# Journal of Socio-Informatics

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# Disasters and IT

Hirohiko IZUMIDA, Governor of Niigata prefecture

Thank you for giving me today's opportunity. As introduced earlier, it was my first job as the Governor of Niigata Prefecture to deal with a disaster. On Friday five years ago ex-governor left the prefectural office, and I was scheduled to start as the governor at 0 a.m. on Monday. However, at 5:56 p.m. on Saturday, an earthquake of magnitude 6.8 occurred in Niigata. What we experienced then was that we had lost means of contact. Today I would like to talk about the roles of IT at the time of disasters, including the reasons we lost means of contact.

By the way, I studied IT pretty well in my Ministry of Economy, Trade and Industry days, and had an aspiration to be a governor who knew well about IT. In reality, I tend to be chased by facts of disasters, however. In that sense, I think I was given the right address theme "Disasters and IT" today.

First of all, please let me explain what kinds of disasters occurred in Niigata Prefecture, especially in relation to earthquakes.

In fact, since I became the governor, we have already requested Self Defense Force to go into action five times. Two of the requests were due to earthquakes, and another two were due to heavy snow. Among the snow cases, there was the case that the border of Nagano Prefecture and Niigata Prefecture became isolated because of the closure of the national highways at the danger of avalanche. We requested Self Defense Force to go into action in the case of the flood around Kashiwazaki city area. In total, I have dealt with disasters five times: twice in the case of heavy snow, twice in earthquakes, once in flood. Among such cases, earthquakes give the most serious impact to the society.

Please have a look at Figure 1 about the situation of Niigata Prefecture. Its location is a little north of the center of the main island of Japan. The prefecture is divided into Joetsu, Chuetsu and Kaetsu, and the length of the coastline is about 333 kilometers. As the JR Shinkansen line between Niigata station and Tokyo station is 333 kilometers, the coastline is almost as long as the distance between Niigata and Tokyo.

In Figure 2, the deep gray shows The Mid Niigata Prefecture Earthquake five years ago, the light gray shows The Niigataken Chuetsu-oki
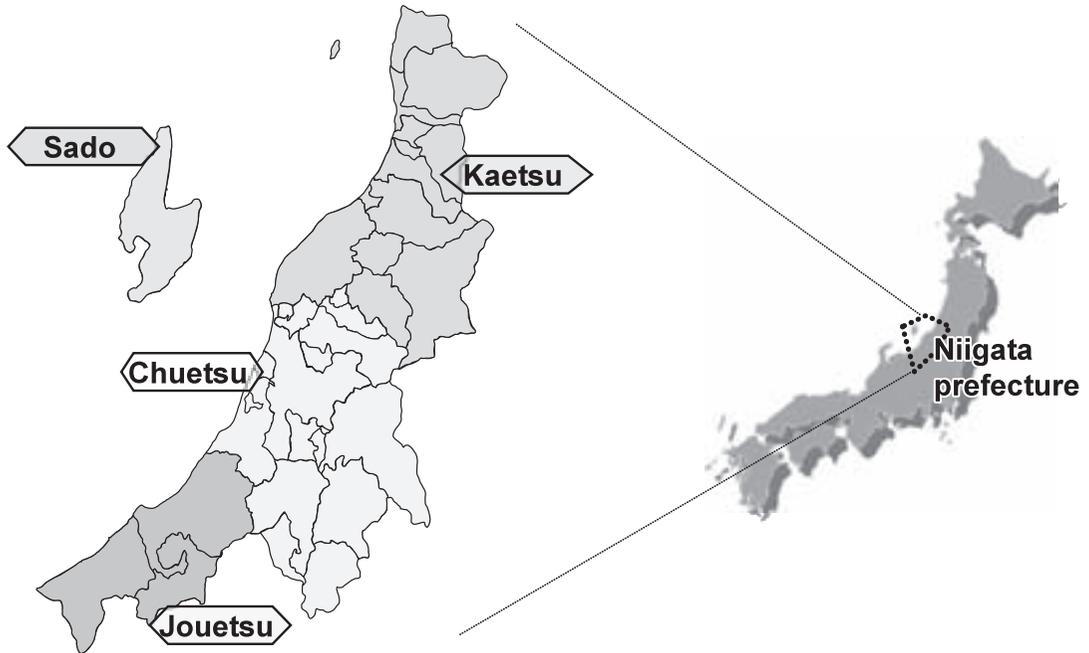
Figure 1    Outline of Niigata prefecture
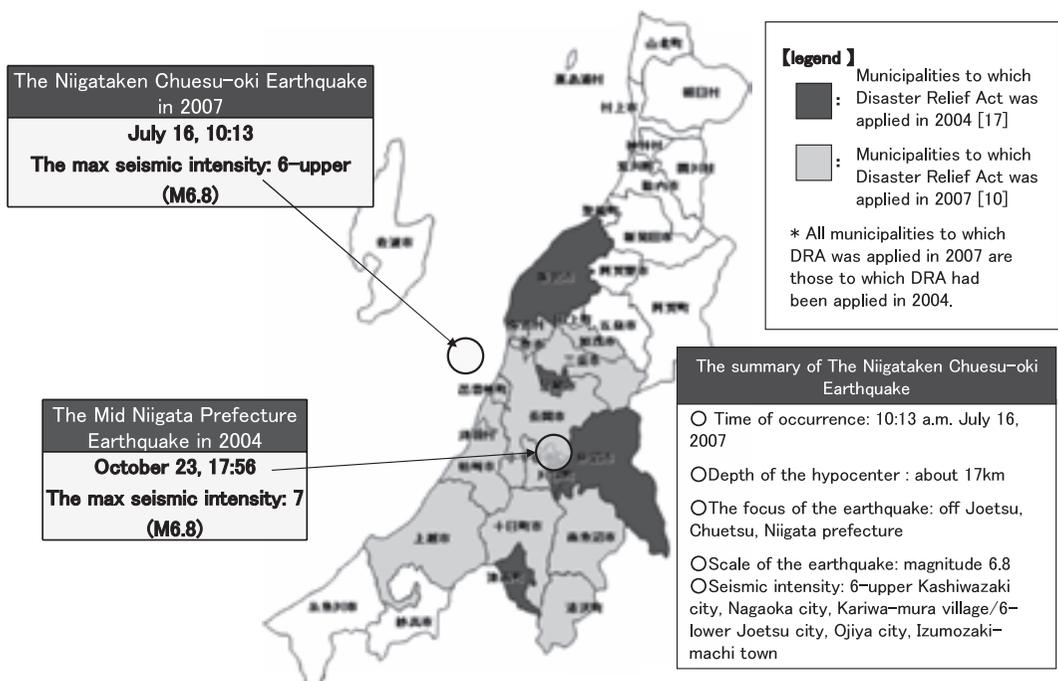
Figure 2    Summary of The Niigataken Chuesu-oki Earthquake

Earthquake two years ago. Please look at The Niigataken Chuetsu-oki Earthquake area at the upper left. It says 10:13, July 16, magnitude 6.8. Please look at The Mid Niigata Prefecture Earthquake in 2004 just under that. It says 5:56 p.m., October 23, magnitude 6.8. It means that the two earthquakes occurred within the distance of 40 kilometers and that both are so-called reverse fault type: the pressured ground slides diagonally upward and causes an earthquake. In short, they occurred at almost the same place, on almost the same scale, with the same cause. The maximum seismic intensity of the earthquake five years ago was scaled 7. The Mid Niigata Prefecture Earthquake has made the record of maximum seismic intensity after Great Hanshin-Awaji Earthquake since the machine measurement started. The earthquake two years ago occurred with almost the same cause, at almost the same place, on almost the same scale, and the maximum seismic intensity was scaled 6-upper. I think the difference between them was that the first occurred on the land and the second occurred in the sea. Although the magnitude was same, the seismic intensity of two years ago was scaled 6-upper and that of 5 years ago was scaled 7 because the measurement machine was only on the land.

It is important to note that every earthquake has unique appearance; it is because the social environment is always changing, never stays the same. To take a plain example, an earthquake

Table 1 Comparison between The Niigataken Chuetsu-oki Earthquake and The Mid Niigata Prefecture Earthquake

| | | The Niigataken Chuetsu-oki Earthquake (October 22, 2007) | | The Mid Niigata Prefecture Earthquake (August 23, 2007) |
|---|---|---|---|---|
| summary of earthquakes | scale | magnitude 6.8 | | magnitude 6.8 |
| | max seismic intensity | 6-upper | | 7 |
| municipalities to which Disaster Relief Act was applied | | 10 | | 17 (after amalgamation) |
| human damage | the dead (person) | 14 | | 68 |
| | the injured (person) | 2,315 | | 4,163 |
| damage to houses | completely destroyed (house) | 1,244 | | 3,175 |
| | half destroyed (house) | 5,250 | | 13,808 |
| | partly destroyed (house) | 34,045 | | 103,854 |
| | total sum (house) | 40,539 | | 120,837 |
| evacuation | places of refuge (place) | maximum 116 | present 0 | 603 |
| | the evacuated (person) | maximum 12,483 | present 0 | about 103,000 |
| lifelines | Electricity (blackout) (house) | maximum 35,000 | restored in about 2 days | about 300,000 almost restored in about 10 days |
| | gas (suspended) (house) | maximum 35,000 | restored in about 40 days | about 56,000 almost restored in about 2 months |
| | waterworks (cut off) (house) | maximum 61,000 | restored in about 20 days | about 130,000 almost restored in about 1 month |
| characteristics of earthquakes and damages | | ・Buildings such as private houses in the center of the city were damaged ・Earthquakes attacked again in the process of restoration ・The nuclear power plant was damaged, which affected the area around it | | ・Traffic networks such as JR Shinkansen lines and highways were cut off ・The ground in mountainous areas was affected |

occurred around here about 150 years ago. It is called the 1828 Echigo-Sanjo Earthquake. It occurred in the Edo Period. What happened when an earthquake had occurred then? The 1828 Echigo-Sanjo Earthquake is supposed to be on the same scale as The Mid Niigata Prefecture Earthquake and The Niigataken Chuetsu-oki Earthquake, but the circumstances of people's life were very different from today: there was no such thing as electricity; there was no road for cars; most houses were thatched-roofed; people led a self sufficient life. In my childhood there was heavy snow called Unusual Heavy Snow in Hokuriku District in Syowa 38th year 1963 winter. In Niigata those days, most families had stock of rice at home. They also had salted salmons and pickled vegetables at home. In short, they led a life that had no problem even if they had been isolated and shut up by the snow all through the winter. In such age, all they had to do after an earthquake was to reform broken buildings a little. On the other hand, nowadays, physical distribution will stop if roads are broken. Electricity will stop and information will be interrupted. What an earthquake gives to the society nowadays is completely different from that in the Edo Period.

By the way, I was in Vancouver at the time of Great Hanshin-Awaji Earthquake. There was no Internet then, and the most troublesome thing was that we could not make sure if our families and relatives in Hanshin-Awaji area were all right or not. All the information we got in Canada then was TV news which showed scenes of billows of smoke and just said, "Kobe was hit by great earthquake", giving us no further details. We got no information except for the number of the dead which was increasing with time: it started with five, and was amounting to 2,000, and to 3,000. We had no information if our families were all right, if

we would be able to go home from the airports. The information from the Ministry of Foreign Affairs came to Ottawa first, then to the consulates, which was very slow and perfunctory. There was no precise information, no information that people from Kansai area craved at all.

We got information through the PC network communication services then.

On the other hand, the roles of volunteer activities have come to be largely recognized since Great Hanshin-Awaji Earthquake. What troubled us at the time of The Mid Niigata Prefecture Earthquake five years ago was how to locate volunteers adequately, and that was extremely important. There is a saying, "Too many chefs spoil the broth". We had to dispatch adequate persons to adequate places in order to avoid that saying's situation.

Moreover, distribution of relief supplies is also hard work. If we call "Please send relief supplies to the city hall", what will happen? Administration is amateur of physical distribution. Then the relief supplies will be piled up. Nobody knows what and where they are, and cannot distributes them. In the end, some people send old clothes which might be regarded as rubbish. The problem then will be how to support adequately. Telling from the conclusion, we really feel that contribution in cash is enough. Even if we are not so explicit, we have to gain necessary supplies such as water and food first of all, and decide how to deliver them to places of refuge adequately. To send information about when, where, and what kind of volunteers are needed, I really feel that IT is an extremely effective tool.

Excuse me for returning to the earthquakes. Disasters never happen in the same way twice. The earthquake of five years ago and that of two years ago show completely different aspects. What

troubled us most at the time of the earthquake which had occurred 30 hours before I became the governor was isolation. That was the biggest problem, and I suppose some of you might remember the keyword, "Yamakoshi-mura village". All people could do to let us know what was lacking was to write down "SOS", then "milk", "diapers", "water" on the road. This was the situation at the time of the earthquake five years ago. It was truly hard then to grasp what kind of people could escape from the mountainous area, to grasp where and how people were isolated. "No news is good news" is a usual way of administration. We deal with petitions passively when they come if there are problems. But we cannot do so in case of disaster. We must judge that it is a crisis if we do not get information. I think it is a very much different pattern of administration from that of the usual time.

Although there are only 31 municipalities in Niigata Prefecture now, there were 112 when I became the governor. The number of municipalities was greatly lessened by The Heisei Municipal Amalgamation. At the time of The Mid Niigata Prefecture Earthquake, I phoned the city mayors, the town mayors, and the village mayors of all the municipalities along the list. There were two mayors who I could not contact then. One was the mayor of Kawaguchi-machi town, where the seismic intensity was recorded 7. The other was the mayor of Yamakochi-mura village, who is Mr. Nagashima, MP now. I could not contact these two.

Afterwards, the line was temporarily connected to Kawaguchi-machi town around 2 o'clock in the morning. Let me tell you why we could not contact them just after the earthquake. The entrance of the Kawaguchi-machi town hall was about to fall at any minute. Judging that the headquarters of disaster control should not be in the town hall in case the hall itself fell, they put up a tent in front of the town hall. Then they decided that they would rely on a satellite phone for outside contact. However, there was only one satellite phone, so the line was always busy. That was the reason we could not contact through the regular lines, which became clear afterwards.

There was a different reason we could not communicate with Yamakoshi-mura village, on the other hand. Here, mountains did not fall, but moved. They stopped a river, which buried three-storied houses in the water. What happened when mountains moved was that roads became scattered. Underneath the roads, there were optical fiber cables and all kinds of infrastructures. As for the wireless base stations, they were supposed to be driven by batteries for three hours, but the line was not connected with optical fiber cables being cut off even when the radio wave was O.K. Then why was it possible for me to contact the mayor of Yamakochi-mura village? There was a core city called Nagaoka city next to Yamakoshi-mura village. They got amalgamated later and became one Nagaoka city now. There was one place between Yamakoshi-mura village and Nagaoka city where radio wave could be received. The village mayor knew that, and he got connected with me on the way to that place.

I asked him, "How is the situation of Yamakoshi-mura village?" I am speaking from my memory, so it can be slightly conflicting with what the mayor remembers. He answered, "It is all over now. It has collapsed completely." I asked him, "Do you need help from the prefecture?" He said, "Please, absolutely." Then all the roads to Yamakoshi-mura village got disconnected and the mountains fell, all the access to Yamakoshi-mura village was stopped. We sought Self Defense Force's help.

To tell the truth, there was something that was the first in history here. There were 2,200 people in Yamakoshi-mura village. It was a big operation to evacuate 2,200 people of the whole village by helicopter. There are two regiments in Niigata prefecture: the Shibata regiment and the Takada regiment. Normally we ask regiment commanders about almost everything and they handle our requests. But this whole village evacuation was such a big operation that we were told to ask the upper level of the Force when we asked the regiment commanders. Then we phoned the brigade commander of Japan Ground Self Defense Force 12th Brigade in Soumagahara, Gunma. He said, "This is too big for us to handle, you must ask the upper level." So we had to phone Chief of Staff, Ground Self Defense Force. Now regiment commanders can judge and operate, but they could not do so those days when operations were on too large a scale. Chief of Staff said to me later on, "You are perhaps the first and the last who requested Chief of Staff to go into action in case of disaster." Now the lower level has all the authorities and regiments can do all, and the upper level does not tell the lower level to operate. Those days, however, only the upper level could operate on such a large scale.

As this earthquake occurred at 5:56 p.m., it was difficult to gasp the situation. In fact, it was on the next day that headquarters for emergency disaster control were installed. The reason they were installed was that Chief of Staff phoned the Prime Minister about the evacuation of the whole village of Yamakoshi-mura village by helicopter units on a large scale. That was how they were installed.

Therefore, it is extremely difficult to grasp the situation at the time of disasters which occur after dark. In fact it took more than two years for all the electricity to restore finally. It was quite hard to restore electricity in the places where mountains had fallen, so it took about two weeks to restore electricity up to the level that people could live somehow. It is really tragic to live without electricity for two weeks. We get nervous at night. At the time of the earthquake five years ago, there were especially many aftershocks. There were aftershocks so often. The earthquake of seismic intensity 6-upper occurred three times in three to four hours, and there were continuous aftershocks after them, people spent anxious nights without electricity.

As I actually saw the village from the sky, it was pitch dark. Basic electricity systems were cut off, which had to be mended. It was pitch dark under such circumstances. What would happen then? Personal computers were just boxes without electricity. IT was completely useless with communication lines being cut off. We could not use cell phones, either. Batteries of cell phones would be empty. It was hard to charge them. It was hard even after the electricity restored, because we had to overload an electrical circuit at the places of refuge. We had to charge up with loads of adaptors getting electricity from one outlet. Each adapter had loads of chargers. It is often said that we have personal TVs as we have One Seg now, but it is clear that we cannot use them from the moment the batteries are empty.

On the other hand, the situation with electricity at the time of The Niigataken Chuetsu-oki Earthquake two years ago drew a mottling pattern in spite of the same magnitude 6.8, because it had occurred in the sea. Looking from the sky, we could both see the areas that electricity was cut off and the areas that it was not, which drew a mottling pattern. Then the circumstances were completely different; there was no problem of isolation from the beginning, and we could contact from the

first.

But we had another problem: we had difficulty in contacting places where information concentrated. Five years ago I had a PHS, Personal Handyphone System. As most people in Niigata used cell phones of NTT docomo or au by KDDI then, I could use the PHS almost everywhere. Although it was not a dedicated mobile phone for priority communication in a disaster, I had no difficulty in making contact. On July 16 two years ago, I was in the official residence of governor, because it was Saturday. I could check information from Japan Meteorological Agency at the official residence and I understood that the seismic intensity of the earthquake was scaled 6. I understood what to be done at once, and took action immediately. However, I could not make contact on the way to the prefectural office from the residence, which took 15 to 20 minutes. I had phoned the Crisis Management Director first of all within 15 seconds after the earthquake had stopped, but I could not make the second contact with him. The reason we could not contact was that we were calling each other at one time. It was the same with Chief of Disaster Management Bureau, section managers, general managers of all departments and the related organizations: when we phoned each other at the same time, we could not make contact. Despite that I had a high priority emergency mobile phone, I could not make contact in transit. That is why I have two cell phones now: one as a receiver, and the other as a sender. We cannot make contact through active lines at the places where information concentrates.

The reason that headquarters for emergency disaster control are necessary is that it is important to have many people within call. I went to the operation room immediately at that time, and I was to make contact with mayors of all related municipalities. As all I had to do was to give instructions, I could talk to the mayors after I had said, "Connect me with each municipality". I could talk to them as they got connected one after another.

It was also hard to contact The Tokyo Electric Power Company. Some of you might have heard of the situation as it was examined in detail. The emergency operation room door of the nuclear power plant was blocked due to the earthquake and they could not get in. There is hotline between the prefectural office and the nuclear power plant, but they could not make contact because we could not reach the hotline.

After all, we made contact with the Tokyo main branch of The Tokyo Electric Power Company at first. As a result, we were reported that all the reactors had been scrammed and that no radiation had escaped. Recognizing the report, we were watching TV at headquarters for emergency disaster control. Because generally information from the press is much quicker than that from the government office, we give instructions while we watch TV. As we were watching TV, we suddenly saw smoke and fire on TV. We cried, "What's this?" Then we started to make contact again.

The reason that we could not get information and that we could not make direct contact at the time of the earthquake five years ago was that the telecommunication cables had been cut off; the reason of the same problems at the time of the earthquake two years ago was that the lines became too busy and congested. Therefore, it is true that disasters never happen in the same way twice.

What would have happened ten years ago? The culture of the mobile phone was very limited then. The world of the car phone was completely different from that of the mobile phone with i-mode

services, so we would have dealt with a disaster in quite a different way. We can say that what to be done at the time of disaster becomes totally different within 10 years or 20 years.

What to be done at the time of disaster also depends on seasons. The earthquake five years ago occurred on October 23. There was no drinking water and food then. We supplied bottled water to secure drinking water, and that was roughly enough. We sent food and relief supplies that could be drunk and eaten immediately at the time of The Niigataken Chuetsu-oki Earthquake, according to this experience. However, people in the affected areas claimed, "There's no water. There's no water." So we went there ourselves and saw the piles of water bottles accumulated at the places of refuge. Five years ago, it was hard even to collect bottled water. Rice balls go well with water or tea, but at that time, just something to drink was enough. People who lived on coke and cold rice balls for a week said, "You are being so good to us", which drew tears from us. We had to give them coke, juice, and rice balls at the same time then. At the time of the earthquake two years ago, on the other hand, people claimed that they had no water, although we had sent them bottled water.

The problem of water had something to do with seasons. It was the difference between July 16 and October 23. October 23 was already late fall, we did not perspire much. On the other hand, it was hot on July 16. It was particularly hard hygienically. When I visited an elementary school in the evening, people there called out, "Mr. Izumida, come over here. We have a problem with toilets." Because many people gathered at the places of refuge, toilets got clogged very easily. Although they were flush toilets, people could not flush without water and they got clogged with excrement.

People said, "We scrape them by hand and manage to flush with water from the swimming pool brought by bucket brigade. Please do something to the toilets." The problem was how to clean hands after toilet. We can manage to clean them with bottled water in fall, but we cannot do so in summer. People in poor health might be infected with some kinds of bacteria. That was why we had to think about water to wash hands after toilet.

In addition to that, people perspired. They wanted to wipe bodies, at least, before they went to bed, but there was no water. They wanted to wash T shirts smeared with sweat, but there was no water.

Kashiwazaki is close to the sea and there is a harbor there. An escort vessel came alongside the pier and supplied water. Conditions then were far better than the time of The Mid Niigata Prefecture Earthquake. The huge escort vessel supplied water steadily. But the water supply was 1% of daily water supply when we can use water freely. How can we survive with only 1% water supply? Daily functions will stop completely.

Therefore, we have to escape from the places of refuge because we suffer heat illness there when it is hot in summer. An airplane which arrives at Narita Airport air conditions the plane after the engine has stopped by fitting a large-sized truck loading an air conditioner to it. We borrowed the trucks and fitted them to the gymnasiums in order to air condition them. We installed quite a number of air conditioners which had been offered.

