt and accurate information provision upon a disaster occurrence, cited by 68.5% (Figure 3-2-2-1), indicating that local governments are very interested in how best to provide information to residents just after a disaster occurrence.

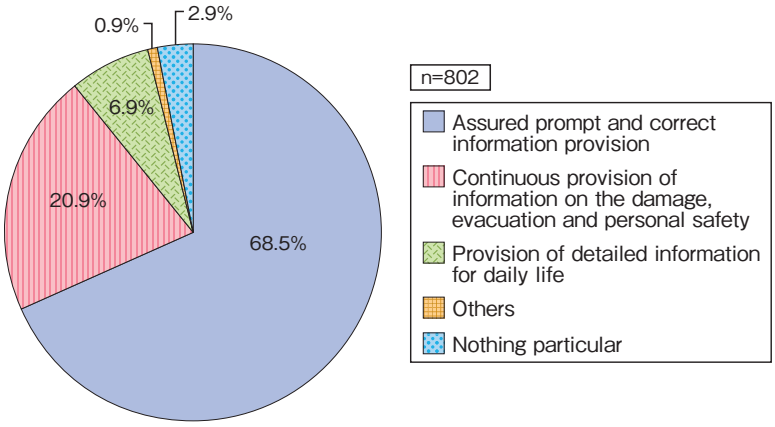
(2) Internet utilization upon disasters

Responses from local governments concerning the utilization of the Internet upon disasters indicate that the Great East Japan Earthquake prompted about 70% of local governments to change their thinking and enhance the utilization of the Internet (Figure 3-2-2-2). Specifically, their Internet utilization focused on their respective websites. Some local governments cited the utilization of social media and portal sites, suggesting that the disaster led local governments to make diversified Internet utilization efforts.

(3) ICT and business continuity plans based on experiences with the Great East Japan Earthquake

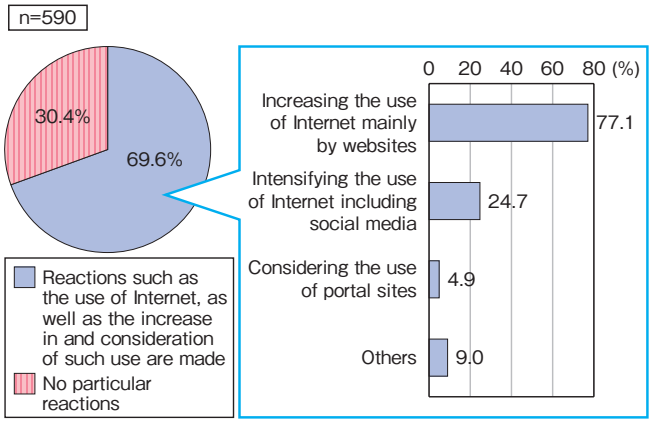
Since the disaster, the importance of business continuity plans has reportedly attracted attention anew both in the public and private sectors. We asked local governments whether they had worked out business continuity plans. Those that have prepared BCPs are limited to some 10% of the total. While some 40% of prefectural governments have prepared BCPs, only 3.5% of town and village governments have done so (Figure 3-2-2-3). But the Great East Japan Earthquake has prompted 34.6% of

Figure 3-2-2-1 "What are challenges regarding information provision to residents upon disasters?"



(Source) MIC "Survey on ICT's Effects on Economic Growth (2012)"

Figure 3-2-2-2 "What actions are taken for Internet utilization upon disasters based on experiences with the Great East Japan Earthquake?"



(Source) MIC "Survey on ICT's Effects on Economic Growth (2012)"

city and ward governments and 33.0% of town and village governments to consider preparing BCPs, indicating that local governments have grown more conscious of BCPs irrespective of their size.

