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Invited Paper

Issues in Disaster Communications

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Abstract: The Great East Japan Earthquake on March 11th, 2011 caused severe damage to the northern coast of the main island in Japan. Since then we have been working to help out the affected area in terms of IT support such as internetworking and providing PCs. Through our support activities we came across an interesting issue concerning collaboration with people from heterogeneous backgrounds. We call this problem disaster communications. In this paper we report our experiences during our support activities and our findings as well as some issues and our current work.

Keywords: disaster communications, information processing for emergency management

1. Introduction

The Great East Japan Earthquake on March 11th, 2011 caused severe damage to the northern coast of the main island in Japan. 15,821 people died, 2,651 are missing and 4,690 are injured [1]. The disaster also caused more global problems due to the nuclear power plant incidents.

Just after the disaster, industry in the Tokyo area wanted to provide PCs and printers to the affected areas but did not know who would like to have them. Academic and industrial groups of engineers wanted to provide internet connection services but again did not know where the services were most needed. With requests from such organizations and groups of people, we started our support with a few of us in the department of Software and Information Science, Iwate Prefectural University ten days after the disaster. Our activities included collecting local information on requirements for IT equipment and internetworking services in the affected area as well as arranging to receive, store and manage incoming IT equipment. We got the information on such needs by communicating with people in the various local government entities and with a volunteer center in Iwate Prefecture. We also set up a mailing list with those people and sent a daily reports on what we did.

Most of our activities lasted for four and a half months from March to the end of July during the initial emergency response. By the end of July, most shelters were closed and the people moved to temporary housing constructed by local governments. Gradually we went back to our normal work.

Through our support activities we came across an interesting issue concerning collaboration with people from heterogeneous backgrounds. Those people who worked on the disaster response came from different backgrounds and most of them were doing quite different tasks from what they usually did before the disaster. Disagreements and distrust happened quite easily. We call this problem disaster communications in this paper. We found that trust plays an important role in such communications.

In this paper we report our experiences during our support activities and present the research issues. The paper organization is as follows. The next section reports our activity in Iwate Prefecture. Section 3 discussed the problem of disaster communication. Section 4 presents some trust issues in disaster communication. Section 5 presents some of our current work. Section 6 gives some conclusions.

2. Report on Our Activities in Iwate

2.1 Report on Our Life in Iwate

We are located in Takizawa City about 67-mi distant from the coast in Iwate Prefecture. Most of us are living in Takizawa City or nearby Morioka City. As our place is far from the coast, although we had a severe earthquake, we did not suffer from the ensuing tsunami. Houses in our area were undamaged. We had some supply line problems for life necessities only for a week or so but after that we got back to normal life. Nevertheless, we report our experience in our place for your information.

Just after the disaster, we did not have electricity for a few days. Traffic lights were not working and it was hard to drive. We used candles for lighting but we had many small earthquakes and we needed to blow out the candles every time we had one. The tall buildings containing our flats ordinarily used pump to raise water to the upper stories, so residents in the upper rooms did not have a water supply. It was still cold in Iwate in March and we spent days without heaters. On the other hand, refrigeration could not be used so foods went bad and had to be thrown away.

Mobile phones were fine so long as the battery lasted. With no electricity for a few days, computer networking was unavailable and we could not use it to get information such as what shops were open or not. Portable radios were useful in this aspect, but lack of information led to fear about what was happening and what could happen next.

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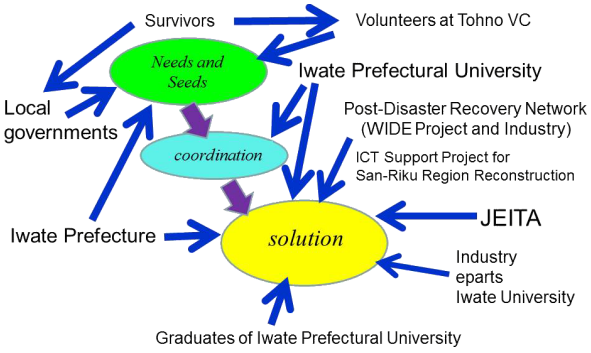

Fig. 1 Support organization.

Many shops could not be operated without their point-of-sale systems. Some shops opened using manual cashiering. They sold foods and emergency items, such as battery cells, hand lights, radios, portable gas burners and battery chargers for mobile phones.

After one week or so, shops were open but they were short of fresh foods such as milk and bread. Gas stations were short of gas; there were long queues of cars for gas for several weeks. Emergency vehicles had priority for fuel. Public transport such as bus services were used much more than usual by commuters.