But they could not cover all. It is difficult to install everything everywhere although we are supposed to be fair at the time of disaster. At the time of the earthquake two years ago, it was necessary to set up an air conditioned welfare refuge where we could accommodate people in poor health and elderly people preferentially.

It frightened us to suppose The Mid Niigata Prefecture Earthquake having occurred two months later from October 23. It snowed heavily that year. If it had occurred two months later when the snow was piled on the roof by one to two meters, the number of the crashed houses would have been incomparable.

Moreover, motorbike corps could not have gone to the deep mountains and looked for isolated villages if it had occurred two months later. They must have waded through the roads which might have been collapsed anywhere. It must have been just like mountaineering.

I made my way to the center of the earthquake in October 23. Normally we do not see people along the mountain paths even if we see house lights. But there was a flood of people then; I had never thought that so many people lived in Niigata. I saw more and more people as I approached the center of the earthquake. The reason that I saw many people was that they had come out of the houses which might collapse with tremors. They made a bonfire to keep themselves warm. It was a fine, starry night. What would have happened if it had been a day of snowstorm? Moreover, there were more and more elderly people as we went into the deeper mountains. What had become of elderly people of 70, 80 years old if they had been crashed by snow? There is a danger of death from cold if people are out of the houses and cannot make a bonfire because of snowstorm. We have been researching the dealings of such earthquakes in case they occur in the middle of winter when there is snow piled up on the roof. We have not found the answer yet. They depend totally on seasons, ages, places, and timing of the disasters. That is the frightening aspect of disasters.

By the way, in figure 2, differently colored are

## The Mid Niigata Prefecture Earthquake (October 23, 2004)
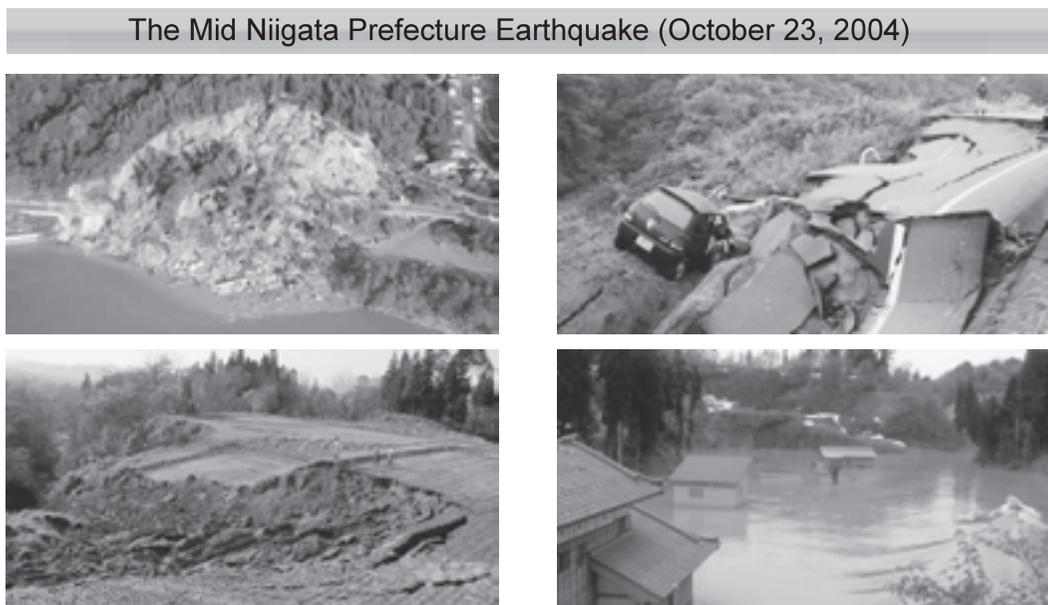


"Mountains moved." Earthquake damages in mountainous areas

Public infrastructures such as roads, rivers, lifelines were severely damaged

Figure 3　Characteristics of the two big earthquakes which attacked Niigata prefecture (1/3)

the areas to which Disaster Relief Act was applied.

Please look at the situations at that time. The upper left of figure 3 is a place called Myouken. This is where a boy was shut up in a car and was rescued miraculously. The other pictures show what became of roads of the mountainous area and rice fields. The lower right shows the flood which was caused by a natural dam made by the earthquake: the houses were going steadily under the water then.

In Myouken, a fire station reported by wireless that the natural dam had swallowed three cars. It was obvious from the image of the falling accident in Hokkaido that the fire stations and the police would not be able to handle the situation, so we decided that the Self Defense Force was necessary on the spot.

I went to the scene myself on the day. I saw a truck that had fallen down. There was a low displacement car. There was a red car. All three of them were there. A police man said, "We have rescued all three." I asked, "Are you really sure that there is no other car?", then he said, "Yes, we are sure." But a day later, a person reported, "My family has not been back." Then I instructed to check the point which had received the final call from the missing family. A helicopter found a mobile phone which was ringing there. After all, it is IT that has something we can find as we search information steadily.

Figure 4 shows the situations of The Niigataken Chuetsu-oki Earthquake two years ago. It was the earthquake on the same scale as The Mid Niigata Prefecture Earthquake, but it occurred in the city area. It was an earthquake which can occur in any city anywhere. What will happen if an earthquake occurs along the coastline? When the Niigata

## The Niigataken Chuesu-oki Earthquake (July 16, 2007)



The earthquake attacked a "provincial mid-sized town" which is everywhere all over the country

It attacked people's life, and many of their houses were damaged

Figure 4    Characteristics of the two big earthquakes which attacked Niigata prefecture (2/3)

earthquake 1964 occurred 40 years ago, oil tanks were burnt down, prefectural apartment houses went upside down, Showa Bridge collapsed over the Shinano River; some of you might have seen the photos of the scenes. Liquefaction occurs, which destroys towns. If a house was O.K. in appearance, it could not accommodate people because the ground has slid. In short, the earthquake 5 years ago struck a hard blow mainly to public infrastructures such as roads which sank, schools and hospitals. The earthquake 2 years ago, on the other hand, struck mainly private properties such as houses and companies. Therefore, the dealings with the earthquakes had very different aspects.

A nuclear power plant was affected. This is the worst financial damage.

Please look at the right side of Figure 5 as a reference. These were ancient trees of the Jomon period which came out of the bottom of the sea off Izumozaki. There is a volcano called Yakiyama. The trees which might have been carried off to the sea by an avalanche of rocks and earth and buried under the sea were shaken by the earthquake and floated on the sea surface probably owing to liquefaction. They did not come up to the coast but abode at the bottom of the sea, which was a problem: it hindered fishing industry. Fishing boats of trawl fishery could not work at all. Therefore, a machine to pull up the trees was purchased and it pulled them up. These are only a part of the trees. Later, they were given to people who wanted them as an interior decoration or as an accessory. I think that the ancient trees were the restoration of disasters of the Jomon period to the present day.

Figure 6 shows the difficulties in making use of information infrastructures at the time of disaster.



## The Niigataken Chuesu-oki Earthquake (July 16, 2007)

Kashiwazaki-Kariwa Nuclear Power Plant was damaged

"The ancient trees" of 3000-6000 years ago coming out of the bottom of the sea appeared off Izumozaki
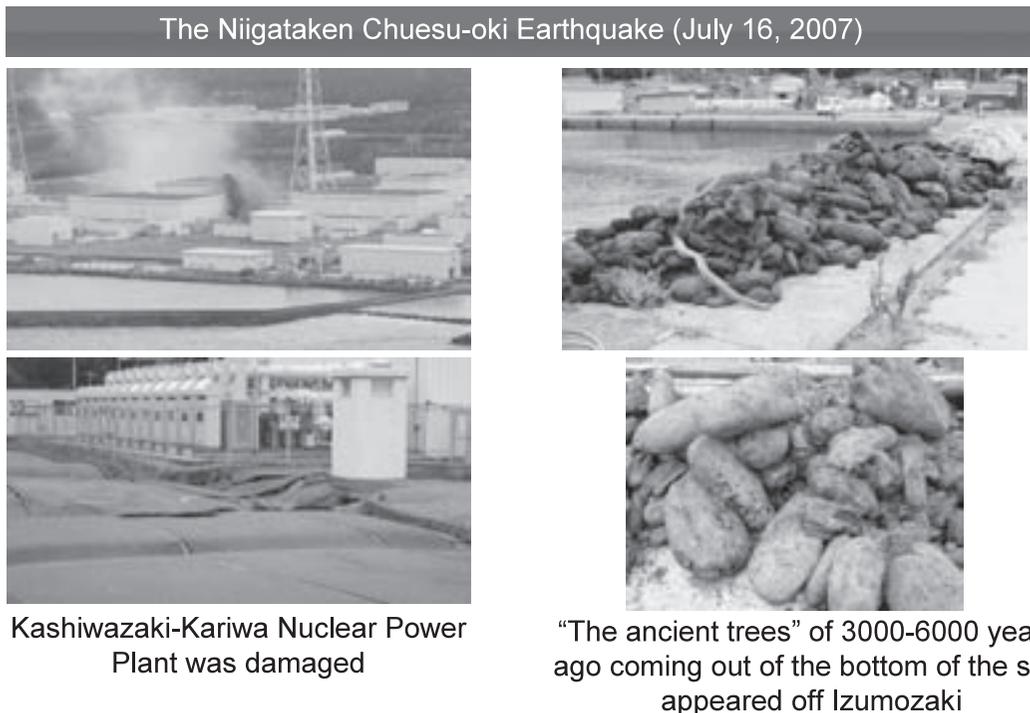
Figure 5　Characteristics of the two big earthquakes which attacked Niigata prefecture (3/3)

■Interruption owing to the trunk lines being cut off (fixed & mobile phone)

■Functions of wireless base stations and transporsers being stopped owing to blackout (mobile phone, broadcasting)

■Communication control owing to congestion (fixed & mobile phone)

⇨ We cannot connect even through high priority phone when we call each other at the same time

※At the time of The Niigataken Chuetsu–oki Earthquake, information infrastructures restored quickly thanks to the lessons from The Mid Niigata Prefecture Earthquake.

Figure 6   On  information  infrastructures  in case of disaster

As I have already told you, it can be hard to rely on them although they seem to be useful. Trunk lines of both wired and wireless phones might be cut off. You might think that it is all right if you have a satellite phone, but I doubt it. I think that it is 80% untrue to say that we can communicate in case of disaster if each village possesses a satellite phone.

Please let me explain. Oze is a national park stretching over Niigata, Gunma, and Fukushima. What is nice about it is that there is no wireless base station there. Therefore, we can be completely off the duty and enjoy the nature of Oze. Fans visit Oze every year, and I went there this year. However, I brought a satellite phone with me because there was a radio program which I had to appear by all means. When the line was connected, I spoke with a director for 15 minutes. Then the line was disconnected; the batteries became empty. We often make sure of the means of communication at disaster drills. We say, "This is ○○ area. All have evacuated Over.", then we hang up. At the time of disaster, however, we cannot communicate in 15 to 20 seconds like that. We have to exchange a lot of information at the time of real disaster. Can we use a satellite phone in case of disaster which was disconnected when the recording of the program was about to start? What should we do with the generator? I experienced myself that it was not all right if we possessed a satellite phone.

After all, there is a case that we cannot communicate with the lines being cut off, and a case that we do not have electricity because of blackout. On the other hand, there is a case that we cannot be connected because the lines are too busy. Therefore, I think that it is difficult to rely on information infrastructures so excessively especially at the early stage of disaster.

On the other hand, information infrastructures have many merits: we can send information to many people. How about community FM? Looking back after disasters, we can say that it is useful. Necessary information changes as time goes by (figure 7). In fact, community FM is completely useless immediately after an earthquake occurred. The reason is that a community FM station is affected at the same time as it exists on the spot. People working for it do not know what are happening to themselves. How about TV? It is also completely useless. We cannot turn it on without electricity. Then we do not get information of what is going on either trough TV or community FM immediately after an earthquake. By the way, when we asked local people about the information that the nuclear power plant was on fire at the time of the earthquake two years ago, "How did you get the information?", they answered, "Our children in Tokyo informed us". Because the news was broadcast in Tokyo, people in Tokyo phoned, "Are you all right?" It was then that they got the information.

TV is just a box without electricity, community FM cannot give information because it is affected itself. What is effective on the affected area is a wide area radio. It is loaded on a car, and we can listen to it with a portable radio in emergency. As I have told you earlier, it is better not to rely on One Seg too much, for the batteries become empty quickly. I would like you to remember that there is
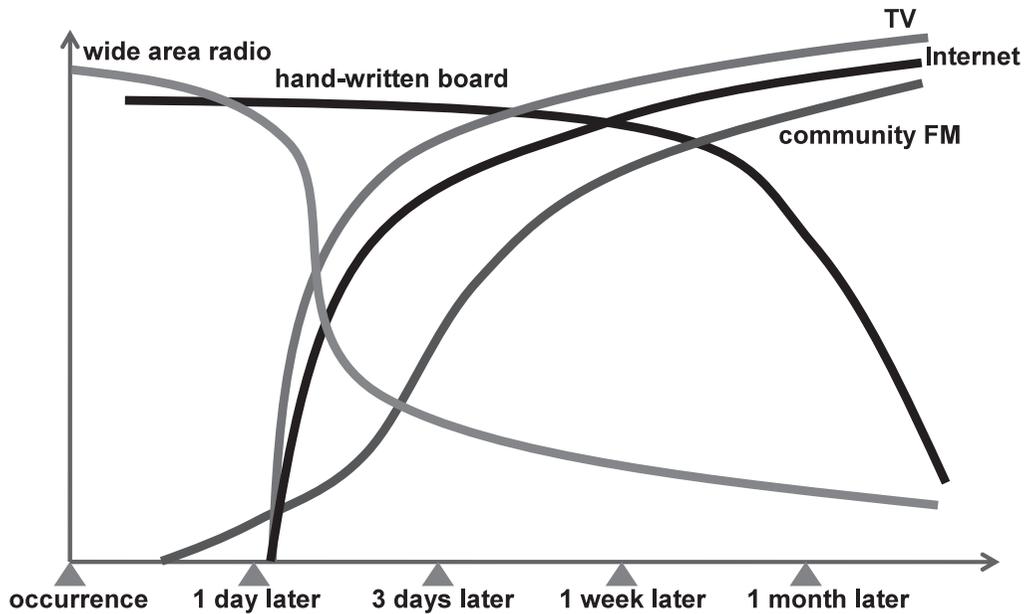
Figure 7   Importance of media in the affected areas

a danger that the normal phone call became unusable while you watch One Seg TV. In that sense, a wide area radio is effective at the occurrence of an earthquake.

As a matter of fact, what is next important is a hand written board. It is necessary to give information about when food is provided, when water is supplied, where we can take a bath. To give such information, TV broadcasting is useless. In Niigata, the same TV broadcasting covers all the prefecture of 2,400,000 people, it cannot send information like, "Relief supplies will be given at ○○ area at × o'clock." Then it is effective to put up a hand written board to provide information of each place of refuge like, "Today's meal is ○○. You can get it at ×× at ○ o'clock."

Especially in the case of an earthquake which occurs in the city area, not necessarily all the people come to places of refuge. There are people who think, "What if something is stolen?" or "What will become of our house?" and they stay at home

putting things in order and come to places of refuge only to fetch meals, because they cannot cook without water or gas. TV broadcasting is effective when we want to send information to 2,400,000 people, but it is completely useless when we want to send information that is peculiar to each place. A hand written board is effective in such cases. It is reassuring to know that there is information at the same place whenever we come, whoever comes. This hand written board is ending its role as time goes by, with less and less people are around, and as a place of refuge comes to close.

TV is effective once it is turned on with electricity. It can give the visual information of what is going on. For example, when a natural dam was made by a disaster, the prefectural headquarters for disaster control knew exactly what was going on with a heli-TV, helicopter video transmission system. There was TV which was attached to the helicopter. A solid rock stopped a river and it became a huge

puddle. We asked the mayors of municipalities to give an evacuation order to people living below the river. But when we went to the spot ourselves, people had not realized the fear of an avalanche of rocks and earth sweeping them up with the entire bogs. They piled sandbags along both sides of the river and were trying to regulate the traffic, calling out not to cross the bridge. We could not send information that all of them had to evacuate because there was a danger of an avalanche of rocks and earth sweeping up the entire bogs. We could not send it by radio, with words only. When they see a moving image of TV looking from above, they realize the danger and escape to the hills. If there is a sensor, they can escape in advance of danger. TV has an incomparable power when there is electricity. Our desire to know what is going on is so strong at the places of refuge that we can get rid of our frustration by turning on TV. We can look at our situation objectively.

I honestly feel that the Internet is useless immediately after disasters occur. We cannot establish a line of communication without electricity; the Internet is completely of no use. However, when it comes to the stage of supporting disaster victims over a long period, nothing is more useful than the Internet. For example, it is a very powerful tool to send information like, "There are elderly people who will move to ○○ district of ××city. Is anyone willing to help them?", "We want someone to talk to.", "We want people to help us put things in order.", or "We want people to help us cook." It can send information when and what people are needed. The Internet is effective because it can control information efficiently. What happened 5 years ago was that people went home without doing anything because 200 people had come when 10 volunteers were needed. We can send information effectively through the Internet

in order to send 5 people to where 5 people are needed, to send people who are good at talking to the places where talks are needed, and to send people who can nurse to the places where nursing is necessary.

Nothing is more effective than the Internet to send information like "such and such relief supplies are needed." in each district without delay. As I have told you earlier, it is foolish to receive relief supplies at a town hall. Five years ago, we asked the warehouse industry and the truck industry to support us halfway, but it caused friction between them and administration. After all, the warehouse industry and the truck industry had to give instructions. But the people who were doing the actual work got emotional and did not follow the instructions because they did not like private citizens to intervene. Then we could not help them or give instructions to them even when we understood the situation, which led to relief supplies piled up in warehouses and to the places of refuge in trouble without relief supplies.

What is terrific about IT is that organizations which have ability in delivery such as convenience stores can deliver relief supplies to each refuge using IT, exactly as they are told when and where to deliver. All we have to do is to give information through the Internet, and stores can establish relationships with places of refuge. At the time of the earthquake two years ago, I was so worried that I went to the affected area in the evening. We had a report "All the arrangements are done. Relief supplies are to be delivered." at the headquarters of disaster control. However, food was not delivered even at 6 o'clock, at 7 o'clock at the affected area. What was the matter? After all, the destination should not be the town hall. We have to make sure how many supplies are to be delivered, and where they are to be delivered finally, otherwise, they

will not be delivered. On such occasions, it is necessary to share information with many people through the Internet, not through telephone which is a person-to-person communication. This system was of great help later. It helped reconstruct the people's life to have information like, "○○ coin-operated laundry is open for washing." or "×× store is open today." all through the day.

Another thing that IT helped greatly was to construct the support system with an application of GIS (Geographic Information System), which was a collaboration with private enterprises and universities. Usually, GIS is used to know where water pipes and gas pipes are buried, but I think it is rather useless at the time of disaster if we use it that way. As was the case with the earthquake 5 years ago, the police come to the rescue from all over the country. Then the headquarters get information of the names and addresses of towns, which they do not understand. Even the people coming from inside the prefecture do not understand. It is all right if we act on the basis of each municipality, but once we act across the borders of municipalities, we are terribly confused if our areas in charge are divided by addresses. If we can show a map and say, "The team of Hokkaido is in charge of this area. The team of Kyusyu is in charge of that area." by distinguishing them with different colors, we will be able to deal with a disaster quite smoothly.

There is one more thing that is important: we have to decide the order of restoration of gas, water supply, electricity, roads in particular when we discuss as we look at a map at the headquarters of disaster control. We cannot restore gas supply without restoring the roads first no matter how hard the team of gas pipes tries. We cannot restore electricity without restoration of roads no matter how hard the team of electricity tries. We used to

decide the order of restoration on the basis of vertical divisions, but the situation is completely different with the use of GIS. Figure 8 does not show it, but we had the information of the number of people in each place of refuge. Also, all the people concerned have come to share the information each time the headquarters of disaster control are settled: how many people are where at the roads, and the details of delay.

With the lesson from 5 years ago, we examined the use of this GIS somehow. For example, there is a fine IT institution at the Cabinet Office, and there is an institution in Kashiwazaki to deal with nuclear disasters called the off-site center. They can do nothing after showing a general map with a mark on the center of the earthquake. As you see on TV, there are fine equipments such as a projector there, but they are of no use after they are used at the beginning. To put them in real use, we have to put data into each of them. They can start working after that. We worked with Research Center for Natural Hazards and Disaster Recovery, Niigata University, and Disaster Prevention Research Institute, Kyoto University, to examine how to use GIS. We had a prize called SAG Award (Special Achievement in GIS Award) together in the USA. Sharing the information, we can see which roads, which electricity, which gas to restore, in order with time. For example, July 21 was the 6th day from the occurrence of the earthquake. This area colored blue is where water supply was restored. It is important to restore at places with many people, and to decide how to restore. The restoration will be quicker if we work together to know which roads obstruct the restoration, and to decide where to restore preferentially.