(4) Expectations for cloud services

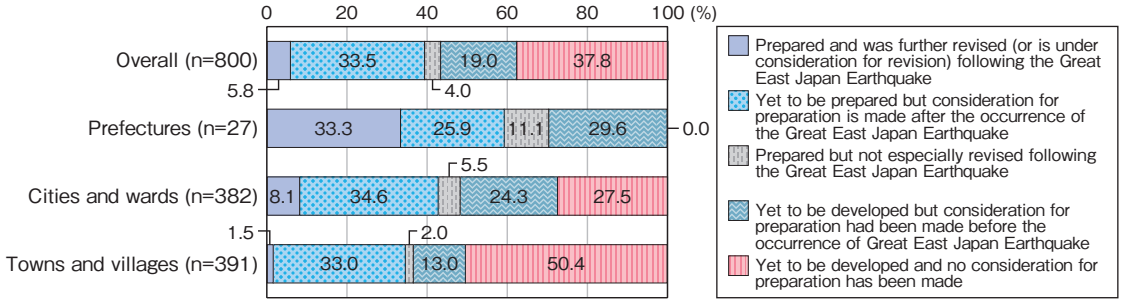
When we questioned local governments on their cloud service utilization, only 6.3% said they fully introduced cloud services. But cloud service users including partial users accounted for 45.0%. Local governments considering introducing cloud services accounted for 79.0% of the total. All prefectural governments are considering doing so (Figure 3-2-2-4). Particularly, 40.2% of all local governments are introducing or considering introducing cloud services more proactively in response to the Great East Japan Earthquake. Some 40% of city, ward, town and village governments are doing so. The Great East Japan Earthquake might have prompted local governments to introduce or consider introducing cloud services.

3. Private enterprises' change in thinking after the Great East Japan Earthquake

(1) ICT and business continuity plans based on experiences with the Great East Japan Earthquake

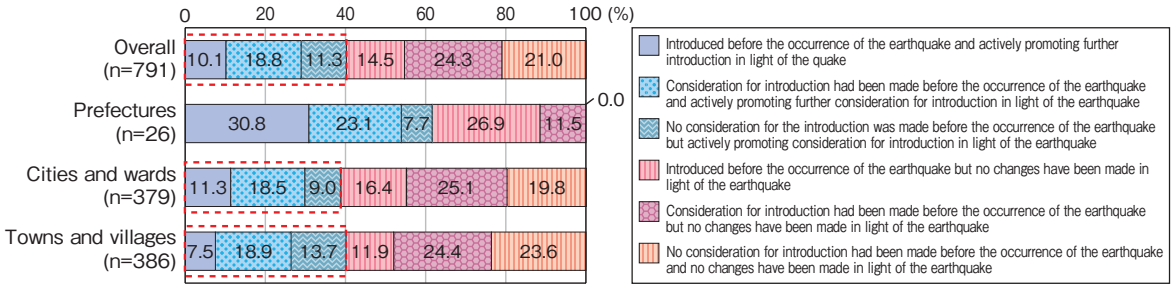
When we questioned private enterprises about the introduction of BCPs in a poll, 20.8% of them said they had prepared BCPs, indicating that private companies have promoted their BCP preparation efforts more than the abovementioned local governments (Figure 3-2-3-1). But those that had prepared BCPs or were considering their preparation after the disaster were limited to some 40% of all responding enterprises, less than the 60% for local governments. Private enterprises' change in thinking after the disaster was smaller than that of local governments. Large companies have promoted their BCP preparation efforts more than small and medium-sized ones, indicating a BCP preparation gap between size groups.

Figure 3-2-2-3 State of BCP Preparation



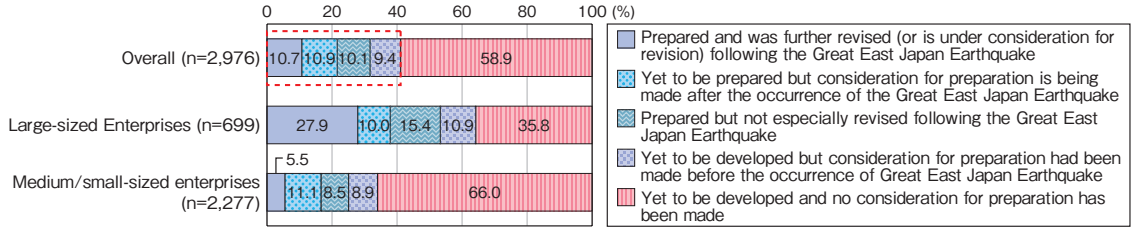
(Source) MIC "Survey on ICT's Effects on Economic Growth (2012)"