2.2 The Iwate Disaster IT Support Project

We received a request from people in Tokyo indicating that some companies located in the Tokyo area would like to know where they could possibly send PCs and printers for use in disaster support. A group of engineers from academia and industry also offered to help set up data networking in the affected area. They needed to know where they could provide the equipment and network services. We contacted the emergency response headquarter of Iwate Prefecture for information and suggestions about providing the coast area with network services and PCs. Moreover, we came to know the people in the large volunteer center (VC) in Tohno City located next to the affected coastal cities. Tohno City did not suffer as much from the Tsunami and was useful to support the disaster locations.

In the end, we organized a loosely coupled federation of projects, organizations and people. **Figure 1** shows this.

Information about lifeline needs such as electricity and 3G communication links was collected by the prefectural office for regional development from local governments and telephone companies. We used their information mainly but when we needed to be sure about the lifeline status of a specific place, we asked the local governments directly. In this way we started communicating with local government offices so that we could get more information on their requirements.

The requirements in the affected area were collected by volunteers in the Tohno Volunteer Center as well. One of our graduates was working there and introduced his fellow volunteers to us. We also got requirements directly from officers in local government in the affected area.

We got requests for connecting networks mainly from the medical team of the prefectural emergency response headquarters at the Iwate Prefecture office located in Morioka near our university. We communicated with one another almost every day by email as well as by face-to-face meetings. The prefectural emergency response headquarter was an ad-hoc organization composed mostly of personnel from other organizations than Iwate Prefecture, such as the Japan Self Defense Forces, the Japan Coast Guard, Maritime Self-Defense Force, local police and medical doctors; the medical team was controlled by the doctors from the local medical school, Iwate Medical University as well as its hospital. In contrast, the prefectural office for regional development that provided us with lifeline information is one of the ordinary prefectural offices.

The network connecting services were provided by the Post-Disaster Recovery Network project, run by a team of engineers from academia and industry including the WIDE project [2], and by the ICT Support Project for San-Riku Region Reconstruction run by Iwate Prefectural University researchers with local industry people. PCs, printers and the other devices from industry were offered by the Japan Electronics and Information Technology Industries Association (JEITA) Information and Communication Supporter project [3]. Used PCs were collected and provided through three organizations, Iwate University which is a national university in Iwate, NPO E-parts [4], and local industry.

We set up a mailing list including most of the people with whom we communicated. We sent a daily report to them so that we could share whatever happened. Iwate Prefecture provided us daily with information on communication related issues such as states of 3G links in all the affected areas in Iwate. This information was based on reports from local governments and the other sources such as telephone companies. As those reports could be delayed due to the shortage of local staff, we needed to give a call directly to a local government office to ensure the state of a certain site.

2.3 Support Activities

Figure 2 shows the map of Iwate Prefecture. It encompasses 5,899.02 square miles. We are located in Takizawa City next to Morioka City. During the disaster recovery we supported mainly four cities and two towns on the coast from Miyako to Rikuzentakata.

During the initial four months after the disaster, we have supported the followings:

1. Information acquisition and provision:
   - Safety information for search people
   - Visualizing lifeline information
   - Portal sites of disaster information
2. Networking for information infrastructure:
   - internetworking with communication links
   - IT environment with PCs and printers
3. Shelter information management
4. Volunteer Support

2.3.1 Information Acquisition and Provision

For safety information, initially we did not have any network connectivity in shelters. One of our graduates, working as a volunteer at the volunteer center, created an off-line system for people search. Another graduate in Tokyo created software for mobile phone access. The safety information was provided by local police; the information was also available on Iwate Prefecture's

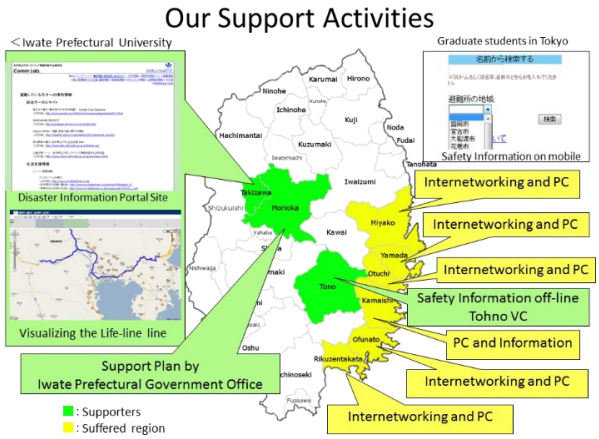

Fig. 2 Our activities in Iwate Prefecture.

home page.

For safety information, we had an interesting technology deployment in Japan for this disaster: the use of broadcast services. People in shelters appeared on TV with a piece of paper on which their names were written, saying where they were staying as well as any other comments such as whom they were seeking. Iwate Broadcast Company (IBC) converted such information on their TV and radio services into the digital form and provided them at their web site. The problem was that the IBC digital form was different from the one provided by the police. We merged those two types of information for the search system on the mobile phone.

For visualizing lifeline information, we mapped road conditions, transport, electricity, water supply and so on. For road conditions, the information was provided by use of GPS car navigation systems. The system was originally created by a car company [5]. Now the information was integrated into major web search systems.