In order to do so, we need a professional team. The map making team called GIS team includes volunteer members of private enterprises. We

## ■Figure of water supply restoration in use of GIS

EMC (Emergency Mapping Center) was organized at The Niigataken Chuesu-oki Earthquake in collaboration between industry, government and academia

■ Restored area before 20
■ Restored area on 21

% of restoration in Kashiwazaki city: 43.3%

■ Restored area before 25
■ Restored area on 26

% of restoration in Kashiwazaki city: 82.8%

■ Restored area before 30
■ Restored area on 31

% of restoration in Kashiwazaki city: 99.97%

**July 21 (the 6th day after occurrence)**  ▶▶  **July 26(the 11th day after occurrence)**  ▶▶  **July 31(the 16th day after occurrence)**
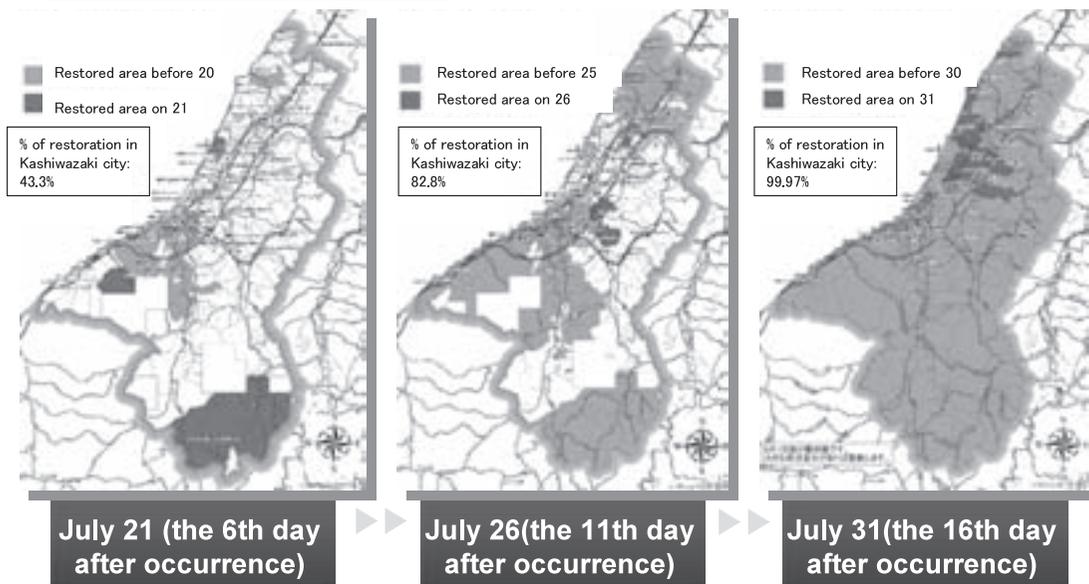
Figure 8    Merits of IT in case of disaster

think that they have to be paid as a team. With the GIS team like this, we can escape from the sufferings of disasters more quickly. It is impossible for the government to establish this. There were various data of 200 kinds. We were surprised to learn the need of a map which showed what to do with guard, where the water pipes were, how many refugees were there, and how much food was needed where. It helps disaster control to have a system with professionals of making a map with addresses and quantity data of the text by just putting them in a computer. In order to do so, Ministry of Land, Infrastructure and Transport set up a team called TEC-FORCE, for example. Medical people set up a team called DMAT (Disaster Medical Assistance Team). There are teams in each field that act without request in case of emergency. I honestly believe that it is impossible for all the prefectures to have a team which has

skills to make this map. I think that it is absolutely necessary to establish a system that a team with experiences goes to support where an earthquake occurs.

This is unnecessary if a disaster is below a certain scale. For example, there was a big fall at the time of The Iwate-Miyagi Nairiku Earthquake in 2008, the town hall could deal with it because the affected area was limited. They did not need it as there was common information already. GIS is needed in the case that people come from outside with information. It is absolutely necessary under such circumstances. Several disasters occurred since The Niigataken Chuetsu-oki Earthquake in 2007, but an earthquake of this scale has not occurred yet. The population of Niigata Prefecture is 2,400,000 and the population of the affected area to which Disaster Relief Act was applied is 1,000,000. One-tenth of them, 100,000 people took

refuge at the time of the earthquake 5 years ago. On the other hand, at the time of the earthquake 2 years ago, there were about the same number of people living in the area to which The Disaster Relief Act was applied, the number of the evacuated was 12,000. In short, the number of the evacuated is one-tenth of that at the time of the earthquake 5 years ago. It was an evacuation of over 10,000 people, and GIS was absolutely necessary then. We can estimate that GIS is not so necessary if it is an evacuation of 500, or 200 people.

Summing up, we have to deal with failures of communication differently on each case, when we communicate with ICT (Information Communication Technology). We should call it ICT rather than IT (Information Technology). The electric wires might be cut off; there might be no electricity; the lines might be too busy with too many people trying to connect. There are various possibilities. On the other hand, what gives us the precise information changes according to stages of disasters: community FM can be good; wide area radio can be effective; TV broadcasting might be needed. In case of disaster, it can be the case that hand written information is more effective than IT. There is no one perfect tool to deal with information, to send information, and to communicate; we have to deal with the situation which changes with time. In doing so, I think that it is necessary to establish a system of providing information technology to deal with social changes, to establish a team consisted of JSIS and JASI if possible, and to bring it up. I would like to end my address now. Thank you very much for your attention today. (Applause)

Q & A

(Question) I was very impressed with the practical ideas of the governor. I am concerned with disaster information myself. The biggest problem of disaster information is that disasters seldom occur. If we improve a system, it is often the case that we cannot use it at once. It is difficult to have training in our daily life. Do you have an idea how to prepare for disasters which seldom occur?

(Answer from the Governor Izumida) I have been talking with various people in charge of disaster protection, and I think that people in the metropolis of Tokyo are the most in trouble. The headquarters of disaster control are installed in each Ward of Tokyo, but a Ward covers a small area. Then it is seldom that people in each Ward experience disasters. I think that the roles of the basic self government and those of the municipal government of a large region are different. Although the earthquakes occurred twice within the distance of 40 kilometers, each of them was the first experience for each basic government. Each of them has dealt with a disaster just once. The areas which had devastating damage were smaller than the areas to which the Disaster Relief Act was applied. The devastated areas were Nagaoka city, Kawaguchi-machi town, Yamakoshi-mura village, and Ojiya city five years ago, and Izumozaki-machi town, Kariwa-mura village, and Kashiwazaki city two years ago. Each basic self government acted on each device, which had no training. It was only the prefecture that could connect the each side.

It would be best if the central government took comprehensive control. But in the present system of personnel changes of the nation, the agents change every one or two years. I experienced earthquakes twice in about two years and half, the agents were different each time. Under such circumstances, with disaster prevention specialists

being changed, the agents cannot take good control at the time of disaster even if they are in a position to accumulate the know-how.

Immediately after I became the governor, I had a call from Mr. Ido, the Governor of Hyogo Prefecture. He said, "Mr. Izumida, I have sent the top members who experienced Great Hanshin-Awaji Earthquake." He said he had sent, not would send. I replied, "Thank you very much." As I was a beginner of dealing with a disaster, I dealt with the first earthquake with advice of the team from Hyogo prefecture, who stood by next to the Office of the Governor. When they were going home, I thanked the Governor Ido, "Thank you very much, they were of great help. We dealt with the earthquake on the experiences of Great Hanshin-Awaji Earthquake, which led to restoration. Thank you again." Afterwards, at the time of the earthquake in Noto Peninsula, we sent our team so that we could help people in Noto with our experiences. People in Noto, including the mayor of Wajima city thanked us and said, "Thank you, Governor Izumida, they were of great help. Thank you for handing down your experiences." It was like déjà vu; it was very impressive that they said exactly what I had said three years ago.

I would like to say, "A kindness is never lost." We try to go wherever there is a disaster. We try to maintain our ability to deal with disasters. By rescuing, we maintain the know-how to deal with disasters, as well as showing our gratitude for having been rescued at the times of the two earthquakes. Therefore we go to rescue actively. In Niigata, we have an experience of a disaster that oil tanks were on flame, Showa Bridge collapsed, and prefectural houses fell sideways. But nothing remains from the disaster. There is no survivor with experiences from the disaster although it was only 40 years ago. There are documents, but they are of no use in case of disaster. We cannot say, "A disaster occurred. Let's look at manuals." Therefore, in order to hand down our experiences, we send people wherever there are disasters including abroad and maintain our ability, as well as showing our gratitude. Among the prefectures, plus Tokyo, Hokkaido, Osaka and Kyoto, perhaps Hyogo prefecture, Shizuoka prefecture, and Niigata prefecture have the abilities at a high level, which makes a triangle. It is also true to the personnel matters. At that time, we had people at Niigata University coming from Kyoto University according to the personnel changes. I am hoping that disaster prevention specialists in the future will not be recognized academically unless they come to Niigata to research disasters in mountainous areas, after having researched disasters in city areas in Kyoto or Hyogo (laughter). Is this a sufficient answer?

# Digital Archiving: Present Status and Issues for the Future

Makoto NAGAO, National Diet Library

## Libraries in the Digital Age

Good afternoon, Ladies and Gentlemen. The title of my talk today is "Digital Archiving: Present Status and Issues for the Future". I shall begin by outlining the state of digital archiving today and then tell you a little about the issues that I myself am facing. Finally, I shall invite discussion.

First of all, Ladies and Gentlemen, as I am sure you are all familiar with the Internet, I am sure I do not need to explain the concept of libraries in the Digital Age – it is as shown on this slide.

Libraries have always been, and still are, repositories of knowledge and information. Their purpose is to store information for long periods and make it accessible for use. I believe the mission of librarians is to ensure that this knowledge and information is freely available for use throughout Japan.

The National Diet Library, of which I am Librarian, has two sites: one in Tokyo, the other in Kansai Science City. This is fine for people who are able to visit the Library in person when they wish to use its collection, but we should strive to be able to provide the same level of service to the many people who cannot visit the Library in person as we do to those who can. To this end, we need to build a proper digital library.

I should therefore like to give you a brief outline of the present status of digitization at the National Diet Library. First, we have the Minutes of the Diet. The records of the plenary sessions and also of each committee have all been digitized and, if you go to the National Diet Library website, you will see that they can all be searched. This makes it possible to check, in detail, who asked or answered what questions on a particular committee, and when.

Next, we have the Minutes of the Imperial Diet. All of our records for the Imperial Diet, which sat until 1947, will be on computer as image data within the next twelve months. The minutes of meetings of the Diet, from 1947 onwards, have been converted to text data and can be searched in a variety of ways, but the minutes of meetings of the Imperial Diet are stored only as image data with an index and can only be searched using this index.

Library users can also search an Index Database of Japanese Laws, Regulations and Bills. And we

have around 150,000 representative books from the Meiji and Taisho periods on computer in the form of image data. We have works by Mori Ogai and Natsume Soseki, and many others besides, all of which can be viewed.

We have rare books and, although you might say it was half for fun, we have a whole range of materials under the theme of "Memories of Japan", which you may find interesting.

## National libraries around the world

So, we are working hard in many areas, but how do our efforts compare internationally? I should like to take a little time to compare them with those of national libraries in other countries.

The Library of Congress in the United States already holds more than 11 million items in digital form. But they are also digitizing historical documents and speeches – you can listen to the voices of past presidents. We would really like to digitize audio recordings too. For example, we would like to make it possible to hear how Prime Minister Shigeru Yoshida's speech on a certain occasion sounded, but we have not yet been able to do so. However, the United States is digitizing music, maps and many other things. These include works whose digitization is permitted within the scope of fair use, and works whose authors have given permission for digitization. Unfortunately, the National Diet Library's digital archives at present contain only works whose copyright has expired and items to which there is no copyright, such as the Minutes of the Diet.

The United Kingdom has digitized over 90,000 items, mostly works whose copyright has expired. Germany is also pursuing the digitization of many items. Some works subject to copyright can only be read on library premises; others can be printed

out or downloaded for a fee. France is also doing a great deal and has digitized scholarly journals, newspapers, images, audio recordings, and so on.

China has put a huge volume of materials on computer in image form. The Chinese do not give out much detailed information, but apparently they have already digitized a considerable part of their collections, starting with the oldest items. It is possible that the Chinese are in the lead, in terms of volume, but I wonder if, perhaps, their digital archives are lacking in variety.

Korea is also making a huge effort. The program focuses on works of high value in scholarly and information terms published since the War; works that have been published for five years or longer are digitized and can be transferred electronically, between libraries. However, the copyright holder receives compensation in respect of such transfers.

Besides national libraries, there are many other kinds of digital library. One is the World Digital Library, which is operated by UNESCO, in cooperation with the US Library of Congress. For three or four years, World Digital Library has been working in partnership with the national libraries of many countries, including those of Egypt, the Netherlands and Brazil, to digitize works – mainly cultural properties – and make them accessible to all. The National Diet Library also plans to join the project by the end of the current year, or by January or February next year, and lend its support to the World Digital Library.

Another example is the Million Book Project. The concept was proposed by my old friend Dr. Raj Reddy of Carnegie Mellon University. The project has secured donations from the Carnegie Foundation and many other organizations and is now putting between 1.5 million and 2 million books, in many different languages, onto

computers. Most of these are works to which the copyright has expired. Factories have been set up all over the world, with equipment for scanning text and, apparently, they are able to scan books at a cost of around 10 cents per page.

One of the major pillars of the Million Book Project is to donate a large number of 100-dollar personal computers to young people in developing countries. Many people in African countries, for example, can't simply plug in their personal computer and go online. Some areas have no electric power network and no fixed line telecommunications network. So the idea is to allow them to access the Million Book Project's wide range of materials and use them for study purposes by providing laptop PCs with their own power source and wireless capabilities. Great efforts are being made, but to date it has not been possible to create a PC for only $100; apparently, it costs around $180, but the aim is to strip away many of the functions of an ordinary PC and end up with the minimum functions that will allow the user to access and study the information in digital libraries and so arrive at a computer that costs $100. This is a very ambitious but wonderful project. The European Union is also working hard on the creation of a digital library.

Digitizing books

As I have said, the cost of digitizing books is not insignificant. I mentioned earlier a figure of 10 cents per page, but in the case of Japanese, the cost will of course probably be higher. The National Diet Library has around 9 million books, of which we estimate at least 3.7 and perhaps as many as 4 million should be digitized. This would come to around ¥35 billion. That's a lot of money, but if we are resolved to do the work over a period of about

10 years, I believe we can manage it. The problem, I believe, will be the issue of copyright.

I have been talking about the digitization of books and so on, but another kind of digital archive is Internet archives, collections of information posted on the Internet – what is sometimes referred to as "born-digital" information. This information originates in digital form and exists only in digital form; in other words, it does not exist on a paper. Its content ranges far and wide and includes cellphone novels, but all these things are a part of human intellectual activity, too. At the National Diet Library, we believe it is our duty as a national institution to work towards a situation where such information is treated as cultural property, collected it in as systematic a way as possible and permanently stored, so that future generations will be able to use it. As we believe Web archiving – the collection of information on the Internet – is important, too, we have made a start.

A characteristic of websites is that new sites are being created and existing sites are being shut down all the time. For instance, websites relating to the Beijing Olympics are likely to disappear any day now. This means that, if we do not set about collecting it, we will have no record of what kind of information was being disseminated during the Beijing Olympics. That information will be lost forever. For that reason, I believe we must collect it.

Another feature of websites is that the information they contained is changing all the time. This means we need to be collecting it all the time. Only once or twice a year is no good, which poses interesting technical challenges.

As you will know, Google has been addressing these problems by holding up a lofty ideal and building the infrastructure necessary for its

realization. Organizing the world's information and making it universally accessible is an extremely ambitious mission. Dreaming up such an idea and working step by step towards its realization is the kind of impressive thing you expect from the American venture spirit. The project was started by scholars and researchers, and it was truly the product of wonderful minds. It sets out to organize all of the world's information simply by crawling the Web on a frequent basis.

The Library and Archives Canada has also started Web archiving. I recently met the head of that institution, who told me that Canada had been unable to collect website information from the 1990s itself, and had therefore purchased the information from Google. That is how rigorous Google is. Naturally, they also have information for Japan and, unfortunately, we may also find ourselves having to buy Japanese website information from the past from Google.

In this sense, too, Google is doing an amazing job. It has also been moving into areas that are close to the functions of a library: it digitizes books and allows its users to browse selected portions. And when people who have browsed through a book decide they want to buy it, Google invites them to do so. If this system is taken to its logical conclusion, I wonder what position existing libraries will find themselves in. The justification for their continued existence may be called into question.

But Google is, after all, a business enterprise and so it is, of course, possible that even Google may become bankrupt in the future. The company is doing well for the moment, but as to whether it is able to take on the task of gathering information and knowledge, organizing it and passing it on to future generations, as libraries do, over a period of 10 years, 100 years or several hundred years – the

answer is that they probably cannot. That is why libraries must persevere in their work, no matter what Google is doing.

## Web archiving at the National Diet Library

The National Diet Library launched a web archiving project in 2003 and is collecting information from 2,100 websites and 1,500 digital magazines. We have the permission of the copyright holders for all of this information.

One area in which we have made a particular effort to date is municipal mergers. After a merger, the website operated by the municipality that is absorbed tends to be closed down, so we try hard to gather as much information as possible before the website is closed down, focusing on information relating to the merger. But it's really no good gathering information once a year, or even four times a year. For example, on one occasion, the minister in charge of a government ministry resigned after only a few months, and we were not able to collect the page that had a photograph of that minister before it was removed from the website. Although photos of other ministers could be seen on a website that shows the faces of former ministers of such and such a ministry, we failed to collect the photo of just that one minister, so the public were unable to see it.

Looking around the world, in the United States, the Library of Congress is building a web archive that is organized by topic. It has collected information from websites relating to the 9/11 terrorist attacks and now is busy with websites relating to the presidential elections. A characteristic of the Library of Congress's approach is that information is collected by theme – sites relating to the presidential elections, sites concerning the damage caused by Hurricane

Katrina, and so on.

There is also a non-profit organization known as the Internet Archive, which systematically collects website information from all over the world, It's like a monstrous collection of memories. Running this monster takes huge amounts of electric power, and this has become a major issue. In the United Kingdom and Germany, the collection of information in this way is enshrined in law – the law guarantees that the National Library has the right to collect information posted on the Internet. In the United States, I am not entirely certain what the situation is, but if they are taken to court for collecting information, they will probably have to stop. There is legislation in France too. China and Korea don't yet have legislation, but in Korea, they are currently making great efforts to introduce legislation.

So, efforts are under way in various countries. At the National Diet Library, with the permission of the copyright holders in every case, we have just about managed to collect information from 2,100 sites, but as there is no knowing how many hundreds of thousands, or even millions, of websites there are in Japan, it would be impossible for us to obtain permission before collecting the information in every case. It would be best if the National Diet Library Law could be revised to allow us to collect information without first obtaining permission, but this would be difficult owing to vested interests, among other factors.

For the time being, we hope to get a law enacted that will allow us to collect information from government-related websites (for instance sites operated by central government ministries and agencies, regional government bodies, national universities and other national and public institutions) without seeking permission, and we are currently making preparations for that. We

hope to present a bill during the next ordinary session of the Diet and begin work once it has been passed.

Of course, websites relating to government are only a small fraction of the whole, so, while continuing to collect information from those websites, we would like to expand, but there are many kinds of website: some are shady while others are plain nonsense. Many people question whether there is any sense in collecting information from such websites. It depends on how you look at things, but it is possible that even shady websites may be the subject of research in the future, because they were a social phenomenon in 2008. It would be convenient if everyone saw things this way, but unfortunately that is not the case and collecting information from these sites is likely to be very difficult task.

Moreover, because the Internet allows people to exercise their imagination and talk freely about whatever they like, creativity is growing rapidly. However, the possibility that everything is going to be collected and stored, and that someone, at some time in the future, will be analyzing every statement in detail and doing something with it, may exert a considerable restraining influence and make people hold back on what they say. Many experts take the view that it may not be a good idea to collect information from all websites, and I believe it will become very difficult to decide what should and should not be collected.

For these reasons, we have started by collecting from websites on which we are certain. We plan to see where society's views on the matter are going and gradually expand the scope of our activities accordingly. So, that is what we are doing, but from society's point of view, it is extremely regrettable that, in Japan, we are not able to do the kind of thing that Google is doing. We may lose out

entirely to the United States. And if archiving generates all kinds of secondary business opportunities, it is possible that large new markets may be created by companies able to exploit such business opportunities. So we need to make it possible to collect information freely and, if we do not, there is a great danger that the United States and other countries will forge ahead, and Japan may be unable to create such markets, or worse, to capture any share of these markets. Therefore, the LDP [Liberal Democratic Party] Policy Research Council has established a Digital Archive Subcommittee and this body is looking at how it may be possible to ensure by law that information can be collected.

Here we have a number of suggestions the subcommittee has come up with. The ideal would be to collect and store all Internet information in Japan. One of its key suggestions is that there is a need to revise the National Diet Library Law, for the time being, to allow the collection of government information, academic information and other information of high public interest alone. As the LDP agrees with this, we hope to be able to bring this about.

## Copyright issues

Another suggestion is that Japan needs a copyright system that is compatible with full-scale Web archiving, and that opting out should be permitted, and copying rights and rights of public transmission should be restricted. In other words, if a complaint were received about information being collected, the site operated by the person who lodged the complaint would be deleted from the archive. In other words, the suggestion is that we might consider something along these lines: information would be collected without asking for

permission in every case, but if anyone complained about the information from their site being collected, the site would be deleted. Furthermore, I suggest that copying at public institutions or libraries and transmission between libraries should be allowed, for example by excluding them from the scope of Copyright Act.

Another suggestion is that, if possible, libraries around Japan should work together to create integrated digital archives that would eliminate inter-regional disparities and that we should work towards creating a copyright system that would allow interlibrary access.

Another factor is that, to satisfy Copyright Act, it is necessary to locate the copyright holder and to obtain permission from the copyright holder. This takes a great deal of time and money. One of the slides I showed quite a way back said that the National Diet Library has put 150,000 books from the Meiji and Taisho eras on computers in the form of digital images. Locating the copyright holders for all those books cost over ¥200 million, so you can see how much money and time the process takes. We wonder if it would be possible for the Agency for Cultural Affairs to come up with a way of simplifying the procedure. Specifically, as written in red on this slide, a copyright database would be created and copyright holders would be required to register their copyrights. When we wanted to obtain permission in respect of a particular work, we would look it up on the copyright database and, if the person we were looking for was on the database, we would also be able to see their address, so all we would have to do is send a request for permission, and if the copyright holder said no, we would know where we were. With a system of this kind, if the copyright holder was not on the database, we could treat the work as an "orphan work" (a work whose copyright

holder cannot be identified) and ask the head of the Agency for Cultural Affairs to rule on the case. This would mean that hardly any cost was involved and the process would also take very little time, so we really hope it can be done.

The Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Economy, Trade and Industry, the Ministry of Internal Affairs and Communications and many other bodies are conducting research into Internet archiving – the scale of the research work being done is amazing.

Relations with the publishing industry

When libraries are digitized, it is the publishing industry that is most directly affected. The publishing industry currently sees the digitization of libraries as an extremely serious problem. At present, the publishing industry is bringing out around 80,000 new titles a year. There are also reprints, but sales are falling and magazines in particular are selling very slowly. The industry also faces an average unsold book returns rate of 40% and has very high distribution costs, with the result that bookstores are going out of business at a rapid rate. The publishing industry is concerned that, if libraries are digitized and the public gains free access to books, books will be harder still to sell. Librarians would, however, like to offer the same level of service to all people living in Japan, not just those who visit their libraries in person. Ideally, we would like to be able to digitize and transmit all kinds of materials, but this will raise all kinds of issues and it will be very difficult to obtain the approval of the industry.

What we are even keener to do is this: when books are published these days, before they go to press, the entire text is put on computers. If publishers could deliver this electronic text directly to the National Diet Library, it would save us the trouble of digitization and save on costs for the country as a whole. At the moment, we get books in hard copy format, but we wonder if it would be possible for publishers to deliver their books in digital format.