Figure 3-2-2-4 Introduction of cloud services and consideration of cloud service introduction



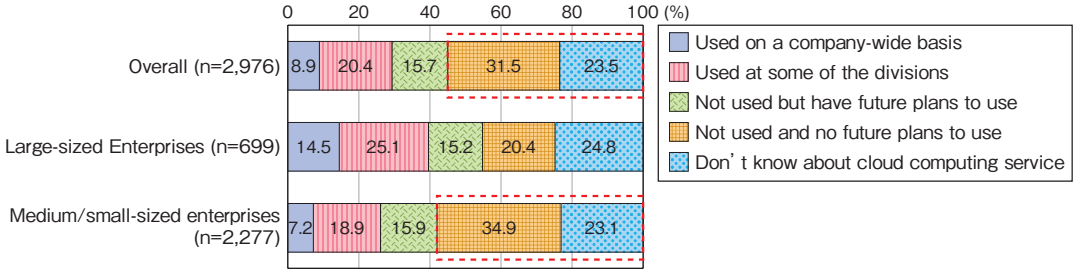
(Source) MIC "Survey on ICT's Effects on Economic Growth (2012)"

Figure 3-2-3-1 State of BCP Preparation (private enterprises)



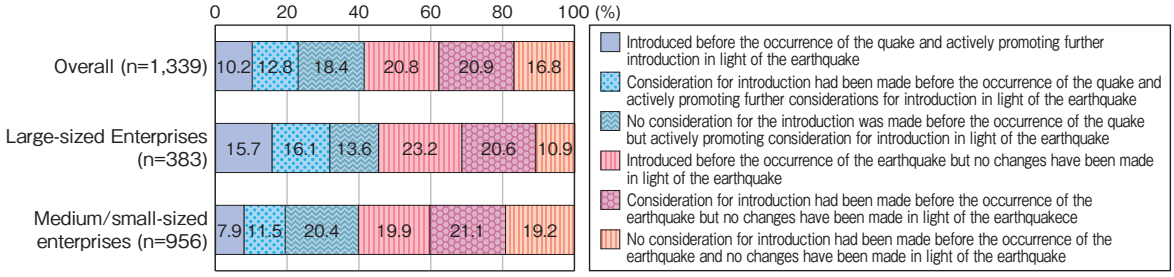
(Source) MIC "A Survey on ICT's Effects on Growth (2012)"

Figure 3-2-3-2 State of cloud service utilization (private enterprises)



(Source) MIC "A Survey on ICT's Effects on Growth (2012)"

Figure 3-2-3-3 Introduction of cloud services and consideration of cloud service introduction (private enterprises)



(Source) MIC "A Survey on ICT's Effects on Growth (2012)"

Those that have prepared BCPs accounted for 43.3% of large enterprises compared to only 14.0% of SMEs.

(2) Expectations for Cloud Services

When we questioned enterprises about their cloud service utilization, only 8.9% of responding companies said they had fully introduced such services. Those using cloud services fully or partially accounted for some 30%. This percentage is smaller than for local governments (Figure 3-2-2-3-2). Of large enterprises, 45.2% are unaware or only slightly aware of cloud services or have never used them with no plan to use them in the future. Of SMEs, some 60% are unaware or only slightly aware of cloud services or have never used them with no plans to use them in the future. Private enterprises have not promoted the utilization of cloud services as much as local governments. As for some change in the cloud service utilization policy after the disaster, some 40% of enterprises were prompted to more proactively introduce or consider introducing cloud services (Figure 3-2-3-3).

Section 3

Lessons of the Great East Japan Earthquake and ICT

We here would like to cite major challenges as indicated by surveys that have been introduced so far.