So we hope to be able to digitize books somehow or other, but the publishing industry is anxious to avoid a situation in which books stopped selling. Publishing companies have said they are willing for us to create digital materials as described in Figure 1, but have put forward stringent conditions. For instance, they ask that materials should only be accessible from a single terminal within the Library and that materials should not be allowed to leave the library (in other words, that the transmission of digital data from the Library to an

What the National Diet Library would like to do:
- Materials published today are produced from digital data.
- The Library would like publishers to deliver the digital data along with the finished publications (digital delivery).
- The Library would also like to digitize publications subject to copyright.
- It has been suggested that digital materials subject to copyright should only be accessible within the Library by one person at a time and that digital materials should be printed out within the scope permitted for photocopying.
- No digital materials would be transmitted outside the Library.
- These issues need to be discussed with the publishing industry.

Figure 1: What the National Diet Library would like to do

individual's personal computer should be prohibited). We are currently discussing these conditions.

So, with an eye to the future, we are rapidly digitizing publications and, in 10 or 15 years' time, it is certain that the number of books that people read only in digital format will be growing. Simple, lightweight digital reading devices will no doubt be available. Many people already read books on their mobile phone, and if even more convenient devices become available, publishing companies will no doubt be forced to publish and distribute books in digital form.

For these reasons, I believe it is important that we give more careful thought to the distribution routes from publishing companies to readers. At present, Japan has many book wholesalers, including Tohan Corporation and Nippan Publishing, but if wholesale databases were created, publishing companies could put their digital publications into the databases. Readers could then search the databases for books, and buy them. Wholesalers who handled digital publications would no doubt see their business grow rapidly but, unfortunately, existing wholesalers would gradually see their business disappear. I believe some things will always be published on paper, but when many things are published digitally, it is possible that only a limited number of bookstores will survive.

As to where this wholesale database should be held, I wonder if it could perhaps be at a library. Libraries already have databases so, the idea would be to set up large databases at libraries, have publishers send all their publications to those databases and allow readers to buy their books via those databases. The money from the sale of books might pass through the libraries' hands, but it would all go to the publishers. However, as the

databases would be held at the libraries, people who visited the libraries would be able to access them for free, via terminals on library premises. I believe the basic principle is that libraries exist to offer a service whereby anyone can read books free of charge – it's not written down anywhere but, as it's a basic principle, it should not be broken.

Those who wished to borrow books would access the wholesale databases from their home computer and download the books. In this case, there would be a charge, but I wonder if it would be possible to create a mechanism whereby the money would go, not to the library but to the publisher. It would be an access fee. People who read books at the library could do so for free, but those who wished to borrow a library book from the comfort of their own home would be asked to pay roughly the same as the cost of traveling to their library. But the publishers would not give their permission unless this fee too was handed over to them, rather than being paid to the library.

At present, however, the publishing industry will not agree even to any of what I have just described. If a reader bought a book, that book could be allowed to remain on the computer of the person who downloaded it, but if the reader simply wanted to borrow the book, there would have to be some kind of system whereby the book would be erased after 12 or 24 hours. I believe this could be done using software.

Figure 2 shows our suggestions as to what the National Diet Library might do. It mentions "libraries" – for example, suitable libraries around Japan, such as prefectural libraries, would receive digital publications from publishers and buy them. If the publications were to be lent out, they would collect the lending charges. (All of the money

Functions to be fulfilled by the National Diet Library

- The Library would provide the same kind of service for publications delivered in digital form as provided by the wholesale databases operated by ordinary libraries.
- As the Library would keep publications delivered in electronic form permanently, publishers would have no need to store their own copies, and would simply download the publications from the database as required. (Publishers would be allowed to use the database without charge.)
- If publishers wished to download their own digital publications for re-editing or re-use, they would be allowed to do so from the National Diet Library.

Figure 2: Functions to be fulfilled by the National Diet Library

would go to the publishers.) In the case of the National Diet Library, the database would be permanent. In other words, unlike ordinary public libraries, the National Diet Library is required to retain its collection in perpetuity, so that publishers would not have to store the original data for their publications on their own premises. Because the National Diet Library would have records of all past publications issued by publishers, the publishers could download publications from the National Diet Library's database and then reprint or reuse them. So, this would be a model for reducing publishers' costs.

The reason why I am telling you this fantastic story is that, if many more publications are digitized, and if they are to be freely accessible at libraries, or anywhere, the publishers must survive. So, unless we are able to establish some kind of business model that will simultaneously allow authors and publishers to derive sufficient income and ensure that library users are able to access publications for free, or for extremely low charges, equivalent to the cost of traveling to their library, then in the present harsh conditions facing the publishing industry, digital library activity, or rather the digital world, will not expand. So, what I have described to you is just one possible model, and my hope is that you will come up with more attractive models yourselves. I hope that you will be able to devise "win-win" models that will please both the publishers on one hand and the libraries and their users on the other. I am using tough words here because I believe that, unless we come up with such models, copyright and other issues mean that the digital world – digital libraries and Internet archives – will not develop in a sound and healthy manner.

Conclusion

After this, Professor Meiwa and the other speakers will be discussing copyright issues in the age of digital information. Our panelists today, in particular, are experts in this area, so what I have told you may be wrong, but I believe the discussion will be very lively and interesting.

The suggestion is that we should construct a copyright system that would allow anyone to access all kinds of information. To this end, I believe it will inevitably be necessary to introduce a mechanism whereby users will pay some kind of fee. I am not talking about the economics of the long tail, but if one were able to collect a very small amount, just a few tens or hundreds of yen, from readers all over Japan, it would come to a considerable amount. I believe a software method needs to be devised for collecting monies in this way.

Other issues that are currently the subject of lively debate are the concept of fair use and licensing rights. Copyrights are licensing rights, so it is possible to allow one person to use a work, but to deny another person that right because one does not like them. However, I believe we must change our way of thinking and look, instead, at a system that allows anyone to use works, but requires them to pay a fee if they do use them – perhaps one would call this fee-charging rights?

These ideas might seem very adventurous, but I believe the experts will put forward better ones in the panel discussion following my talk.

I have talked to you about the current status of digital archiving, and have made some very adventurous proposals regarding the issues involved, but I hope these will be discussed in greater detail during the panel discussion.

Ladies and Gentlemen, that concludes my talk. Thank you for listening.

# Empirical Study of Factors Influencing Attitude toward Advertisement: Case Study of Ubiquitous Street Project *Media Pole* in Seoul, Korea

### Yoo Sam KIM, Waseda University

Abstract

Information and Communication Technology – ICT – has dramatically changed advertising and has substantially impacted advertising creativity. In similar fashion, future advertising will be altered via – and apace of – the emergence of new technologies.

New advertisement tools loaded with the convergence of art, media and ICT, and styled as *Media Pole* in Seoul, Korea is a good example of a new advertising medium in ubiquitous network societies. Media Pole is street advertisement architecture providing a variety of information and services on the streets of Gangnam, one of the busiest districts in metropolitan Seoul.

This study examines factors impacting attitude toward the new advertisement medium called Media Pole. This study is based on Ducoffe's (1996) Advertising Attitude and Value Model and Ajzen & Fishbein's (1975 & 1980) Theory of Reasoned Action. This research proposes a new theoretical model to examine attitude towards this new advertisement medium. It also provides valuable case study results for governments, organizations and industries regarding the current status of new technology and value-added public advertisement facilities, marketability, and suggested future directions. This study recommends that focus should be on users' viewpoints and on trying to provide user-centric services in future development.

## 1. Introduction

Information and Communication Technology – ICT – has changed modern societal life. The ICT evolution opened a new environment called Ubiquitous Network Environment-UNT. That UNT means we are connected by invisible media, anytime, anywhere. It changes our lifestyles in all directions and demands changes in all areas including the advertising market. This new market will use new, uniquely processed methods to approach consumers about entertainment, personal interests and new technology. This new area of advertisement will provide consumers with various platforms surpassing limits of expression.

A well-known French advertiser, Robert Gue'rin, described the advertisement thus: "Air that we are breathing is nitrogen and oxygen and advertisement. We swim through advertisement. All forms of advertisements follow us all day and don't leave us." His exuberant phrasing suggests we live in an age of ubiquitous advertisement evolution. Historically, advertisements in one form or another existed from early human society, and developed along with evolution of that society. New inventions of advertisement media arrived as industry and technology developed. Latterly, ICT has brought dramatic changes in advertisements and substantially has affected advertisement creativity and this evolutionary process will continue apace of new technology development.

This new advertisement medium, at the convergence of art, media and ICT, called *Media Pole* in Seoul, Korea is a good example of that medium in our ubiquitous network society.

*Media Pole* comprises street advertisement posts providing various information and services on the street of Gangnam, one of the busiest districts in the Seoul metropolis. According to



Figure 1. Scene of Gangnam *Media Pole* in Seoul, Korea (Source: www.newsis. com)

Korean Statistical Information Service (KOSIS), Korea's population is some 47 million of whom, at the most recent count, Seoul has some 9.75 million (i. e., in 2005 [www.kosis.kr]). These use a mixture of private and public transportation daily for various purposes. According to Seoul Metro (the public subway company), daily passenger traffic rate is 3.98 million throughout subway stations in Seoul. Gangnam Station has a daily passenger traffic rate of 129, 285 which ranks it as the busiest subway station in Korea (as of September 2009). *Media Pole* is installed with commercials, artworks and technologies to provide information and services on this, Seoul's busiest street, as part of the Seoul Metropolitan City's "Design Seoul Project."

According to *Economic Review*, (July 28. 2009; www.ermedia.net), since the start of 2009, Gangnam Ward Office installed 22 *Media Poles* in the 760 meters from Gangnam Station to Kyobo Tower Intersection, at an average separation of 30 meters each. These 12-meter tall *Media Pole* shapes are vertical columns with rectangular viewing fascia, loaded with new ICT, street lighting,

CCTV providing public contents such as local area information, area map, movie information, media art, advertisements, latest news, photo service and game service through LED and LCD touch screens. People can enjoy games, take pictures and send e-mails by photo mail service. Currently, the poles are managed by Gangnam Ward Office, Korea Telecom and Che-Il Worldwide, Korea's largest advertisement marketing company.

To be successfully recognized as a new advertisement medium, empirical consumer research should follow to discern consumer needs, wants and interests relating to this new advertisement medium.

Much precedent research exists on attitudes towards advertisements via traditional media (Alwit & Prabhaker, 1992; Shavitt, Lowrey, & Haefner, 1998), via online media (Brackett & Carr Jr., 2001; Ducoffe, 1996) and mobile media (Okazaki, 2004; Tsang, Ho, & Liang, 2004; Yang, 2005). But research lacks on technology and value added street advertisements. Hereafter, seeing that new advertisement media will be introduced continuously due to the emergence of new technology and research will increase on such new media.

Based on Ducoffe's (1996) Advertising Attitude and Value Model and Ajzen & Fishbein's (1975 & 1980) Theory of Reasoned Action, this study aims to examine how factors impact attitudes toward *Media Pole*, and propose a new theoretical model to examine attitudes toward that new advertisement medium. It also expects to provide a case study to governments, organizations and industries to show the efficacy of this new advertisement medium, its marketability, and its suggested future direction.

## 2. Literature Review and Hypothesis

The concept of attitude has appealed to social scientists primarily because of the belief that attitudes influence behaviors (Allport, 1935). The Theory of Reasoned Action (TRA) proposed by Ajzen & Fishbein (1975 & 1980) was an attempt to measure the concept of attitude. TRA components have three general variables: Behavioral Intention (BI), Attitude (A), and Subjective Norm (SN). TRA explains that attitude toward behavior and subjective norm impact behavioral intention (BI = A + SN). When people intend to behave in certain way, it is likely that they will. Behavioral intention measures people's degree of intention to perform certain behavior. Attitude consists of beliefs and valuation of certain objects. Subjective norm is treated as expectations from others, along with intentions to comply with these expectations, hence one's perception that most people who are important to one think that one should or should not perform the behavior in question (Azjen and Fishbein, 1975).

The Traditional consumer behavior model explains that cognitive factors influence emotional factors and emotional factors influences behavior factors, based on Fishbein & Ajzen's (1975) Unidimensional Model. Based on this, the proposed Media Effect Model by Lutz et al. (1983) explains the impact process of advertisement stimulation and intention to buy. It can be explained
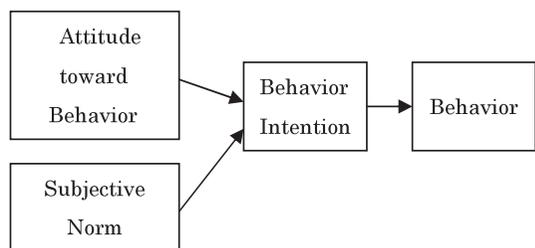


Figure 2. Theory of Reasoned Action

via displacement hypothesis that cognition factor for stimulation as an independent variable can measure attitude toward advertisement, brand name and intention to buy (Mitchell & Olson, 1981).

New perceptions and sophisticated models were proposed that not only between stimulation and response – as Unidimensional Model, but also involvement – as a new variable, will impact consumption of information (Petty & Cacioppo, 1986). These sophisticated models indicated that high involvement will take information along a central route, low involvement along a peripheral route. This means that value of advertising is individual-specific. Some consumers may find what they need from the advertisement and perceive it high in value, while others may find it low in value because of lack of the information they seek.

These consumer behavior models were developed along with the development of website advertisement and were based on Mackenzie & Lutz (1989). Ducoffe (1996) proposed the Advertising Attitude and Value Model which uses variables of informativeness, entertainment, irritation and advertisement value to explain consumer attitudes.

This means that informativeness, entertainment, and irritation variables impact advertisement value and that this impacts attitude toward advertisement. Also, entertainment variables assume direct
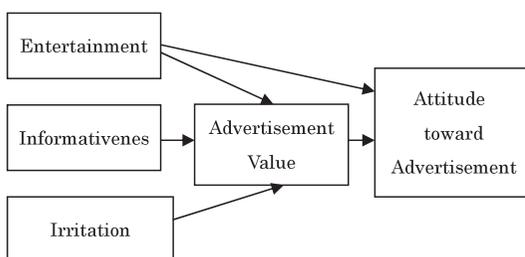


Figure 3. Advertising Attitude and Value Model

impact on attitude toward advertisement. Furthermore, mobile advertisements have become vitalized and researchers have applied Ducoffe's Advertising Value and Attitude Model to analyze mobile advertisements (Yang, 2005; Tsang & Liang, 2004; Okazaki, 2004; Oh & Xu, 2003). These researches have used similar variables – informativeness, entertainment, irritation – to measure impact on mobile advertisement's value and attitude. And it is noted that website advertisement and mobile advertisement have much in common (Tsang & Liang, 2004).

Ducoffe (1995 & 1996) found a significant positive. 65 correlation between informativeness and advertising value in traditional media and a. 73 correlation in Web advertising, plus a significant positive. 48 correlation between entertainment and advertising value in traditional media and. 76 correlation in Web advertising. Chen and Wells (1999) found a positive correlation of. 68 between informativeness and attitude toward a site, and a positive. 51 correlation between entertainment and attitude toward a site. Ducoffe (1995 & 1996) found a significant and negative correlation of -.52 between irritation and advertising value in traditional media and-.57 in Web advertising.

Based on these precedent results, this research adopted Ducoffe's (1996) website Advertising Attitude and Value Model and modified it so that informativeness, entertainment and irritation directly impact attitude toward advertisement, to examine attitude toward *Media Pole* as a new advertisement medium. *Media Pole* seems an advertisement medium similar to website and mobile advertisements, but might have different characteristics of irritation. *Media Pole* is a public facility in a public place so it does not have the same irritation variable as measured in Ducoffe's (1996) website Advertisement Attitude and Value

Model. But it might irritate differently, possibly causing annoyance in public places. *Media Pole* is located on the street of Gangnam Station which is the busiest district in downtown Seoul. People might feel uncomfortable to use services provided by *Media Pole* because of their potential to interrupt pedestrian traffic flow, even cause pedestrian traffic congestion. People might feel uncomfortable in playing games, taking and/ or e-sending photos, creating User Created Contents (UCC) in such a busy street in Seoul. Alternatively, their discomfort might be because in using such facilities they have a lesser degree of privacy. These considerations might lead to lower usage. By this mean, these different characteristics of irritation on attitudes toward *Media Pole* usage could be measured via the subjective norm variable from Ajzen & Fishbein's (1975 & 1980) Theory of Reasoned Action (TRA).

$$SN \propto \Sigma n_i m_i$$

Based on these precedent research results, this research combined Ducoffe's (1996) Advertising Attitude and Value Model and Ajzen & Fishbein's (1975 & 1980) Theory of Reasoned Action, to propose a new research model. Research hypotheses and research model are thus:.

H1: Informativeness will have POSITIVE (+) affect on attitude toward *Media Pole* advertisement.
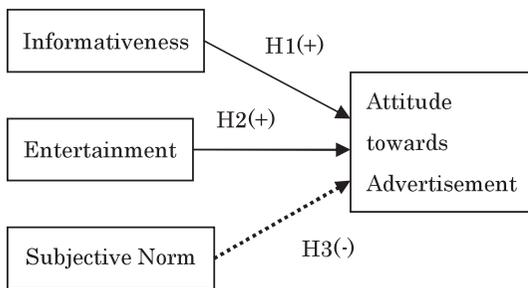


Figure 4. Research Model

H2: Entertainment will have POSITIVE (+) affect on attitude toward *Media Pole* advertisement.

H3: Subjective Norm will have NEGATIVE (-) affect on attitude toward *Media Pole* advertisement.

## 3. Research Method and Analysis

Quantitative survey research has been conducted to identify factors affecting attitude toward *Media Pole*. College students were selected as a subject of study because that particular group have distinctive characteristic of media usage and are recognized as intensive users of media. Their focus is on self discipline, searching for role models, forming human relationships, desiring new information and using media to satisfy their desires (Vincent & Basil, 1997). Thus media chosen by college students will impact future media usage patterns. Also, the college student groups are experienced ICT goods and services user group and a main target of advertising (Park & Yang, 2004).

A pre-survey was conducted from August 24 to 28, 2009 to modify wordings and mistakes. An actual survey conducted from September 2 to 16, 2009 in Seoul, Korea. A total of 250 survey questionnaires were distributed to university students in Seoul and 214 valid survey questionnaires were used to analyze data; 36 invalid survey responses were excluded.

Construction and components of survey questionnaires adopted were based on literature review and precedent research. Students were asked to rate four sections via a 1-5 Likert scale including attitude toward *Media Pole*, informativeness, entertainment, subjective norm. Demographic questions, questions regarding knowledge about *Media Pole*, and questions about

the experience of using *Media Pole*, were included. Definition and full features of *Media Pole* services were fully explained before the distribution of survey questionnaires.

Three analysis methods were used for this survey and SPSSWIN 14.0 was used to analyze data. First, frequency analysis method was used to analyze demographic questions, knowledge about *Media Pole* and experience of using *Media Pole*. Second, Cronbach's α coefficient method was used for reliability test and factor analysis method was used for factor validity test. Third, multivariate regression analysis method was used for correlation analysis.

## 4. Research Results.

### 4.1 Demographic Analysis.

Demographic results showed that respondents comprised 111 males (51.9%), 103 females (48.1%), average age 22 (Std. Deviation 2.2), youngest 19, oldest 29. Of 214 respondents, 92 (43.0%) had knowledge of *Media Pole* before the survey and 46 (21.5%) had experience of using *Media Pole*. These facts suggest that Seoul, organizations and industries should focus on promoting *Media Pole* to attract more attention to, and increase demand diffusion of, *Media Pole*.

### 4.2. Reliability Test.

Reliability test of measurement variables have been performed. Cronbach's α coefficient was

Table 1. Demographic Analysis

|  |  | Frequency | Percent (%) |
|---|---|---|---|
| Sex | Male | 111 | 51.9 |
|  | Female | 103 | 48.1 |
| Knowledge about Media Pole | YES | 92 | 43.0 |
|  | NO | 122 | 57.0 |
| Experience of using Media Pole | YES | 46 | 21.5 |
|  | NO | 168 | 78.5 |

used to test internal consistency reliability. Results, shown in Table 2, are that each variable scored over 0.7, which is acceptable. Generally, reliability measurement acceptability rate is 0.6 or higher, so this survey obtained an acceptable score.

### 4.3. Validity Test.

For the validity test, this study used principal component analysis and varimax rotation to test construct validity for variables used. Results, as shown in Table 3, indicate that all questions properly loaded in 3 variables and that these factors explain 64% of all variables. Generally, rates over 0.5 load in applicable factors and rates lower than 0.4 load in other factors are considered as proper measurement questions (Hinkin, 1998). Therefore, survey results as Table 3 verified that all questions used in this survey satisfied these requirements.

### 4.4. Hypothesis Verification and Results

This study established hypothesis variables as informativeness, entertainment and subjective norm. Results of correlation analysis between these variables and attitude toward advertisement are shown in Table 4.

Multiple linear regression analysis performed on attitude towards advertisement (dependent variable), informativeness (independent variable), entertainment (independent variable), subjective norm (independent variable) indicate that these variables explain 64% of the value predicted by the regression model are related to the observed value of the dependent variable. Adjusted R square between independent variables and dependent variable is. 397. Thus these three independent variables explain about 40% of the proportion of variance in the dependent variable. Tolerance Limit – TOL – was over 0.1. Variance Inflation Factor – VIF – was lower than 10 which means that

Table 2. Reliability Test

| | Measurement Index of Attitude Toward Media Pole | Cronbach's α |
|---|---|---|
| Attitude toward Media Pole | 1. I have a good feeling toward Media Pole. | .756 |
| | 2. I have positive feeling towards Media Pole as new advertisement medium | |
| | 3. I like the interactive advertisement medium as Media Pole. | |
| | 4. I have a positive view toward Media Pole. | |
| | 5. I feel satisfied about multi-language services provided by Media Pole. | |
| Informativeness | 1. Informations provided by Media Pole are useful. | .775 |
| | 2. Informations provided by Media Pole are convenient | |
| | 3. Informations provided by Media Pole will be beneficial to our life style. | |
| | 4. Informations provided by Media Pole will be good source of timeliness news. | |
| Entertainment | 1. Services provided by Media Pole are entertaining. | .777 |
| | 2. Services provided by Media Pole are exciting. | |
| | 3. Services provided by Media Pole are interesting. | |
| | 4. Services provided by Media Pole are pleasant and fun. | |
| Subjective Norm | 1. I feel uncomfortable to use Media Pole services in a congested area which might cause annoyances and inconveniences to pedestrians | .785 |
| | 2. I feel uncomfortable to use Media Pole services because it might cause obstruct traffic in a congested area. | |
| | 3. I feel uncomfortable to use Media Pole services such as game, photo, videos and UCC services in a busiest street of Seoul with public facility. | |

Table 3. Factor Analysis

| | Component | | |
|---|---|---|---|
| | 1.Informativeness | 2.Entertainment | 3.Subjective Norm |
| Inf2 | .872 | .129 | -.025 |
| Inf1 | .803 | .115 | .112 |
| Inf3 | .747 | .152 | -.071 |
| Inf6 | .596 | .267 | -.068 |
| ent2 | .149 | .802 | -.016 |
| ent3 | .159 | .778 | .118 |
| ent1 | .077 | .708 | -.270 |
| ent4 | .345 | .708 | .001 |
| Sn2 | .030 | -.077 | .870 |
| Sn1 | -.024 | -.019 | .828 |
| Sn3 | -.043 | -.006 | .793 |
| **Eigenvalue** | **3.486** | **2.171** | **1.400** |
| **Cumulative %** | **31.694** | **51.431** | **64.159** |

□ Extraction Method: Principal Axis Factoring
□ Rotation Method: Varimax with Kaiser Normalization

Table 4. Results of Multiple Linear Regression Analysis

| | B | Std. Error | $\beta$ | $T$ | Sig. | Multi-Collinearity | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | | TOL | VIF |
| (Constant) | .963 | .261 | | 3.692 | .000 | | |
| Informativeness | .429 | .059 | .427 | 7.228 | .000 | .810 | 1.234 |
| Entertainment | .296 | .054 | .323 | 5.447 | .000 | .804 | 1.243 |
| Subjective Norm | .019 | .041 | .024 | .454 | .650 | .991 | 1.009 |
| $R$=.637, $R2$=.405, $R2_{(adj)}$=.397, $F$= 47.226, $P$=.000 | | | | | | | |

□ VIF: Variance Inflation Factor
□ TOL: Tolerance Limit

there were no problems in Multi-Collinearity. This indicates that independent variables were mutually independent.

Result of regression model significance test showed that this model was suitable (F= 47.226, p=.000). Among three independent variables, informativeness (t=7.228, p<.001) and entertainment (t=5.447, p<.001) were significant but subjective norm (t=.454, p>.05) was not significant regarding attitude towards advertisement. Looking at $\beta$ coefficient value, informativeness is. 427, entertainment is. 323. This means that attitude toward *Media Pole* advertisement increases apace of increase of informativeness and entertainment. This also means that informativeness influences more than does entertainment, and does not influence subjective norm. Therefore hypotheses 1 and 2 were accepted and hypothesis 3 was rejected. Figure 5 shows results of Hypothesis
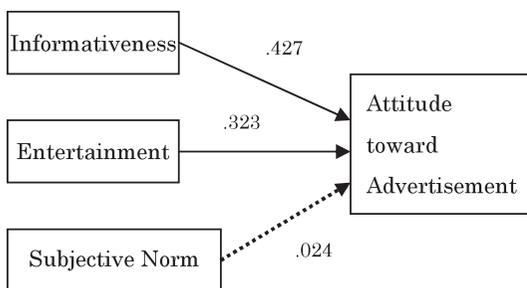


Figure 5. Hypothesis Test Model

Test Model.

H1: Informativeness will have POSITIVE (+) affect on attitude toward *Media Pole* advertisement. (ACCEPTED)

H2: Entertainment will have POSITIVE (+) affect on attitude toward *Media Pole* advertisement. (ACCEPTED)

H3: Subjective Norm will have NEGATIVE (-) affect on attitude toward *Media Pole* advertisement. (REJECTED)

5. Conclusion

Purpose of this study was to examine factors impacting attitude toward the new advertisement medium called *Media Pole*. Ascertain the present status of *Media Pole*, field research has been done. The author had the opportunity to explore all features that *Media Pole* offers to Seoul. Literature has been reviewed and precedent research has been studied to develop research hypotheses and a research model. Ducoffe's (1996) Advertising Value and Attitude Model and Ajzen & Fishbein's (1975 & 1980) Theory of Reasoned Action (TRA) were examined to analyze factors impacting attitude towards the new public facility advertisement medium called *Media Pole*.

Survey research was conducted. Results indicated that informativeness and entertainment variables impact attitude towards *Media Pole*. Findings indicated that the model originally developed by Ducoffe (1996) and extended by Brackett and Carr (2001) is valid in a case study of *Media Pole*. These results are similar to those regarding attitude toward web or mobile advertisement. Among these two variables, informativeness had higher impact on attitude toward *Media Pole*. Another variable, subjective norm was the challenge in consumer attitude toward *Media Pole* acceptance in a busiest public area. Survey results indicated that subjective norm did not significantly affect attitude towards *Media Pole*. This indicates that, if services satisfy their needs, wants and interests, people intend and are willing to use *Media Pole* without concern about subjective norm.

At the end of the survey, the author asked respondents for future recommendations about what is expected from *Media Pole* services in the future. Many respondents answered about local area information; most-wished information centered on restaurants, bars, clubs near Gangnam subway station; additionally-wished information centered on cultural events at theatres, movies etcetera. In short, the public mostly want information about what can be enjoyed in and proximate to Gangnam.

Recommendations to government, organizations, and industry are that more focus is needed on promoting *Media Pole* to residents of Seoul. Survey results showed that 43.0% of respondents know about *Media Pole* yet only 21.5% of respondents have experience of using *Media Pole*. Gangnam ward office and affiliated companies should add more local area information including restaurants, bars, clubs and theatres near Gangnam

area. This study's author also recommends that more focus is needed on users' viewpoints and on user-centric services.

This study's limitation of this study was that it surveyed college students only. Although such students are high consumers of ICT, they are not representative of the whole population. In future study, the survey needs extension to a wider range of respondents more completely representing the combined populace, or at least a metropolis cross-section norm in a culturally and commercially busy modern city. Pertinent research should develop similarly themed and investigative case studies in other metropolises, for cross cultural comparison and to develop a wider database.

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# Global Googlization and the Sharing of Memory

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## 1. Current Issues

In recent years, advances in digital technology have given rise to a social phenomenon known as "googlization".

"Googlization" can be summarized (at least for the purposes of this paper) as "the exhaustive and systematic digitization of culture (cultural property) by global companies, on a global scale". The trend clearly appeared in 2004, with the Google Books Library Project (GBLP), which involves Google, in partnership with a number of libraries in the United States, making digital copies of the main text of books and compiling a database thereof. It eventually spread beyond the borders of the United States and around the world.

At first, the whole issue was something of a shock. A sterile debate, between those who believed the GBLP to be a public-spirited project, combining economic merits with efficiency, benefiting all stakeholders and representing a victory for the cyber-enlightenment movement and those who saw it as an attempt by a private

commercial enterprise to establish an Orwellian control over information, had existed for many years, during which a project like the GBLP was only hypothetical, but the project had now become a reality and was being brandished under our noses. In fact, the "Google Problem" is linked to many other series of issues with intricately linked conflicts underlying them.

Figure 1 is a simple schematic representation of these groups of issues. It is by no means perfect or complete, but it shows, at the very least, that the interconnection of these groups of issues makes it difficult to gain an overall perspective, or to find a starting point for the debate.

## 2. A Summary of the Points at Issue

There is no space in this article to deal with the many groups of issues surrounding the public character of culture depicted in Figure 1. I shall therefore outline three issues that, at present, may be considered critical.

The first is the issue of copyright in the context

Figure 1: Interconnection of issues relating to public use and conservation of media cultural property

of the use and conservation of cultural property. The first and most important reason that the Google problem gave the world such a shock is the GBLP's approach to copyright. In the past, the copyright system created a bottleneck, hindering the use and preservation of cultural property through digitization because it required the prior approval of the copyright holder. If the whereabouts of the copyright holder were unknown, it was not possible to go ahead and digitize regardless. Google removed this obstacle by means of an opt-out system, in which the copyright holder's permission is obtained after the fact. This "mold-breaking" approach has suddenly encountered opposition. One view is that the copyright system has played an important role to date and that the opt-out system may infringe the copyright holder's rights. Those actually involved in the digital archiving of cultural property, while recognizing the importance of the copyright system, have expressed concern that it is hampering their efforts and that it may eventually allow Google to

claim rights as first comer. In other words, they fear that, if people continue to worry about complying with the existing system, a situation may arise in which those who have pursued digitization at the risk of being accused of infringing the system are able to monopolize the benefits of digitization. Scholars such as Kotaro Nawa who take an overall view of the situation, have also pointed out the paradoxical nature of this feedback loop in the present copyright system.

The second issue relates to media. It is clear that digitization is a powerful means of promoting the use of cultural assets in many different ways. Digitization also has the benefit of reducing the physical volume of cultural assets to a minimum and may, at one stroke, resolve the problems of lack of space and need for maintenance that have long plagued many archives. It is because of this benefit that Google has announced that its mission is to "organize the world's information and make it universally accessible". However, alarm bells are sounding, both because original data, of which

digitization is intended to facilitate the use, is in danger of being lost owing to the difficulty of preserving the original media on which it is recorded, and because of the risk that digitized cultural assets may one day become unreadable. These problems do not concern experts alone: already, some of the electronic books created in the early years of digital technology (the 1980s) can no longer be read. As regards problems specifically concerning media, in addition to the problem of demagnetization intrinsic to magnetic disks, the standard format of magnetic disks has changed many times over the years and huge numbers of disks are becoming obsolete.

The third issue is a matter of viewpoint. The "public character" of cultural assets has been used to justify digitization. But what are the standards by which this "public character" is defined? For example, a "state" is one kind of "public", but what happens in the event of a conflict of interests between a "state" and a "community" – which "public" has priority? Printing companies, film companies and broadcasters all serve a public purpose, but they are also private enterprises and profit-seeking business entities. How is "public" to be defined in the context of the global society? How should international conflicts of "public" interest be resolved? In fact, this issue concerns "conflicts of public character or legitimacy" in the context of global society and will require extensive discussion in the future.

## 3. Corporeality and spatiality of information

There are many other issues that must be resolved, including (i) storage and monitoring issues, (ii) multi-layered moral conflicts at global, national, local and private levels and (iii) horizontal moral conflicts between technology, industry,

society and culture, but I should like to leave the discussion of these to another occasion.

I would, however, like to say a few words, from my own perspective, as to what constitutes "information" or "culture". One of the panelists at the symposium said that "culture is a combination of the 3 Cs: content, carrier and context". It should not be forgotten that culture, or information, is not something that exists in a vacuum, without form, but has some kind of corporeal or physical properties.

Now that digitization has become a major current, the tendency is to see only its merits. Greater attention should be paid to questions such as whether it will be possible to digitize all cultural assets and to the fundamental weaknesses of electronic media – the physical fragility of the media, the dependence of readability on format and the risk that, at some time in the future, it may not be able to read the information directly. It will never be possible to digitize everything and, for long-term preservation of what can be digitized, it will be essential to keep multiple copies on other media. Taking these factors into account, how should the social costs of preserving this culture be assessed? Another factor is that the volume of culture, or information, is continually growing; as more material is archived, the volume of information will grow to huge proportions. This position may, at first, appear to be counter to the theme of the symposium, but I believe it will be important, in future, to consider how this explosion in the volume of information can be controlled.

Finally – although I may be alone in taking this view – I suggest that the term "information" could also be applied to things that "vanish". At the symposium, the discussion quite naturally focused on "preservation", but I wonder if it is reasonable to preserve everything? Our memories vanish. We

lose some memories are lost but when superfluous memories fade away, we recall other memories. Sometimes, forgetting can be a good thing.

Walter Benjamin, the author of "The Work of Art in the Age of Mechanical Reproduction", claimed that mechanical reproduction led to the loss of "aura" (uniqueness) from social events. However, no matter what advances may be made in media technology, I suggest that each and every event is intrinsically unique. At the symposium, I conversed with people in the audience. This, too, was a once-only event, something that was gone the next instant. It is true that various records were made of the proceedings. There are also audio and maybe even video recordings. However, events are once-only phenomena and I believe that the importance of their uniqueness should not be forgotten as it is one of the issues relating to information.

## 4. New trends and proposals

Another feature of the current media environment is the great speed with which it changes. To borrow a term from the sociologist Zygmunt Bauman – it is in a state of liquidity.

Besides the Google question, the second-generation Kindle released by Amazon in 2009 and the Apple iPad, whose release in the United States in April 2010 caused a great stir, are likely to make a substantial contribution to the growth of the market for electronic books. The way society regards cultural property is changing rapidly. We tend to be captivated by the speed of that change and, on occasion, feel powerless to think about or discuss it. However, if we give in to the temptation to be cynical, it is possible that the balance of society will suddenly be severely disrupted and that an unforeseen catastrophe will occur. To avoid

such a catastrophe, it is essential that we continue to think and debate as we run.

On the basis of the points discussed in this article, I shall now summarize the most pressing issues, as I see them:

(1) Promotion of digitization and conservation of original media and semi-permanent storage media

To allow full use to be made of cultural property, it will be necessary to restructure knowledge to visualize the hyper-linkage between items of cultural property. The digitization of cultural property is a powerful means to this end. Moreover, if only to ensure that Japan's cultural properties do not become isolated and, as a result, invisible in the midst of the ongoing global accumulation of knowledge, it is essential that their digitization should be encouraged (although rights and other issues will also have to be discussed.) However, digitization may also diminish the strength of conservation, and may impact on the integrity of information. Accordingly, when it comes to existing cultural property, the original media will also have to be conserved in parallel with the digital data. The volume of cultural property created in electronic form from the start is likely to grow, but thought should also be given to storing this on more robust semi-permanent media than digital media.

(2) Expansion of the debate on information/media culture

At any rate, as I stated earlier, it is important that the debate should continue without a pause. Today's media issues directly and indirectly affect the interests of

a far greater number of people than ever before. For this reason, it is essential that the debate should be open and multilateral, and that it should be expanded.

(3) Promotion of interdisciplinary research on information/media culture

However, an adequate foundation of basic research into the information/media culture that should serve as the basis of this debate has by no means been established. Basic research into information/media culture involves a wide range of fields, from the physical sciences and engineering to social sciences and the humanities. (This, in fact, implies that the issue of information/media falls outside the scope of conventional science.) To date, the compartmentalization of academic fields has made interdisciplinary research difficult. This state of affairs must be resolved as a matter of urgency.

(4) Promotion of international research on information/media culture

At the same time, information/media or knowledge/culture belongs to all humankind and is basically borderless. Knowledge and culture begin very locally, as a myriad of small currents. However, these small currents flow into global oceans and become the universal, common property of humankind. The promotion of international research is therefore even more important in the field of information/media culture than in other fields. It could even be said that the act of "research" itself is part and parcel of information/media culture and that international research will serve as a testing ground for the resolution of information/media issues.

(5) Promotion of education on information/media culture

Delay in research into information/media culture translates directly into delay in education in the knowledge (in other words information/media culture) that we should be passing on to the next generation. However, generations who are forced to live in an age of media upheaval without this education will be obliged to start research into information/media culture again, from the beginning. If the issue is not addressed, there is a severe risk that a negative feedback loop will arise. The situation must be corrected right away.

(6) Revisiting the intellectual property rights system (especially the issue of fair use for education/research purposes)

Nevertheless, the fact that the current intellectual property rights system will have to be dealt with immediately if some kind of debate on information/media culture is to be pursued, is a serious problem. The system by definition must have a degree of rigidity and therefore some degree of difficulty cannot be avoided, but at present the system is confusing the issues and, if anything, tends to allow unreasonable behavior. At the very least, there must be some easing of the rules, if only by allowing limited exceptions (applying, for instance to use for research and education purposes). If immediate action is not taken on this point, it will be difficult to make any headway on the six issues I have described above.

I hope these rough observations will serve as a starting point for future debate.

# The Upper House Election 2010 and the Social Media of Japan

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## 1. After the Upper House Election 2010

The 22nd Upper House Election was held on July 11, 2010. The ruling coalition secured 44 seats out of all the reelection seats, and the opposition parties (including 51 seats of LDP, Liberal Democratic Party) secured 77 seats, meaning crushing defeat for the ruling coalition. In less than a year after the change of government, the ruling coalition failed to gain majority in the Upper House. People's disappointment in the DPJ, also known as the Democratic Party of Japan, rather than the favorable wind to the LDP lead to this outcome. Chaos looms in politics of Japan.

A major change is taking place in the in media, which is a stage in the election "theater". In this paper, I will report a new relationship between the election and the media, using the results of the survey that I have conducted on July 12, a day after the election.

## 2. The types of media people got information from

■ Diversification and convergence of the media and information of the election

The election is like a festival. A news flash of the results of the vote-count ignited enthusiasm in people at the finale of the festival, the voting day. The interesting observation in the last election was that these special TV programs do not close in TV, but interconnect with various information channels. For example, in the NHK's news flash of the results of the vote-count, the screen showed various channels including TV-General, BS1, Radio-1, and FM, all related to NHK, and also showed phrases such as the internet and mobile phone. Other TV stations also worked-out various programs, including digital broadcasting as well as Twitter.

On the internet side, there were many trials. "NICONICO LIVE", which is a live broadcasting media using the internet, performed net exit polls, after the Lower House Election in 2009. After the vote count was completed, "NICONICO LIVE" put a live talk show with Takafumi Horie, Hiroyuki Nishimura, Takashi Uesugi, Nobuo Ikeda, and the members of the Diets as guests, hosted by Koichi Kakutani. The "mainichi.jp" provided the election results. This program was broadcasted from 19:50 of July 11 to 01:16 of July 12, accessed by 149,518 people with comments as many as 1,039,074.

The ustream, another live internet media,

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The targets of internet monitor survey were people living in Tokyo, Kanagawa, Saitama, and Chiba (metropolitan area). The number of samples was one thousand.

broadcasted a live discussion program of disputants and politicians, hosted by Takeshi Takano and Yoshitsugu Tanaka, both journalists. This program was sponsored by "Infoseek Naiyu-Gaikan", and was accessed by 59,728 people. Similarly on the ustream, the Nippon Cultural Broadcasting put a live program "7/11 Upper House Election Special News Flash" titled "Ronboo's Election Club: Please share us your real thoughts and comments with us!"

Based on the movement of the media convergence described above, the importance of the internet as a media is increasing rapidly. Figure 1 shows the percentage of people who believe that internet was "important" or "fairly important" source of information in this election. The graph shows that people in their 20's and 30's believe that the internet is more important than the newspaper.
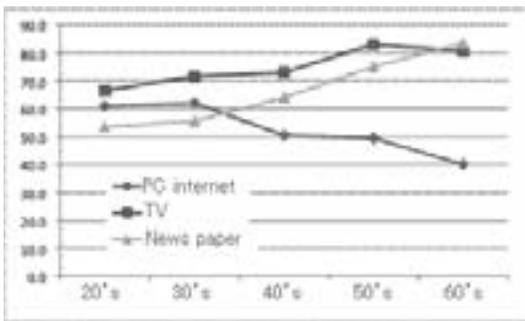


Fig. 1 Importance of the media in the election felt by each generation (%, based on the survey by Inter-Media Society Research Group, on July 12, 2010)

■ From which media did people gain information from?

From what specific media did people get information from?

Figure 2 shows the results of the survey where

I asked people "What did you use as a source of information in this election?" Percentage of the news sites such as Yahoo! or Infoseek stride out. This may be somewhat due to reason that the survey was done on the internet.

On the contrary to the above observations, the newspaper's power of providing information has not necessarily declined, because these web sites utilize news service from newspapers. This means that present media does not have a structure where different types of media are confronting each other like "TV vs. news papers vs. internet", but has a structure where each of them are complementing one another like "TV and news papers and internet". I would like to call this media environment an "Inter-Media Society".
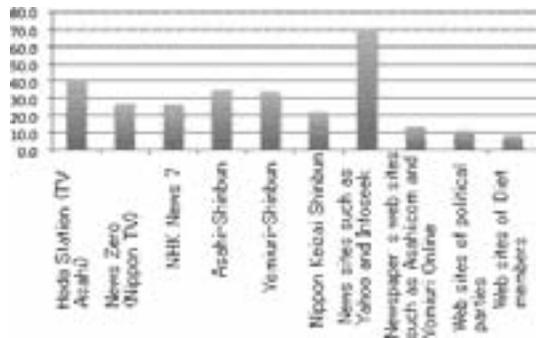


Fig. 2 Information sources at the election (%, only media in the top ranks are shown, based on the survey on July 12, 2010)

3. Political activities using the internet: election in the Inter-Media Society

■ Election information from internet

Let's look into the internet trend, in more detail. Other than news sites, which already gained many users, there are emerging new services such as large bulletin board system, blogs, SNS (Social Networking Service), and mini-blogs such as

Twitter. These are called "Social Media", and their characteristics are in the capability to provide communication environment based on the virtual community. It is said that these social media strongly influenced Obama's win in the presidential election of US, in 2008.

Video communications on the internet are also active in recent years. Video hosting services, such as YouTube, are already using information from TV programs (for example, "Scoop! Contribute together Videos" of NHK). Other than these services, there are new services in which people can make their own video clip and broadcast it live by themselves, such as Nikoniko video service and ustream. "Jigyo-shiwake", which sort out government businesses to defeat wasteful ones, and which was almost the only political activity by DPJ that succeeded in gaining people's support, was broadcasted live using the internet, which contributed to its popularity.

In Figure 2, web sites by political parties or by Diet members have made their place in the top ranks, as popular information sources for the election. Internet is a suitable media for political parties or Diet members to appeal their political ideas, since it costs very little. Furthermore, internet can be used by citizens to promote their activities or personal opinions. Thus, possibilities of obtaining information or gaining your place in the election campaign have increased dramatically thanks to the internet. Development of social media or video hosting services, described above, accelerated this movement. In this year's election, various independent election web sites, such as "Yahoo! Everyone's Politics", "Rakuten Love Japan", "Google Vote for the Future", "JANJAN The Election", or "e-Politics", provided information on the election. Now we can access various kinds of information.

The election web sites, such as "Yahoo! Everyone's Politics" or "Rakuten Love Japan", started a service to mediate small amount of political donations to candidates. This service enables candidates without campaign funds to collect money. Even a candidate, who does not have sponsorship from large companies, now has the opportunity to become a politician.

The voting rate among the young generation has always been and is still only half of that of aged generation, as shown in Figure 3. It is expected that by using the internet to provide information on the election, we can get more young people to be interested in the election.
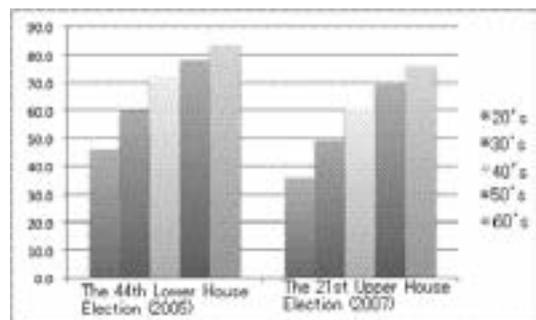


Fig. 3 Voting rate for each generation in the recent national elections (source: Association for Fair Election Promotion)

Web sites where people can enjoy the election as if they are playing computer games are being built one after another. Examples are: the site "Shugi.in" (http://shuugi.in/), where you can virtually participate in shugi-in (Lower House Election), and "Vote Now" (http://agilemedia.jp/lets_vote/), which gathers Twitters on the election. It is expected that these projects will raise the interest in politics among young people.