1. Information conveyance in disaster-damaged areas and ICT

(1) Quick, certain information provision using diverse information conveyance means

In interview surveys, high ratings were given regarding the performance of the nearly instantaneous radio during the disaster occurrence and to the interactive mobile phones and E-mail just after the disaster, once again indicating the importance of broadcasting and the mobile phone during disasters. While broadcasting means including the community broadcasting were frequently used, the highest utilization rate was limited to 40 plus percent for the radio. Broadcasting was found as failing to sufficiently provide instantaneous and regional information. While information provision through community broadcasting and extra disaster broadcasting stations was conducted along with information gathering through personal communications widely, advanced Internet users took advantage of social media for effective information collection. Mobile phones had been expected to be useful and have turned out unusable during the disaster occurrence and during the evacuation. Administrative information was viewed by many interviewees as insufficient. But Internet users were among interviewees who were more satisfied with administrative information. Administrative information was given high ratings by nonprofit organization officials and volunteers who made effective use for the Internet.

Given the abovementioned indications, diverse infor-

mation conveyance means including not only broadcasting and mobile phones but also that the Internet and social media should be used simultaneously to secure prompt, accurate information for residents, workers and tourists.

We must take note of the fact that the disaster indicated the importance of securing power sources for both the transmitting side (including base stations and broadcasting station equipment) and the receiving side (including mobile phone terminals and TVs). Meanwhile, Japan is required to diffuse the "public information commons" to quickly and efficiently provide such administrative information as disaster evacuation advisories and orders to relevant local residents through various media including the TV, mobile phones and radio.

(2) Importance of mobile phones during disasters

Mobile phone terminals are rated high as familiar information terminals. At the time of the disaster occurrence and during their evacuation, most people in the disaster-damaged areas carried mobile phone terminals with them. But many of them complained that the impact of these terminals' prolonged unavailability was serious. An interviewee went so far as to say, "Measures for securing communications with mobile phones are more necessary than the enhancement of embankments." Interviewees also pointed out that mobile phone functions should be improved to allow emergency information to reach mobile phone terminals that people always carry with them.

Needs for mobile phones were strong not only during the disaster occurrence but also during evacuation. It could be said that discontent with mobile phones as information sending and receiving tools disappeared with the recovery of the network. .

While the importance of mobile phones has once again been recognized through the disaster, mobile phone companies are required to enhance mobile phone networks' resistance to disasters and terminals' functions.

(3) Securing ICT tools

Regarding needs for ICT tools in the disaster-damaged areas, we saw strong demand for mobile phones at evacuation centers and for TVs at temporary houses. Supply-demand matching efforts are required to secure supply meeting demand for these basic information terminals for people over a wide area forced to live at evacuation centers or temporary houses for a long time, as seen after the Great East Japan Earthquake. A majority of interviewees said no special consideration was given to elderly people at evacuation centers. The introduction of tablet computer terminals, etc., to give elderly people easy access to ICT tools has surfaced as a challenge.

2. Information behaviors and usage of ICT in neighboring areas

(1) Importance of Internet-based information provision

The disaster seriously affected not only the disaster-damaged areas but also their neighbors including the Tokyo metropolitan region. Information behaviors of commuters in the metropolitan region indicate that they dominantly used TVs for obtaining information. They saw news sites as more important than newspapers. They pointed out that while it was difficult to obtain service on mobile phones, websites and personal computer E-mails were more accessible. Especially, information through the Internet was very useful. Meanwhile, social media, though attracting much attention after the disaster, generally failed to provide necessary information to commuters sufficiently. How best to make necessary information easily accessible through social media is a challenge.

(2) Smooth provision of transportation information to stranded commuters failing to return home

Mainly in the metropolitan region, a large number of commuters were stranded and failed to return home on the disaster day. What these stranded commuters wanted for their return home were information-gathering goods, including portable TVs and radios, and batteries for mobile phones. This indicates that it is important to secure various information conveyance means and convey information accurately not only in the disaster-damaged areas but also in neighboring areas. After the earthquake-tsunami disaster, there were strong needs for information on railway, subway and road transportation services, suggesting that efforts are required to smoothly send such information. Such efforts are discussed as part of measures for stranded commuters failing to return home at a panel of representatives from central and relevant local governments. This summer or autumn plans to compile such measures to be taken on a big earthquake with its epicenter below Tokyo.

3. Business continuity and utilization of ICT in and after disasters

(1) Addressing consciousness and effort gap between size groups

Given that the disaster affected business continuity in many cases, local governments and private enterprises both in the disaster-damage areas and others have grown more conscious of business continuity. Many of them have prepared and are considering preparing business continuity plans. However, BCP consciousness and

effort gaps have emerged between size groups – between prefectural and municipal governments and between large enterprises and small and medium-sized ones. We must appropriately address these gaps in order to enhance the entire society's resistance to disasters.