## ■ Political activities on internet

It is quite common nowadays for Diet members to have official web sites. There are many Diet members who became famous by utilizing social media.

A Diet member who is good at using Twitter is called "Twitter Diet member". Diet members, such as Seiji Ousaka and Kenzo Fujimatsu, are famous "Twitter Diet members". Ousaka is famous for using Twitter to broadcast the debate between party leaders live at the Diet held on July 2009. Interactive communication in politics may attract people to the actual political events, such as speech meetings.

In the US, President Obama is famous for using Twitter, and he has attracted more than 5 million followers up to now (Obama says that he has not contributed by himself).

In Japan, the former Prime Minster Hatoyama started Twitter just after he took office, attracting nearly 700,000 followers. It got into the news when Hatoyama said that he would re-follow. To act against the Hatoyama's Twitter, Tanigaki, the President of LDP, said "I followed Hatoyama's Twitter" before the start of debate between Hatoyama and Tanigaki, held on April 2010. This topic also got in the news as it attracted a lot of attention.

The web site "Politter" (http://politter.com) was opened, which shows the list of Twitter Diet members, with their "murmurs (contributions)". We may to able to prospect the future of Japan's politics, by watching the topics on this site. Politicians, not interested in the "actual voices of people" expressed in the Twitter, may have difficulties to be successful.

There are other political activities that we can do using the internet. Virtual space "Ameba Pigg", operated by a server agent, provides various opportunities to political activities. Examples are: establishing a special area called "Our Wishes to Politics Forum", where we can discuss or share our idea on politics by presenting can be held; the distribution of the virtual item "Let's Vote Badge"; and an open forum participated by Diet members and candidates. In this open forum, Diet member Fujimatsu and a candidate Junko Mihara participated, and Mihara won the election.

## ■ The obstacle named the Public Offices Election Act

Currently in Japan, the providing of information on the election using the internet is strictly restricted. This is because the Public Offices Election Act, which is the rule for fair election, was established in 1950, when people were not expecting this kind of situation on media that we have now. In this law, updating information on the election during campaign period is prohibited whether it is done by candidates, supporters, or by citizens. This restriction is more sever than that of other foreign countries.

There were discussions on the modification of the Public Offices Election Act, accommodating to the current media environment, within the last ten years. There was a rather strong movement of the modification of the Act, when "Research Group on the Election Campaign in IT Era" was started by the Ministry of Public Management, Home Affairs, Posts and Telecommunications, in 2001. The strict restriction on the net election was not changed, however. On May 12 of this year, there was news on the agreement between the ruling parties and opposition parties on the removal of the banning of the net election. The action in the agreement was postponed, however, because Prime Minister Hatoyama resigned.

Although the net election is not unconditionally
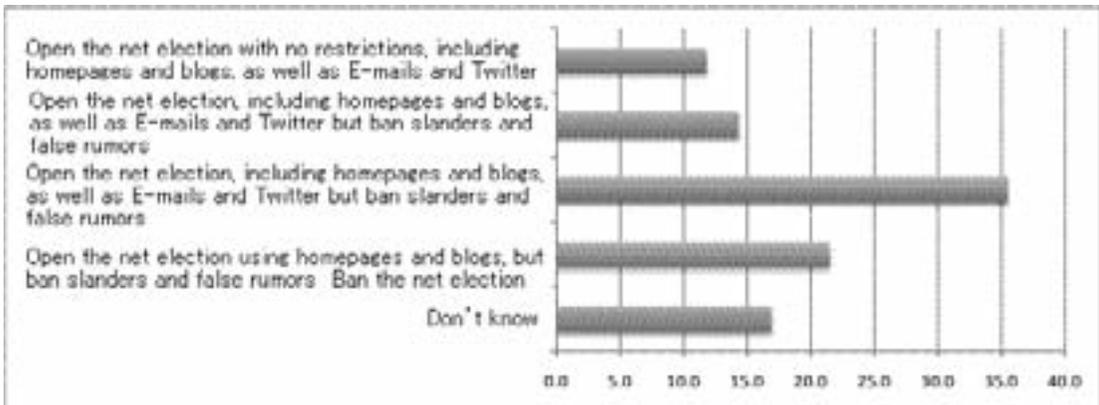
Fig. 4 Opinions on the Public Offices Election Act (%, based on the survey by Inter-Media Society Research Group, on July 12, 2010)

wonderful, restrictions that suppress people's desire to communicate or political interests must be modified as soon as possible, since internet is widely used among people.

Based on the result of survey where I asked people's opinion on the net election, most of the people feel the need to modify the Public Offices Election Act, as shown in Figure 4. The percentage of the people who are against the modification of the Act is only 20%.

### 4. The trends in foreign countries

The change in the media is making its progress now in Japan, but what about in foreign countries? Let's look into the movement in other countries.

■ The midterm election of US

In the US, where the internet technology originated, there are essentially no restrictions against the utilization of the media in election, and internet is widely used throughout the campaign. Obama won the election by MYBO (My Barak Obama) strategy, where various media, fused with each other, were used effectively, including the

internet. The characteristics of the MYBO strategy are that it strongly connects the messages on internet with the organization of grass-root supporter's activities in the real world. After taking the office, Obama still utilizes the internet to communicate with people, and he is called "WIRED President". He has web sites in social media, such as YouTube, Facebook, Twitter, and others.

It is now the season of the midterm election in US. Every political party is actively utilizing the internet for election campaign. This is because internet influences greatly the grass-roots activities of people (grass-roots activity using the internet is called sometimes as "net-roots"). In the midterm election campaign, conservative groups who are against Obama's tax reform are active in having "tea party". In opposition to this, liberal groups are eagerly making the "coffee party" movement using the internet. The internet is main battlefield of the election.

■ Trend in France

In France, commercial newspapers became subsidiaries of the company, which is thought as near government. Therefore, criticisms against

the government are done mainly on internet news. In recent days, internet news site "Media Balt", started by people who were reporters of Le Monde, is active in reporting on the suspicions of President Sarkozy. In opposition to this, President Sarkozy started Facebook, as a public relations tool, from around 2009. There are about 230,000 members.

■ Trend in UK

In Europe, Facebook is most popular among all social media. In UK, users of Facebook have reached 24 millions. Facebook opened the election site "Democracy UK on Facebook" (http://en-gb. facebook.com/democracyuk#!/democracyuk), at the General Election in May of this year. In this site, about 270,000 users are registered, and more than one million people joined mock vote. The debate of three party leaders was broadcasted in cooperation with YouTube, and the party leader opinions were voted using a button on the screen. The opinion of Mr. Clegg seemed to be most popular. It seems than this event changed politics into an entertainment.

■ Trend in Korea

In Korea, internet was the most important place for democratic campaign. To act against the powerful traditional media, internet news site "Oh My News" was opened in 2000, and it got supports from many users very rapidly. In the Presidential Election 2002, it is said that internet user, called "Netizens", played a great part in contributing to the win of Roh Moo-hyun, the current president.

After that, however, the control against internet was strengthened, and access to "Oh My News" decreased rapidly, and thus political activities using internet declined to some extent.

Nevertheless, "demonstration with candles" was organized using the internet in 2008, to fight against the government's decision to import American beef. It is said that "demonstration with candles" gathered from 5,000 to 50,000 people in 2 months.

In the general election of local governments in June of this year, the ruling Grand National Party suffered crushing defeat. The reason is that the messages from Twitter calling for people to vote raised the voting rate among the young generation significantly, especially of people born in 90's. Before the election it was expected that the Grand National Party would overwhelm.

5. The future of the social media

Media politics using the internet is the world-wide trend, as described above. We wonder if Japanese can survive this trend, because some people say "It is hard for me to communicate well with other people", or "Japan suffers from Galapagos Syndrome".

However, there are many trials, as described above. As shown in Figure 5, the power to influence using the social media is not small among the young generation, though the percentage of social media being used as a source of information in total is not high.

Actually, based on the result of the research by Netratings (http://www.netratings.co.jp/), Japan is collecting more than one million active blogs every month. This number is far larger than that of other Asia-Pacific countries, and Japan is "the great country in blog" in the world. Furthermore, Japan's reach to Twitter (ratio of Twitter users against the total active internet audiences) is 16%, larger than that of US, which 10%.

By the way, based on the formal blog of Twitter (http://blog.twitter.jp/2010/06/2.html), Twitters per second reached as many as 3,283, just after the
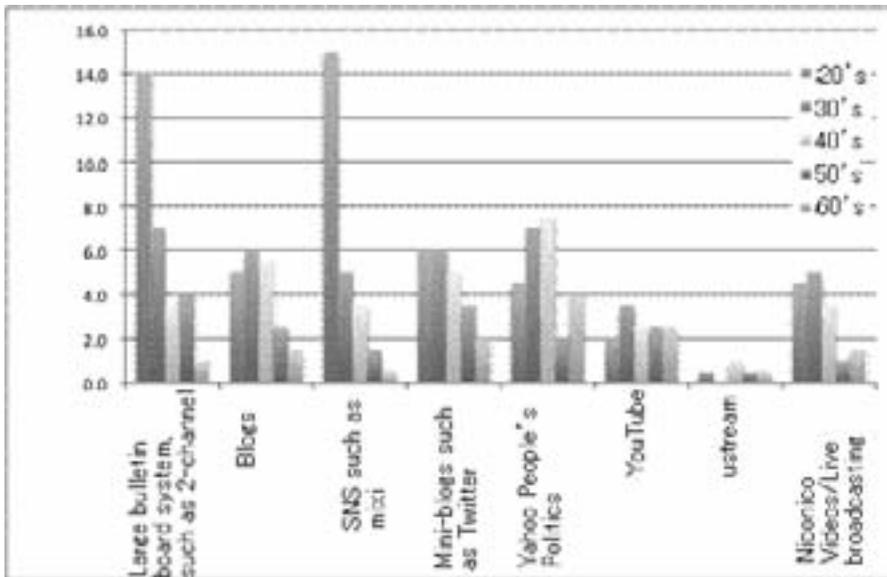
Fig. 5 Out of all information sources on election, social media are most popular among the young generation (%, based on the survey by Inter-Media Society Research Group, on July 12, 2010)

Japan's victory over Denmark by the score of 3-1 at the World Cup Soccer 2010 in June. This number is the highest in the record book, larger than that at the moment of Los Angels Lakers victory over Boston Celtics at the NBA Finals.

Above observations suggest that the internet will be the most important media of campaign in the next election. However, it does not seem that internet will drive out TV and newspapers completely, surviving as the only one media. It is plausible that various media will converge together, creating a new information environment (Inter-Media Society). The important thing now is how we communicate with the real world using the new information environment, or how we interconnect the new information environment with our living. The politics in the inter-media society may be a grass-root politics using the media.

In this paper, I outlined a new relationship between the election and the media, using examples from the Upper House Election, 2010. Changes in media do not necessarily influence the politics. Any media can be a good one, or can be a bad one. It is important to raise our "political influence" by using media wisely, not being abused by media.

# Breakthroughs in Socio-Informatics through Data-centric Science

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Abstract

Until the middle of the last century, the primary paradigms in mainstream science had been either experimental science or theoretical science. Starting in the 1950s, computational science began its rise to equal prominence and this change resulted in the realization of complex, large-scale numerical calculations and simulations. Now, scientific research is continuing to evolve with further innovative changes brought by the advent of the Internet and related technologies. Thanks to the technology used in these sophisticated information systems, most of the hardware and sensors used to gather information are linked to these networks. Information distributed in digital form technically allows anybody to access it anytime and from anyplace. The empirical scientific research method based on complex large-scale data collected through these networks is called "Data-centric science." The "Knowledge Circulation" infrastructure, which creates new value by projecting concrete information from our society into cyber space, analyzing and simulating it on the web, and enabling feedback from the web to real people and objects, will be one of the major pillars of future socio-informatics. In this paper, we describe the trends in methodology of data-centric science developed in various academic disciplines, and the possibility of these types of developments in socio-informatics. Further, we discuss the data sharing/ collaborative research infrastructure that may result in breakthroughs in socio-informatics achieved through sharing vast amounts of data collected from throughout society and utilizing information science.

## 1. Breakthroughs in socio-informatics through data-centric science

Japan has developed one of the world's preeminent infrastructures for Information and Communication Technologies (ICT); this infrastructure includes the Internet, broadband services, mobile phones and associated networks, and digital broadcasting. Such technological progress, however, has resulted in a variety of social changes. One of the issues is the explosion in the range and the amount of information available, information that often is of uncertain reliability and credibility. This change has resulted in a vast amount of varied information from different sources, as opposed to the uniform information that has been traditionally distributed by mass media. The new availability has resulted from significant improvements in the efficiency of organizational activities and information distribution capability of ordinary people through highly advanced ICT. We begin to see cases in which the complex nature and reality of society exceeds our capabilities to make appropriate decisions, in which men, organizations, and even society at large have limited abilities in their selection of useful information from the vast amounts available. One illustrative example of the fruit that ICT has borne is the environment for purchasing goods and services via the web; with this ability came the difficulty of obtaining full and accurate information regarding the credibility of web-based traders of goods and services due to the asymmetric nature of information in e-commerce. The list of potential problems that come with this new technology continues to grow: digital copyright infringement, leakage of personal information, distribution of harmful information, an increase in internet fraud, and changes in the nature of communications with the advent of mobile phones. Issues such as these have been addressed in new socio-informatics studies in tandem with the progress of ICT.

These issues have arisen because human activities and social systems in the real world do not adopt themselves well enough to the world of web information, which has advanced rapidly in a short period of time. The study of socio-informatics should be done with a view that it is necessary to resolve these issues using empirical evidence through the investigation of the essential changes brought by such a vast increase in rapidly available informatization. The study of socio-informatics and research in various related fields have deepened the understanding of our society in a time of swiftly growing informatization, through constructing logical hypotheses and then verifying them. The research paradigms employed there have been conventionally regarded as either "theoretical science" in their mathematical models and thought experiments or "experimental science" supported by social surveys and experiments using human subjects. However, we are finding there are difficulties in fully understanding the recent rapid development of informatization using these conventional paradigms. For example, as there has been an explosion in the amount of data related to human communication accumulated through social media, including blogs and Twitter, we doubt that social research based on conventional sampling methodology can provide a full understanding of this data. Furthermore, although it is becoming extremely easy to collect huge amount of human communication data using information science, there are cases in which hypothesis testing using conventional mathematical statistics does not work for the huge amounts of data collected in this

way.

On the other hand, in computational science complex, large-scale calculations and simulations can be conducted, and in this field there have been advances in the area of information science thanks to improvements in computer capabilities. We can say that computational science has made steady achievements in genome information analysis and other areas though use of improvements in high-speed calculators and algorithms. A new target of analysis in computational science is the variety of real world data collected electronically in real-time using newly developed sensing technologies capable of probing our lives and whereabouts. Obviously, various aspects of our society, which have been the target of socio-informatics, are becoming the target of this type of sensing technology. Even mobile phones, familiar to us as part of our communication infrastructure, are being utilized as sensors that collect information on the physical movements and communications of people.

Considering the changes in the environment surrounding socio-informatics, we need to conduct socio-informatics research based on data-centric science by organically integrating theoretical science and experimental science, the sources of conventional social science, and computational science with its developed technologies in order to fully understand the new changes in society emerging from the development of ICT. Data-centric science is the paradigm for understanding and solving various issues in our highly informatized society by constructing models through the analyses of a vast amount of data electrically collected from real society through various networks, and then feeding back the results of simulations based on constructed models to observers in the real world. In short, we expect

to make breakthroughs in coping with various issues created by informatization through the use of highly informatized methodology in socio-informatics. In socio-informatics, the breakthroughs that we hope to achieve using data-centric science have the following characteristics:

[1] Collection and accumulation of a vast amount of electronic data concerning society (semi) automatically through various networks.
[2] Actions to aimed at solving issues by providing feedback to society based on the models constructed using the collected data.
[3] Promotion of data sharing and collaborative research for researchers achieved though the placement of collected data on a network-type collaborative research infrastructure.

The above [1] features the collection and organization of a vast amount of data from our society projected onto the web via various sensing and web crawling technologies. [2] features the setting of goals for the solution of various issues that have arisen due to this spread of informatization in society, as opposed to simply understanding the phenomena associated with informatization from the point of view of socio-informatics. In order to fill the gap between human activities/ social institutions in the real world and the world of web information, it is important to provide feedback based on the analyzed data in such a way that this feedback may help us enact changes in society. In short, we need to construct a information circulation system to support human decision making in the real world and to provide triggers to change actions, through (semi) automatically collecting and accumulating data related to our current society which then can be projected into the world of web information. Finally feedback
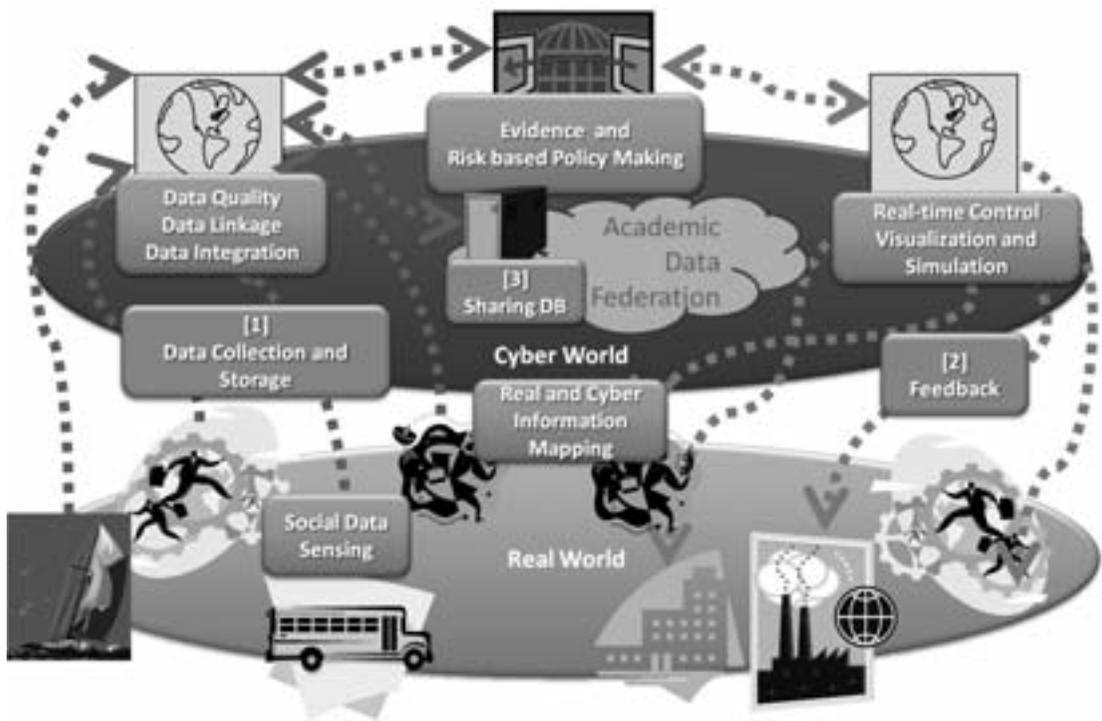
Fig. 1 Information circulation system based on data-centric science

from this collection and analysis must be provided to agents in the real world (Fig. 1).

Information circulation systems such as this have already been put in practice in the areas of traffic informatics and agricultural informatics. In traffic informatics, a method to predict the near future and current positions of vehicles with higher precision and less data is currently being researched. This method uses car motion data collected through sensing and then analyzes the data at central server in order to send it back to individual vehicles as feedback. In the field of agricultural information, new developments using remote sensing technology in the collection of data related to both the status of cultivated agricultural products and the weather are being made. The data would then be analyzed at a server and the feedback returned to the agricultural areas.

It will soon be fully possible to introduce the same type of information circulation system in the area of socio-informatics. The information needed for smooth social exchanges, economic transactions, and sustaining our increasingly interlinked society has traditionally been distributed through both mass and interpersonal communication. However, such information is also currently distributed via the Internet. For example, in order to smoothly conduct social exchanges and economic transactions, it has been shown that it is important for trading partners to have a credible reputations (e.g. Nowak & Sigmund, 1988; Milinski et al, 2002). This can be seen in the net auction market: information concerning the reputations of traders is accumulated and organized over the web and accessible to potential auction customers. The feedback of information on the reputation of traders in net auctions makes

transactions containing an asymmetric nature of information possible without the parties involved really knowing each other (Yamagishi et al., 2009). Information concerning not only the reputation of people, but also the reputation of products and services and the credibility of e-commerce transaction sites is scattered about on the web. Collecting, accumulating, organizing, and analyzing this information through electronic sensing and crawling, and then returning the feedback to society at large will contribute to the solution of problems that have arisen due to rapid informatization.

[3] represents a breakthrough in the usage phase of collected data. This is not conventional manner of usage in which data is gathered and stored by a single researcher or a research group. It represents the promotion of sharing collected data through the utilization of recent information-science advancements connected to authentication and security technologies. This will reduce inefficiencies in the dispersion of research resources and enhance research infrastructures, especially for researchers who may be young or not yet well established. Making common data accessible to a greater number of researchers will ideally lead to more empirical investigations that are able to replicate analyses and provide counterevidence, and this will contribute to the development of research in socio-informatics. In this way, data-centric science aims to make breakthroughs using a fusion of the elements of information science including data collection, feedback to members of society, and data sharing.

In the following section, we list specific research examples of the methodological trends in data-centric science developed in various areas in socio-informatics.

## 2. Examples of socio-informatics studies based on data-centric science

### 2.1 Research on communications using smartphones

One of the important research targets for socio-informatics is examining how the usage of new media relates to human behavior and psychology. Especially, mobile phone usage, which has skyrocketed in recent years, has dramatically changed the manner of interpersonal communications. The change in communication at a personal level via mobile phones is having a huge impact on the way we form social networks, our capability to form groups, and our ability to organizing collective action (Rheingold, 2002; Ling, 2004; Katz, 2008). The research on the relationships between mobile phone usage and human behavior and its psychological basis has for the most part been done conventionally using social survey methodology. Typically, the most widely accepted method is to measure variables regarding mobile phone usage (e.g. frequency and content of usage), and to examine their correlation with behavioral and psychological variables. Actually, there is a large amount of knowledge on the social impact of mobile phones that has been clarified through such research methods, and social surveys will continue to be a pillar of research methodology.

On the other hand, the technology used in mobile phones is developing at an extremely high rate. Specifically, the advent of smartphones that feature full-fledged network functions and open source operating systems may bring methodological breakthroughs not only in research related to the impact of mobile phone usage in society, but also in research related to

human communication in general.

First, call and SMS (Short Message Service) history can be obtained directly from applications in the terminal OS. As for email, it is technically possible to obtain information from web mail servers such as Gmail through API permission using open protocol such as OAuth. Further, it is possible to obtain information on the location of users through GPS information acquisition. "Sensor data mining technology" that analyzes presence (5W1H) of users in real-time is also in development. Additionally, it is becoming possible to estimate the status of mobile phone user's movements and ascertain whether these people are riding on trains or in cars by the environmental sounds obtained using various sensors and microphones. In this way, mobile phones currently act as sensors featuring multiple functions related to human communication and behavior, and this is expected to serve as a basis for methodology to obtain data for socio-informatics. Although measurement errors are inevitable in social surveys that rely on self-reports by respondents, the automatic collection of usage logs directly from mobile phones should help to counteract the disadvantages found in social surveys (i.e. measurement errors), which create obstacles in statistical hypothesis testing such as attenuation in correlations. This corresponds to the aforementioned feature [1] in data-centric science. Automatic collection and accumulation of a vast amount of data related to human communication through mobile phones has become possible.

At the same time, there are some previous findings that have shown the negative social consequences of mobile phone usage, and made the point that there is a need for technological and systematic support to counteract these issues. The author (Kobayashi, 2010) has pointed out that mobile phone usage among younger people is correlated with the formation of homogeneous and intolerant "foxhole type" networks, and mentioned the need for more technological support to counteract this trend. If the usage of mobile phones drives the strengthening of "strong ties" that help form homogeneous and sometimes intolerant networks, embedding technical "hooks" to help interaction with "weak ties" and create heterogeneous groups in mobile phone usage can work as a technological counterbalance to these types of negative social results. For example, we can collect communication logs automatically from smartphones and then analyze the logs to estimate the pattern of communications. In this way feedback that can activate "weak ties" is returned to an application on the mobile phone based on the estimated pattern. Specifically, it would be possible to remind those who have been out of touch recently or to send a message to try to encourage communication with persons who may have been out of contact for a long time. This corresponds to the aforementioned feature [2] of data-centric science.

Of course, we must take extreme care to pay attention to the ethical issues in research that accompany these methods of data acquisition. We certainly need to obtain consent from mobile phone users and to pursue research in a thoroughly ethical manner using such methods such as the application of irreversible encryption when collecting communication logs. We must be sure not to collect data that could possibly contain specific personal information. However, it is certain that there are great advantages from a research point of view to be gained by finding ways to conduct research in concert with these ethical criteria. Both the automatic collection of precise communication data, which has been collected

only in indirect and limited form, and the direct linkage of data to efforts to find solutions to existing issues are concurrently possible.

Our research group including the author (Kobayashi) is developing a communication research application operating on "Android" – the OS for the smartphone provided by Google. The application is installed, with user consent, on Android equipped mobile phones and after anonymization and encryption automatically collects and accumulates usage logs of phone calls, email, and SMS. Additionally, the application samples the contact counterparts of users (the other end of phone calls and SMS communication) at preset criteria, and can obtain information about these counterparts (attributes, relationship and frequency of face-to-face conversation) via short a pop-up survey questionnaire. From the automatic collection of communication log data and the analysis of survey data, we will be able to obtain a deeper understanding of mobile phone communication, which has been difficult to do when only social surveys have been employed. Furthermore, by constructing a model to classify user counterparts, certain types of technological support may be developed for mobile phone communication, which has a tendency to form homogeneous social networks. This would be done by providing automatic feedback periodically to a terminal that would help to maintain "weak ties" in the form of messages reminding counterparts classified as "weak ties" to stay in contact. In addition, this type of feedback can be modulated in combination with information gathered about user locations through GPS and data on user movements.

In this way, smartphones are expanding their nature as sensing devices for human communication. It is as if most people are walking around with highly sophisticated sensors, and we can say this circumstance is a great opportunity for the field of data-centric science. In communication research targeted by socio-informatics, data-centric scientific methodology based on ICT can produce major breakthroughs.

## 2.2 Risk estimates for e-commerce transaction sites and providing feedback to users

The trust in our sophisticated information society is threatened in various forms: fraud, libelous posting, the spread of rumors, web groups promoting violence and self-destructive behavior, and unofficial (malicious) websites using ICT including email, home pages, blogs, and SNS (Social Networking Service). As opposed to the way trust has traditionally been built in society, based upon norms of face-to-face communication, trustworthiness in the information world, whether it is of a person or of information, is hard to judge because this world of the Internet is often characterized by anonymity and it features a lack of non-verbal communication. In this way, the anxiety that accompanies this lack of information we traditionally use to judge trustworthiness and the resulting mistrust of the information communicated on the web are a major barriers to economic development in the information and knowledge service industries. For this reason, a system that provides feedback on evaluations of the trustworthiness of trading partners to users by collecting information on the web and analyzing it is required.

As an example of the need for this type of system development, we chose the issue of the trustworthiness of electronic commerce sites (EC sites). Securing full confidence in EC sites requires a large amount of resources. However, not conducting full verification of EC sites risks

severely damaging the market due to the spread of flawed and/ or malicious businesses, and a drop in the amount of transactions spurred by consumer distrust in the market. So, in order to create economic development through the spread of smooth e-commerce, it is crucial to secure user confidence and security by evaluating the trustworthiness of EC sites. This can be done utilizing information that is scattered about on the web.

Watanabe, Ando, & Sonehara (2008) have analyzed the clues that users use to judge the trustworthiness of EC sites. As a result, it became clear that information showing the existence of these companies in the real world such as a company overview, address, and phone number were important. The result indicates that users are trying to evaluate the trustworthiness of EC sites through the same cognitive process to judge trustworthiness as they would do with trading partners in the real world. The current legal system for e-commerce partly guarantees the existence and continuity of these companies in the physical world. For example, the Act on Specified Commercial Transactions obligates traders to provide information including phone numbers, domain names, names, and physical addresses. This obligation has the effect that supports user judgments by legally guaranteeing the physical existence of the EC trader and provides continuity for the EC site between the web and the real world.

The authors (Sonehara and Ichifuji) have been developing a system to provide clues that will help users to make judgments of trust about EC sites by collecting, analyzing, and organizing the data representing the existence and continuity of EC sites in the physical world. First, we focused on the data below and evaluated the existence and continuity of identification information obtained online and those obtained in the physical world: (A) the lifecycle of EC site ID, (B) the lifecycle of phone number indicated in EC site, and (C) the degree of compliance of the site with the Act on Specified Commercial Transactions. It has been shown that EC sites with low credibility are known for their frequent changes in ID, and thus the analysis of the lifecycle length of identification information contributes to judgments about the trustworthiness of an EC site.

Furthermore, using the same logic, information on the lifecycle of phone numbers is a valid way to estimate trustworthiness. It has been pointed out that the collected 188 phone numbers of fictional companies used for phishing fraud that have been made available by major credit card companies, are mostly invalid (out of use) numbers. In short, phone numbers are obtained immediately before net fraud and cancelled immediately after the fraud is completed, and thus the lifecycle is extremely short. For example, 91% of phone numbers connected to entities cited as having a high risk of being fraudulent have a contract period of less than six months.

The degree of compliance with the Act on Specified Commercial Transactions, which should be included on EC sites, is also an important way to verify the existence of this company in the physical world. The authors (Sonehara and Ichifuji) have obtained URLs of about 74,000 EC sites, and collected addresses and phone numbers from the information given on the page for the Act on Specified Commercial Transactions. As the information on the web itself changes over time, we intend to develop automatic web crawling systems in the future. This type of research corresponds to the aforementioned feature [1] in data-centric science.

In order to provide feedback regarding the trustworthiness on online entities to EC site users, we must simplify the collected data used to verify the trustworthiness and present it in the form of a statistical score. Therefore, we have constructed a statistical model to summarize the information below into the form of a risk score: (a) evaluation of phone number and address ID (evaluated using length of continued usage of a phone number and degree of correspondence of known physical address with the phone number and address shown on the website), (b) evaluation of EC site ID, evaluation of degree of compliance to the Act on Specified Commercial Transactions, (c) evaluation of the length of continued usage of URL, and (d) the frequency of renewal of the EC site. With this model, the EC site risk score can be provided to users through the use of information gained through web crawling. In fact, as a result of accessing and verifying the information on various EC sites with this system, we confirmed that the discrimination of high-risk EC sites was possible.

Providing a calculated risk score to potential EC users corresponds to the aforementioned feature [2] in data-centric science. One way for users to receive this risk score is to have them install a plug-in on their web browser that shows risk scores on their browser windows when they visit EC sites, another is having users input the URL of an EC site into a designated verification website when they have doubts about the credibility of an EC site. In this way, the providing feedback in an appropriate form that allows users to judge the trustworthiness of a trading partner will make the discrimination of EC sites with high credibility from those with low credibility much easier, thus promoting smoother commerce on the web. This feedback is especially useful for potential EC users who hesitate to use EC sites because they doubt the trustworthiness of these entities, not for users already trading who are capable of judging EC site trustworthiness.

The authors (Sonehara, Ichifuji) are currently researching a more sophisticated calculation method of risk score using the accumulation of the above-mentioned knowledge as a basis. Specifically, we envisage the development of a method that takes not only data obtained from the web, but also the correlations between EC sites and geographic locations into account in the evaluation of risk score. The method for this includes linking the information for the address of a company running an EC site with the lifecycle data of the building or shopping mall listed as a physical address, and merging this information with data regarding the size of the buildings, and the period of use of these buildings and the names of other companies located in the same buildings. As a result, the information on the website that may not be easy to verify, such as an address, can be verified as physically existing in the real world, and this fact becomes part of a crucial index for the risk score calculation of an EC site. This type of system for feedback on evaluations of the trustworthiness of EC sites that combines information on the web with that found in the physical world may be able to increase the number of EC users, thus contributing to economic development by encouraging this type of commerce.

## 2.3 Traffic control via real-time sensing of moving objects.

Traffic jams have many harmful effects that are felt in various ways in our society. These effects may include such things as delays in the arrival of emergency vehicles and the prevention of evacuation of pedestrians during disasters. In cases in which we have advance knowledge of

areas that have chronic heavy traffic, we can detour around these places using conventional car navigation systems. However, it is currently difficult to predict sudden traffic jams. And once one is caught in a traffic jam, it is very hard to get out. Thus there is a need for a system that allows us to avoid traffic jams before we become snared in them or to control vehicles to in order avoid the occurrence of traffic jams themselves. The easiest way to avoid the occurrence of traffic jams is to forcibly control the flow of vehicles, but in reality this is not a practical solution. Therefore, the authors (Sonehara, Ichifuji), Ryosuke Shibazaki of the University of Tokyo, and Hiroshi Osawa of Saitama University are developing a method that aims to realize social coordination and cooperation in order to avoid traffic jams by considering the needs and purposes of each vehicle.

Emergency vehicles such as ambulances can reach destinations more quickly when other vehicles aid them by yielding. This can be seen as a time-lagged value exchange, meaning that drivers of ordinary vehicles that yield the way expect to gain the value of the rapid arrival of emergency vehicles should they need assistance in the future. The authors (Ichifuji and Sonehara) have envisaged the realization of this type of value exchange between ordinary vehicles in real-time through the use of ICT. For example, when some vehicles are in hurry and others are not, and all these vehicles are heading in the same direction, vehicles traveling at slower speeds are presented the offer of obtaining discount gas prices in exchange for yielding to faster traffic. If the slower vehicles accept this offer, faster moving vehicles receive the value of arriving in time and slower vehicles receive economic incentives. In this way, both parties collaborate voluntarily, not obligatorily, to reach to their goals respectively in a smooth

manner without sacrificing need or purpose. If this kind of value exchange is realized in real-time, the occurrence of traffic jams can be controlled with incentive-compatible collaboration and cooperation. At this moment, there is little research on traffic control utilizing this type of value exchange between vehicles. In order to realize navigation utilizing this type of real-time value exchange, we need to develop a system that collects and analyzes information on the movement of vehicles and pedestrians in real-time via sensors, and to return this information to vehicles and pedestrians as comprehensible feedback. This system should also offer customized information for each user. This is exactly the type of system that would correspond to the aforementioned features [1] and [2] in data-centric science.

First, information collected on each moving object through sensing technology is important as it allows us to recognize action patterns of moving objects. Based on the measurement data gained from the GPS of each vehicle, the locations of a great number of vehicles are analyzed and the behavior of the entire pattern of these vehicles as a whole is gained. Furthermore, the development of data acquisition methods with lower loads on servers are required as a vast amount of data detailing the location of vehicles which is subject to constant change will be accumulated. Additionally, in order to estimate the needs and purposes of individual vehicles and to match different needs properly, we will need to link qualitative metadata such as a vehicle's purpose of movement to each motion using the various map related data and the movement data accumulated in the past. This real-time collection of vehicle movement information and metadata attached to it corresponds to the aforementioned feature [1] in

data-centric science.

In order for real-time monitoring of humans and vehicles to be done precisely and on a large scale, it is important to combine and analyze metadata on objects, such as location information, and the data on the purpose of movements that have been collected in real-time. Then we must appropriately predict both the movements of each singular moving object and all the moving objects as a group. For example, in the cases of parking, stopping, and selections of routes less frequently travelled, valid feedback can be provided to users through the establishment of a method for the attachment of metadata, including purpose of travel, utilizing geographical data such as POI (point of interest), and cross referencing this information with large amounts of similar data accumulated in the past. If this kind of feedback, based on estimated results, is returned to users in each moving vehicle, we can help emergency vehicles avoid routes in which sudden traffic jam are likely to occur, and control heavy traffic through proposals of value exchanges between vehicles. The research on time and space data mining which has conventionally targeted the migration of wildlife, which can move freely in space, but research on vehicles, whose movements are usually bound to roads, is not sufficient enough to have accumulate this type of information. This research is designed to support smooth movements of vehicles through conducting automatic collection of real-time social data through a vast amount of sensors (car navigation and mobile phone GPS, for example), matching value exchanges between vehicles, and providing systems that are able to provide feedback to users in vehicles.

## 3. Creating a research infrastructure for network type data sharing and collaborative research

In new research on socio-informatics using the aforementioned data-centric science, we need to collect and accumulate a vast amount of electronic data from the physical world (semi) automatically. Thus, greater investment in academic research and higher education that has not been required for conventional socio-informatics research based on theoretical science and experimental science, occurs here in the cost of system development, data sharing servers and data storage management. However, it is inefficient and unrealistic for each research institute to spend its resources establishing individual infrastructures for data-centric science. In data-centric science that targets the construction of models utilizing a vast amount of data and providing feedback based on these models to members of society, it is of crucial importance to promote the formation of collaborative and cooperative research infrastructures, which will archive the collected data and make this available for sharing. If this does not happen, data-centric science will not be able to widen its boundaries, and will only be available to limited users at research institutes with abundant research resources.

Especially, researchers who may be younger or not so well established would not have the resources to carry this kind of cost burden. In order to make progress in socio-informatic research aimed at harmonizing information technology and human and social sciences, a variety of different researchers, regardless of their age, scale of research, or the research institution, should be able to exchange information about their findings, opinions, and ideas by direct access

to shared data collected through data-centric scientific approach. This could be considered the spirit of data-centric science. In most cases, social survey data and laboratory experiment data obtained through conventional experimental science methods have been accumulated in the hands of individual researchers and have not been open to public. It is obvious that it is difficult to make the data widely available without any legitimate evaluation of data collection itself, but we can't deny that problems with data sharing has made replication tests and provision of counterevidence difficult and at times halted the development of social science in our country. What those involved in data-centric science hope to do is to make it easier for researchers to commit to data-centric science by fully utilizing information science. Through opening up the availability of data to a collaborative research infrastructure utilizing ICT, the verification and transparency of socio-informatics will be enhanced, and we expect

this will lead to the development of new research regardless of the amount of individual resources researchers or research groups may have.

As the collaborative research infrastructure for data-centric science, National Institute of Informatics, to which the authors belong, is promoting establishment of data sharing/ collaborative research infrastructure with the cooperation and partnership of universities nationwide. A data sharing collaborative research infrastructure would integrate identification and attribute information, which previously had been utilized only internally at each university and organization, and enable data sharing across universities and enhance the sophistication of collaborative research and cooperation in higher education (Fig. 2). As this data sharing/ collaborative research infrastructure allows individual authentication, researchers can utilize various services for collaborative research not only in universities and research institutes nationwide,
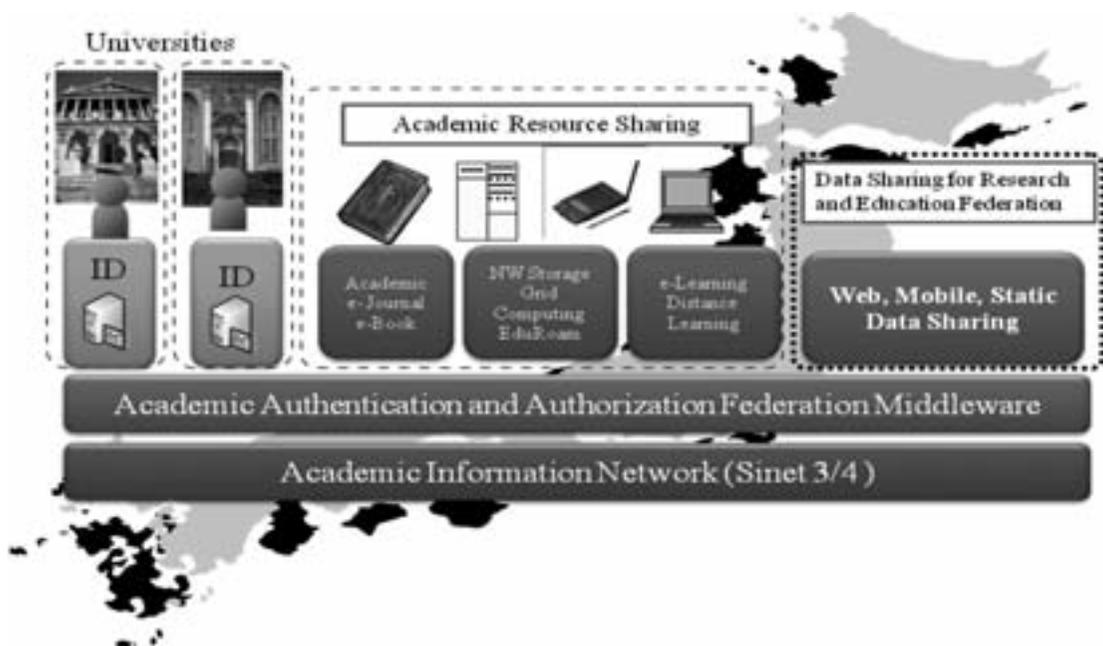


Fig. 2 The structure of data sharing/ collaborative research infrastructure

but also at home. As this infrastructure would be to some degree ubiquitous, we hope that quality can also lead innovations in collaborative research and education. Further, data archives and various information systems for collaborative research constructed and managed by individual universities and research institutes will be shared and centralized in the data sharing/ collaborative research infrastructure, and this should lead to improvements in the efficiency of collaborative research utilizing data-centric science.

The services provided in a data sharing/ collaborative research infrastructure include networks, wireless LAN access service on campuses, overseas wireless LAN roaming service for the purpose of academic research and education, academic content access service (for example electronic journals and books), calculator access service such as Grid, and research and education platform services including remote lectures and e-learning. The various data obtained through data-centric science will be accumulated in an academic information infrastructure that promotes the correction of disparity in research resources and encourages collaborative research. That is, the promotion of collaborative research is possible because researchers in universities nationwide will have an equal level of access to research resources for collaborative research, and there will be no barriers such as physical distance, security, or user authentication.

In this paper, we illustrated the current situation surrounding social informatics including the forced innovation of methodology with the background of rapid ICT development, and described the possibility of breakthroughs of socio-informatics from the viewpoint of data-centric science, which looks to ICT for innovations in methodology itself. Specifically we have focused

on the three points: [1] automatic collection and accumulation of a vast amount of data reflecting our society, [2] providing feedback to users based on models constructed by the collected data, [3] the possibility of forming a site for data sharing and collaborative research, which enables us to review emerging socio-informatics research using data-centric science. In order for our country to win 'the great intelligence war' in social informatics, which has been brought on by increasingly sophisticated information technology, it is vital that we utilize the rapidly advancing power of ICT. We would like to contribute to breakthroughs in socio-informatics from the viewpoint of data-centric science that utilize the full power of ICT in all areas including data collection and accumulation, feedback to society, and the promotion of data sharing and collaborative research.

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# In Search of a Paradigm of Socio-Informatics: On Socio-Informatics and Social Informatics

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Abstract

   With the development of ICTs, the earth is progressing to globalization more and more, and politics, economics, and the society are getting merged. The problems concerning ICTs and human beings/society which occur in the international society and the international relationships in globalization have become common problems everywhere both in big and small countries. Thus, as an academic system to answer such themes, "Socio-Informatics" was planned in Japan, and "Social Informatics" was planned in the West. Many researchers are making efforts to solve various problems in reality.

   "Social Informatics" in the West has its roots in IFIP, a society mainly consisting of information sciences. "Socio-Informatics" in Japan was born out of the ideas of humanities, social sciences, and philosophy, rather than out of those of "information sciences". However, it is only the beginning of the precise definition of Socio-Informatics/Social Informatics and its objects of researches also in Japn and the West.

   In this script, we suggest our ideas concerning objects and methods of Socio-Informatics after introducing the present situation and themes of its researches in Japan and in the West. One of our ideas is that we need a viewpoint to grasp the whole human society comprehensively more and more in such new reality for developing Socio-Informatics/Social Informatics. About the necessity and the meaning of this viewpoint are examined in detail.

## I. Introduction

It has been said that we live in the information society. Interdisciplinary departments consisting of specialists of humanities, social sciences and social informatics were founded in several universities in Japan, in order to research new problems that occur in our life and social organizations as ICTs (Information and Communication technologies) spread. Since 1990 to the present, six departments whose names are with the prefix of "Shakai Jouhou Gakubu" (departments whose purposes are researches and education in relation to socio-informatics) have been founded. To name them as the time of foundation, they are: Faculty of Social Information (Sappro Gakuin Univ., 1990); School of Social Information Studies (Otsuma Women's Univ, 1992); Faculty of Social and Information Studies (Gunma Univ. 1994); Faculty of Social Information Science (Hirosima Bunka Gakuin Univ. 1996); Faculty of Social Information (Jumonji Women's Univ, 1998); School of Social Informatics (Aoyma Gakuin Univ., 2008) Although the term in Japanese is "Shakai Jouhou Gakubu" altogether, each of these departments has peculiar characteristics as they are expressed in the English terms.

Apart from them, many departments in relation to social information such as departments of information and media were founded all over Japan.

In 1996, JASI Japan Association for Social Informatics and JSIS Japan Society for Socio-Information Studies were founded, and each has been presenting results of various researches. Since 2004, they have been holding a joint society of the presentation of the results of researches, and they published English journal *The Journal of Socio-Informatics* (JSI) in 2008. They published the third issue this year.