(2) Developing an environment where cloud services are used securely

Local governments place great expectations on cloud services to be used for ensuring business continuity and are making cloud service-introduction efforts. But private enterprises have lagged behind local governments in this respect. Problems with the cloud service introduction include the absence of measures to customize cloud services to meet specific needs, information leaks and other security fears, and network safety fears. A poll of local governments shows that more than 40% of respondents cited these three points. These problems represent challenges facing the entire cloud services. With a view to ensuring business continuity in disasters, we may be required to develop an environment where enterprises and other entities can securely use cloud services.

Section 4

Enhancing anti-disaster ICT measures based on lessons of the Great East Japan Earthquake

1. Government measures

(1) Cabinet Office responses

In an effort to thoroughly review earthquake and tsunami countermeasures in response to the Great East Japan Earthquake, the Central Disaster Prevention Council on April 27, 2011, established a special panel on earthquake and tsunami countermeasures based on lessons of the Great East Japan Earthquake. Based on final recommendations given by the panel on September 28, the council revised its basic disaster prevention plan on December 27.

(2) IT Strategy Headquarters responses (IT disaster-prevention lifeline promotion council)

On March 9, 2012, the IT Strategy Headquarters established an IT disaster-prevention lifeline promotion council to consider and diffuse disaster-prevention lifelines using ICT and enhance information-sharing and cooperation between the public and private sectors.

2. MIC responses – Enhancing ICT's resistance to disasters

(1) Enhancing communications' resistance to disasters

a. Securing communications in emergencies including large disasters

In April 2011, the Ministry of Internal Affairs and Communications created a panel on how to secure communications in emergencies including large disasters. The panel submitted final recommendations on December 27, 2011.

b. R&D for enhancing communications infrastructure's resistance to disasters

The MIC has launched research and development efforts to improve communications infrastructure's resistance to disasters under the third FY 2011 supplementary and FY 2012 principal budgets. Under the FY 2012 budget, the MIC is implementing the research, development and evaluation of "satellite communications networks effective in disasters" and "technologies to quickly increase communications capacity in emergencies" as information and communications network infrastructure technologies to be required for secure information conveyance in disasters.

c. R&D and demonstrations of information and communications technologies responding to wide-area disasters

Under the FY 2011 budget, the MIC implemented an early adoption of research and development fruits and demonstration tests in disaster-damaged areas to help contribute to the reconstruction of areas damaged by the Great East Japan Earthquake.

(2) Enhancing broadcasting's resistance to disasters

Based on an analysis and assessment of damage to broadcasting equipment in the Great East Japan Earthquake, the Information and Communications Council gave additional consideration to technical conditions for broadcasting safety and reliability that had been under consideration since before the disaster. The council then concluded that blackout countermeasures should be enhanced. Based on the council's recommendations regarding this point (May 17, 2011), the MIC implemented the technical standards for broadcasting safety and reliability on June 30, 2011.

3. Restoration and reconstruction from the Great East Japan Earthquake

In order to revive societies and economies and reconstruct the livelihood in the disaster-damaged areas and revitalize the entire Japan, the government must make all-out efforts to promote restoration from the Great

East Japan Earthquake and far-sighted reconstruction efforts including the creation of safe, secure and future-oriented towns using sophisticated ICT technologies.

Under the FY 2011 supplementary and FY 2012 principal budgets, the MIC has ensured key communications in the disaster-damaged areas, deployed power source vehicles for disaster countermeasures, supported the recovery of information and communications infrastructure and helped local government's ICT-using efforts (Figure 3-4-3-1) to promote the post-disaster restoration and reconstruction. In order to implement these measures steadily, the MIC created a Great East Japan Earthquake Reconstruction Support Office at the Tohoku Regional Bureau of Telecommunications on May 9, 2011. MIC officials have been sent to disaster-damaged municipalities to support municipal governments' restoration and reconstruction of the information and communications environment.

Figure 3-4-3-1 Projects subject to the information promotion program for the disaster-damaged areas