In the preface of JSI, the basic problems which they have been researching so far are explained as below:

There, progress is being made on resolving questions like "What is Information?", "What kind of change is information technology causing to human relations or social structure?" and "What is the design for a desirable society which is taken and constructed to elucidate a concrete everyday social phenomenon or a social problem?" (Endou & Abe, 2008, p.3)

Above are the trends in Japan. What are the trends abroad? The academic conference about Human Choice and Computer (HCC) which was held in Slovenia in 2006 as a flagship conference of Technical Committee 9 of IFIP, the International Federation for Information Processing, is placed as a research meeting in memory of Rob Kling, the founder of IFIP-TC9, who passed away at the age of 58 in 2003. It is because he is supposed to be the founding father of "Social Informatics" in the West. *In Remembrance of Rob Kling* (Nurminen, M. I., Berleur, J., and Impagliazzo, J., 2006).

According to this book, in the conference of HCC7, three sections were held under the themes written below:

Part1: Social Informatics: What is it?
Part2: Social    Informatics:    ubiquity?    An       information society for all?
Part3: Fair globalization.

As is clear from those themes, it is only the beginning of the precise definition of Social Informatics and its objects of researches also in TC9 which consists of members of the countries in

the West.

In this script, we would like to suggest our ideas concerning objects and methods of Social Informatics after introducing the present situation and themes of its researches in Japan and in the West.

## II. The situation in Japan

It is said that Socio-Informatics has two roots: information science and theories of information society. Information science is a technical science which brought about the invention and development of computers. Nishigaki, T. (2004) sums up the circumstances as below:

Speaking roughly from the conclusion, "informatics" which stretches over humanities, social sciences and natural sciences was formed by information science which had been a technical science cooperating and being merged with academic fields of humanities and social sciences such as philosophy, law, economics, and sociology. As is widely known, one of the biggest moments of formation of informatics was that personal computers and the Internet permeated explosively into the public at the end of the 20th century. In such context, "social informatics" can be defined as "the social field of informatics". Then "information" which was a technical concept must be defined again from the viewpoint of humanities and social sciences and be placed as a key concept concerning people and the society. (pp. 2-3)

In addition, Nishigaki (*ibid.*) says, "Informatics is, in short, a discipline of "meaning". It is important to define it again basically because it connects intellect of natural sciences and that of humanities

and social sciences with "meaning" as a medium (p.4). Then he suggests the establishment of Fundamental Informatics from life to society as the basis of the three fields: information and computer sciences and technology, applied informatics/applied information studies, and socio-informatics/socio-information studies.

As we have seen, new informatics which merges information sciences, humanities and social sciences is being groped. In Japan, both JASI and JSIS have been progressing researches and education of a new study of informatics in order to establish it as "Socio-Informatics".

Hiromatsu, T. (2010), the president of JASI emphasizes the necessity of constructing a new academism of socio- informatics.

Socio-informatics is, in its essence, a discipline of interdisciplinary and field-crossing nature which is related to cultural sciences, social sciences and to the field of engineering and that of medicine. Based on this, we are aiming at the construction of a new academism which deals with the Japanese society and the world in the future by integrating theory and practice.

Ito, M. (2010), the president of JSIS explains the significance of developing "Socio-Informatics" as below:

The rapid expansion of the use of electronic media seen in blogs and twitters has a considerable effect on the way of personal communications, on political communications and political awareness, and also on economic activities. Its effect will be the more crucial in the future. Also, social changes caused by technical innovations of the media, such as the world wide movement of electronic books which

Google raised and the trends to oppose it, the development of the trends of electronic libraries, the movement of full scale archives of publications, images, films and broadcasting and active discussions concerning their practical use, are occurring one after another. The development of "Socio-Informatics" is strongly needed which aims at determining the essence of the changes in this process of social information, and solving the problems occurring in the process both theoretically and positively.

It is certain that the present ITCs bring us various merits and demerits, and that various problems to solve occur daily. However, these explanations do not give us a precise answer to the question, "what is Socio-Informatics?".

Therefore, we would like to examine the discourses concerning the possibilities of "Socio-Informatics" in Japan so far.

The first person who discussed the possibilities of "Socio-Informatics as one discipline" was Yoshida, T. (1994). He defines "Socio-Informatics as a discipline" as "an academic field to clarify 'modern characteristics of self organization', dealing with the information society into which information and information processing permeate, based on the construction of *General Theories Concerning Self Organization of Informatics of Social Systems*." His thought bears fruit in "Supertemporal and Temporal-constraint Characters of Socio-Informatics" (Yoshida, 2008). He describes in this thesis:

"supertemporal socio-informatics" is another name for "socio-science that claims symbolic and ontological constructionism" or "socio-science that has the self-organizational character of the symbolic program" and can be said to be

the biological informatics. As a result, various socio-sciences, such as the study of law, sociology, economics, political science, psychology, business administration, social psychology, etc., can have the possibility of synthesis upon the common and general foundation of supertemporal socio-informatics. Once Marxism was said to provide the common foundation for socio-science, but today this common foundation should be found in supertemporal socio-informatics in the exact same way as biological informatics in now regarded as the common foundation of the various biological sciences. (p.42)

This opinion of Yoshida's has something in common with Nishigaki's fundamental informatics plan. Both ought to be examined in detail in the future.

As we have already seen, Nishigaki (*ibid.*) defines social information as "information which circulates via various media in the human society", from the viewpoint that defines information as "meaning". This idea is widely accepted in Japan.

For example, it is defined as below in *Iwanami Encyclopedia of Science* (2004):

Information is the meanings and contents of sentences which are expressed by symbols, marks, and letters (they are generally called "data"). In a wide sense, it includes knowledge expressed by images and sound. It is usually assumed that the receiver of information is affected in some way as he or she receives it, because it is a person that finally receives it. (p. 509)

Hamada, J. (1995) also defines social information as below:

It is the information which appears in the process of works of human society. In short, it is the information that circulates between person to person or organization to organization as a person or an organization as a basic unit of society produces, processes, accumulates, uses it. (p. 70)

It is explained as below in the purpose for which JSIS (1995) as a society was established:

Socio-Informatics is a methodology which is established on the basis of the understandings of information studies concerning society and human beings, and it tries to clarify the structures and functions of social information systems concerning information behaviors and communications of human beings, and their meanings and themes.

From these opinions, information is the meanings and contents that human beings and animals produce and circulate, and the process of their circulation is the process of social information. If that is so, the object of the researches of socio-informatics should be "the process of social information". Endo and Abe (*ibid.*) name the three points of this study as "Socio-Informatics which treats information interdisciplinary (interdisciplinary) and synthetically" as below:

The objectives of Socio-Informatics are:
1. To clarify various aspects of production, circulation, accumulation, and use or consumption of information in society.
2. To reconstruct a theoretical framework about a social system from the viewpoint of "information".
3. To search for a relationship between the new information/communication network and social system.

What is significant here is the terms of interdisciplinary and synthetically. Why should it be interdisciplinary when we try to define social information process from the standpoint of information? Why should it be synthetically? We cannot establish socio-informatics unless we cannot solve this problem.

The opinion of Masamura, T. (2003) helps greatly in this point:

Socio-Informatics is placed as a study that clarifies various social phenomena through information. It does not extract and analyze only information phenomena from social phenomena. To interpret information in a wide sense, all human activities that form the society are mediated by information, and it exists within all social phenomena. Because information is a basic factor that forms human society, it is the object of socio- informatics. When Socio-Informatics analyzes various social phenomena from the standpoint of information, it is the common viewpoint of analysis that assures the unity of Socio-Informatics, contrary to the case earlier. If the objects are of economics, law, or sociology, they are; cluded in Socio-Informatics by analyzing them from the standpoint of information. The viewpoint of analysis not only defines the range of objects to analyze, but also prescribes the way of the recognitions of the objects. In order to establish the viewpoint of analysis of Socio-Informatics, we must make clear the forms and functions of information theoretically, and construct the view of the world of information. Each study has its own view of the world. When we construct the view of the

world of information based the theories of information, Socio- Informatics will be formed as a "proper science", distinguished from the existing fields. (pp. 32- 33)

To sum up, Socio-Informatics has a viewpoint of "information", and assumes information as its object. In short, information has a double meaning for Socio-Informatics. On one hand, it plays a role to define the range of objects to analyze as a viewpoint of analysis, and on the other hand, it is the object of analysis when social phenomena such as the circulation of information are explained.

When information circulates, it becomes the object of researches, and the viewpoint to analyze the object is also information. Because information is the point of connection between person and person, person and organization, and organization and organization, it includes the fields of politics, economics, sociology, psychology and etc., and naturally, the cooperation of these academic fields is necessary. This is the reason of the necessity of interdisciplinary studies.

Masamura uses the term, "the view of the world of information", instead of the term, "synthetical". We understand that he assumes a new paradigm as a comprehensive viewpoint which cannot be expressed just by the term, "synthetical", an independent academic system. The term "synthetical" mainly means "to sum up the results of interdisciplinary researches", and we think that the neglect of the essential problems of how to sum up is one of the reasons of delayed development of social informatics. We greatly agree with the construction of the view of the world of information. We would like to suggest our ideas in chapter IV.

III. Social Informatics in the West

As we have introduced earlier, we would like to examine several themes suggested by Alice Robbin, in order to develop the ideas of "Social Informatics" of Kling further, as well as examining their definition.

We have introduced the definition of Social Informatics in the preface of HCC7 of IFIP TC9 at the beginning. We would like to introduce "About Social Informatics" on the website of the view of Rob Kling Center for the Social Informatics (Kling, R. 2001a), which explains it most comprehensively.

About Social Informatics

Social Informatics (SI) refers to the body of research and study that examines social aspects of computerization – including the roles of information technology in social and organizational change and the ways that the social organization of information technologies are influenced by social forces and social practices. SI includes studies and other analyses that are labeled as social impacts of computing, social analysis of computing, studies of computer-mediate communication (CMC), information policy, "computers and society," organizational informatics, interpretive informatics, and so on.

SI studies and SI courses are organized within diverse fields, including information systems, anthropology, computer science, communications, sociology, library and information science, political science and science and technology studies (STS). SI provides a common meeting ground for isolated and scattered scholars to locate each other as well as relevant academic programs and courses.

Because this account of Social Informatics is quoted in several literatures, it can be understood not as Kling's personal opinion, but as a common opinion which was discussed and agreed with at HCC of TC9.

What we can see from this account is as below:

1) SI is a study which deals with the social aspects of computerization.
2) This study includes researches concerning the themes such as "social influences of computerization", "CMC", and "computers and the society".
3) It is interdisciplinary as an academic field.
4) It provides researchers who research separately with a common place to meet.

1) and 2) show that such assumption of the objects of study is the announcement that SI deals with real problems which occur in the information society; they do not necessarily show the necessity of "Social Informatics" to deal with them uniquely.

3) and 4) are true; especially the aspect of 4) is important.

Therefore, the range with which "Social Informatics" deals is defined, but it is not sufficient as a definition. We would like to quote the writings which Kling, R. (2001b) placed in Encyclopedia of LIS.

What is Social Informatics?

Social Informatics (SI) is the systematic, interdisciplinary study of the design, uses and consequences of information technologies (IT) that takes into account their interaction with institutional and cultural contexts." Thus, it is the study of the social aspects of computers, telecommunications, and related technologies, and examines issues such as the way that IT shape organizational and social relations, or the way in which social forces influence the use and design of IT.

This definition of Kling's only adds the term, "the systematic, interdisciplinary study" to the account earlier, and it does not show the fundamental and philosophical viewpoint which Japanese researchers have been trying.

In any case, Social Informatics which is studied here is an interdisciplinary study concerning the designs and use of information technology, and their results.

Alice Robbin, who is a successor of Kling as the director of SI center of Indiana University suggests the necessity of examining again the way of Social Informatics which has been led by Kling fundamentally. First of all, Robbin, A. (2007) points out six points as below as Kling's Contribution to Social Informatics (Kling's Legacy).

1) the adoption of a critical stance towards technology in order to destroy false illusions embedded in prescriptive education, research, and the ideologies of ICT use in social life.
2) research based on observation of empirical world.
3) research that applies useful theories and concepts from various fields.
4) research questions that cross disciplinary boundaries.
5) education of information professionals, and
6) responsibility-centered role for information professionals; thus, public polices of the consequences of computerization and a legitimate topic of study. (pp. 2-3)

They estimate the various knowledge and achievements of Kling as the founding Father of "Social Informatics" in the West, his formation of the right understanding of "information technology", his contribution to information policies, and his education of the junior.

At the same time, Robbin points out the five points as below as "What Is Social Informatics beyond Rob Kling?".

1) Is there a compelling vision of what Social Informatics is and its agenda? Does it matter?

2) Kling argued that Social Informatics was defined by its "fundamental questions" about the "social aspects of computing". Have any of these "fundamental questions" been defined?

3) Is "computerization" the core concept?

4) Or should we be talking about "technology" more generally?

5) What are the institutional and theoretical problems that Kling and we have encountered?

These are fundamental pointing out, and they suggest the viewpoints toward a new change as a study from the accumulation of experiential data of the problems of individuals and the society caused by the development of ICTs. Furthermore, Robbin (*ibid.*) suggests six points "to make Social Informatics worthy of attention, to make Social Informatics an influential actor, and to legitimate Social Informatics". We would like to introduce the two main points:

1) Go beyond the definition of Social Informatics that Kling gave, which really focused rather narrowly

2) Develop a theoretically informed set of methodologies.

Among these suggestions, the second applies to Socio-Informatics in Japan.

As we have seen, the definition of Social Informatics and Socio-Informatics is not sufficient yet both in the West and in Japan, but we can see that there is something in common in the attitudes toward the problems caused by ICTs in today's society and their solution.

We would like to develop the world-wide, international exchange of researches of Socio-Informatics through this JSI in the future.

## IV. For the development of Socio-Informatics

As we have seen earlier, Socio-Informatics in Japan adopts "interdisciplinary" and "synthetically" aspects as its basic methods of researches. To establish a study, three conditions are necessary: 1) the definition of the objects, 2) establishment of the research methods, and 3) publication and accumulation of the results of researches. We have no problem about 3) in Japan, as the results of researches have been published in the various academic journals including *Journal of Socio-Information Studies* (in Japanese) and *The Journal of Socio-Informatics* for these 20 years. The objects of researches of 1) are the process of social information. About 2), it is not sufficient yet either in Japan or in the West. Therefore, we would like to examine "interdisciplinary" and "synthetical" aspects.

### 1. Interdisciplinary aspects

We have already discussed the necessity of interdisciplinary aspects, and we would like to supplement it now. Social information is sent and

consumed in almost all scenes of our life. Those aspects of our life are the objects of researches of traditional studies such as economics, psychology, sociology, management, and politics. However, "information" as the object of researches is only a part of each of the traditional studies. Masamura, T. (2003), whom we have introduced earlier gives a simple example of this:

Although information has a nature which is not easily merchandised contrary to wealth in general, in the modern society where information production is industrialized, information is produced, circulated, and consumed as wealth. It is a theme of social economics to study its structure. (p. 32)

This account is an example of economics and information. In the case of psychology, it is its theme to study how human beings "process information". However, it is obvious that it does not cover all the themes of psychology.

As social information crosses almost all the academic fields, it must naturally adopt the results of all related studies. The point is how to sum up the results of these interdisciplinary studies.

## 2. Synthetical aspects

As we have already discussed, to be interdisciplinary means the common studies by the researchers of various academic fields, and the researchers participating in them cannot help studying with their own unique methods and knowledge. There, grasps and solutions of problems are challenged from various viewpoints. How can we "sum up" (synthesize) the results of researches from these various viewpoints? Normally they will be confused because of variety of viewpoints. Or, a great genius who has wide knowledge of all academic fields might appear and will sum them up from his viewpoint. But we never know when he or she will come along; in 10 years, or 100 years?

"To sum up" is, speaking from the point of cognitive psychology, "to pick up meanings from the given data". How can we pick up something meaningful? In order to do so, it is essential to image in ourselves possible systems concerning the matters which might be embedded in the given data. It is possible when we connect the characteristics of the data and adjust them to the self images. In short, we can have "understandings" only when we sum up the data in one connection, one shape. We practice the same intellectual control both when we see face a face of an intimate friend, and when we see a face of a stranger. We must not forget that we recollect what we image from one viewpoint of ourselves then. Picasso's famous paintings, "Weeping Woman" was painted from various viewpoints, which looks odd from ordinary viewpoints.

To synthesize is not just to put together additively and accumulatively, but to sum up from one viewpoint. In other words, it is the viewpoint with which we grasp general images of the objects of researches, and we always assume them when studying. Now we cannot help grasping essentially the problems which cannot be expressed by the term, "synthetical". Masamura (*ibid.*) calls this "the view of the world of information".

For example, traditional psychology divides human beings into "sensation, perception, thinking, intelligence, and personality", and studies them each separately. It discusses "human beings" separately from the viewpoints of the academic fields such as "psychology of sensation, psychology of perception and psychology of thinking" and hardly studies "general images of human beings".

It is typical of "a study without one view of the world".

Also, one of the most famous theories in the history of science, "the Copernican theory" can be said to have been established on the basis of a totally original view of the world at that time.

Onuma, M. (1982) explains the accomplishment of Copernicus, N. (1473-1543), opposing to the Ptolemaic theory of Ptolemaeus, C. (83-168) which was officially recognized by Church at that time (the 16th century) as below:

In Ptolemy's case, it was true that he could explain each of the five planets by the combination of the circular movement of the celestial sphere rather accurately at that time, but he could not explain what connections of the movements of these planets built up this universe (the solar system). On the other hand, Copernicus "observed many times" the connections between the movements of the planets, and made efforts to do mathematical, geometrical calculations over 30 years, and came to the conclusion that the Copernican theory was necessary for their explanations. In other words, he had not only the idea of the Copernican theory, but also observation and calculations to prove it … (pp. 70-71),

The idea which Copernicus adopted then, in fact, exists in heliocentricism advocated by Aristarchus (BC310-BC230), an astronomer in Ancient Greece. Copernicus could establish the Copernican theory premised on this model as an analysis of the solar system.

Therefore, "general images" or "models" of the objects of study play an extremely important part. To establish social informatics as a peculiar study, we must establish methods to grasp the objects of study concerned under some kinds of general images concerning the objects of study analytically and synthetically. We would like to describe our ideas of the methods of approaches to the objects of study in social informatics.

## 3. Basic unit of study of Socio-Informatics

As for how to define the objects of study, we would like to introduce the pointing out of Vygotsky, L. S. (1944-1969), who aimed at establishment of scientific psychology, as a reference. He emphasizes the necessity of focusing on units, as "*all the basic characteristics of the whole.*" saying, "The unit is a vital and irreducible part of the whole." (Vygotsky, 1987, p.46), and does not divide the objects of study into "factors" such as sound and meanings when studying the relationships of "thinking and languages" in psychology.

Vygotsky (*ibid.*) takes the example of the case in which the object of study is water, points out the problems of resolving it into its factors of hydrogen and oxygen to study, as the research method concerning "thinking and languages". He says that they also apply to the study of "thinking and languages":

The essential feature of this form of analysis is that its products are of a different nature than the whole from which they were derived. The elements lack the characteristics inherent in the whole and they possess properties that it did not possess. When one approaches the problem of thinking and speech by decomposing it into its elements, one adopts the strategy of the man who resorts to the decomposition of water into hydrogen and oxygen in his research for a scientific explanation of the characteristics of water, its capacity to extinguish fire or its

conformity to Archimedes law for example. This man will discover, to his chagrin that hydrogen burns and oxygen sustains combustion. He will never succeed in explaining the characteristics of the whole by analyzing the characteristics of its elements. (p.45)

Thus, it is not possible to study "water" without "treating it as water". It is obvious, of course that it is necessary to resolve water into hydrogen and oxygen as a study of the factors of which it is consisted; however, he points out that it cannot be the study of water if we study the elements of which water is consisted as the objects of study.

If we consider "studies of Socio-Informatics" from this viewpoint, because the factors of which social information process is consisted are 1) human beings, 2) various information and media, and 3) human beings/the society/organizations, we can hardly differentiate them from the existing traditional studies when we study them separately. In other words, studies of each factor are done by: 1) "psychology, sociology, pedagogy, and literature, 3) "economics, law, politics, sociology", as social sciences.

Thus, if we try to make clear the basic units of study in Socio-Informatics, we need to synthesize the pointing out of Vygotsky above and the opinions of Masamura (*ibid.*) which we have seen earlier.

To sum up the pointing out of Masamura first: 1) social informatics is a study to clarify social phenomena from the viewpoint of "information", 2) information is a basic factor of which the human society is consisted, 3) therefore, we must not study information by extracting it independently, and 4) human beings and the society are also basic factors of which phenomena of the social information are consisted. If we synthesize them

with pointing out of Vygotsky, the basic unit of study of social informatics is "the process of social information in the certain relationships between person to person, person to society, organization to organization, and society to society". Thus, in the process of social information as infinite combinations existing in the modern society, it is an important theme to grasp the all basic characteristics of the whole of these components comprehensively.

## V. Expectation of Socio-Informatics/Social Informatics

As is often said, human beings began to walk upright 5 million years ago, strengthened the functions of hands, developed sticks and stones into the tools of hunting and eating. The development and use of tools not only make it possible to hunt and collect effectively, but also raise the abilities to use them in ourselves. Thus, we change ourselves every time we invent, improve and use new tools. Therefore, tools and machines also are the media that are inserted between human beings and nature. At the same time, in the process of such development of tools, we developed languages as a tool of communication. Vygotsky calls the former technical tools, the latter Psychological tools. Today, it is possible to call the former technical media, the latter Psychological media, as their essence is tools. We have taken both of the two media in ourselves and have expanded human beings and human relationships.

In this sense, the pointing out of McLuhan, M. (1964) is to the point:

During the mechanical ages we had extended our bodies in space. Today, after more than a

century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man – the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media. (pp.3-4)

With the development of ICTs, the earth is progressing to globalization more and more, and politics, economics, and the society are getting merged.

We need a viewpoint to grasp the whole human society comprehensively more and more in such new reality. That is the viewpoint of Socio-Informatics we have seen above, in short, the viewpoint to grasp the information process as one unity when studying the social information connecting person to person, and person and society as the object of study.

Thus, as an academic system to answer such themes, "Socio-Informatics" was planned in Japan, and "Social Informatics" was planned in the West. Many researchers are making efforts to solve various problems in reality.

"Social Informatics" in the West has its roots in IFIP, a society mainly consisting of information sciences.

"Socio-Informatics" in Japan was born out of the ideas of humanities, social sciences, and philosophy, rather than out of those of "information sciences". However, we find no essential difference between these English terms. The problems concerning ICTs and human beings/society which occur in the international society and the international relationships in globalization have become common problems everywhere both in big and small countries.

In this sense, "Socio-Informatics" and "Social Informatics" are expected to go hand in hand to form global communication in order to solve various problems of the society of ICTs.

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