We set up a portal site of disaster information [6]. We provided all the above information and also information such as radioactivity levels, because in the beginning some people including the volunteers in the Volunteer Center (VC) did not know this because they were too busy every day to look at the news.

2.3.2 Networking for Information Infrastructure

For networking for information infrastructure, we supported the engineers for internetworking by providing information where to set up the network with communication links. Accordingly, we provided an IT environment with PCs and printers in shelters and other sites such as city halls in which networks were set up. Networking was hard due to the size of Iwate Prefecture. For instance, travel takes nearly three hours from Morioka to the south of the prefecture. It took almost one day for network engineers to go to the south of the prefecture from Morioka and set up networks. They worked so hard and were exhausted.

We consulted the prefectural emergency response headquarters for which sites to be connected in the beginning and asked the network engineers to set up when communication links and electricity could be made available.

The engineers researched each site thoroughly by visiting and seeing what type of communication links should be set up such as a 3G link or a Satellite Communication link. Gradually, those network engineers knew the affected areas much better than we or engineers in the prefecture's headquarter in Morioka did. In the end, the field engineers were deciding where to set up networks independently by talking directly with the local government officers.

Through our joint work the major shelters were connected onto the network and we provided around 200 PCs and 50 printers in total.

2.3.3 Shelter Information Management

Shelter information management was required from the beginning, however, we were asked to help with it one month later, in the middle of April. What happened was that goods and foods sent to Iwate Prefecture were stored in the central warehouse near Morioka then they were delivered to shelters at the coast. However, the requirements from each shelter were not reported precisely enough and many shelters received some unnecessary goods. Initially, the requirements were collected manually and sent to the prefecture's emergency response headquarters by fax.

A management system with a good communication system was required. We came across the people working on the Sahana system [7] and introduced them to the prefecture's emergency response headquarter. A group of programmers from industry and Sahana Japan [8] got together and to create a new system for distribution.

It took a while to produce a system customized for use in Iwate, and it was ready for use in the end of May. It was slightly late for many shelters because in a month's time people would start moving from shelters to temporary housing and shelters were to be closed. Moreover, even though the shelter managers had only poorly-designed tools and procedures, once they got used to them, it would have been hard for them to change.

2.3.4 Volunteer Support

We also provided information on shopping and other daily-life-related tasks for newcomers to the Volunteer Center. We were asked to set up a Volunteers' site for sharing information. In the VC, they were not capable or too busy to set up a server. Moreover, a physical system would have been hard for them to maintain.

We set up their site using a cloud service. We found it very practical. The cloud services are sustainable in that they do not suffer any damage such as blackout or physical damage to the server from local disaster. One does not have to worry about maintenance. Compared to physical servers, cloud services were much more flexible and easier to set up.

3. Disaster Communications

3.1 Overview

Throughout our activities we faced to many blocks. We introduce some of them in this section and identify the needs for disaster communications.

3.2 Problems with Disaster Support Activities

3.2.1 Problem with Our Providers' View Point

In the beginning of our support activities, most of us working in the information science and engineering area assumed that information and communication technology would be required desperately, however, the truth is that it was not so. We presumed the

providers' viewpoint. What was really needed in the first place was support personnel and cars with drivers; moreover, a person who could listen to the people in the suffered area, as well.

One day we were asked to set up a network connection at a shelter by the head of the medical team at the prefectural emergency response headquarters. We gave a call to the shelter, and talked to one of the shelter managers from the local government. The manager answered and told us to bring cars and support personnel; they did neither need any network nor PCs at all. We kept listening to the manager and proposed we could arrange a volunteer person to help out. The answer was no, again. What they needed desperately was an experienced person who could manage the shelter for a few months whereas a volunteer would stay temporarily for a week or so. They would stay too short to work for management. We asked the Tohno Volunteer Center and they found such a volunteer who lived nearby so that he could come and help for quite a while. We gave a call to the shelter manager next day and reported about the person and the case was solved; this time.

A few days later, the head of the shelter gave me a call and asked us for a photocopier and we sent out a printer which would be used as a copier straight away so that they had it next day. He gave me a call to thank us. Eventually, they asked for information processing which we were able to support. The head of the shelter asked us for help inputting personal information on affected people living in shelters or in their relatives' houses. He was the head of the shelter and also a social welfare officer at the local government. The size of data was three thousand paper sheets. Initially he asked us to input data with students. However, I presumed that it was not appropriate for students to input such personal information. I managed to ask a company volunteer for this. The company had a huge operation center and they helped us on a volunteer basis. We sent to them data on paper via secure delivery services. The electronic data was sent back to the local government directly with the paper originals again by the use of secure delivery services.

We learned that emergency response services need many kinds of support. Whatever was requested, when we showed our intention to provide what was needed, trust was generated. That way we could have a better communication going onwards.

3.2.2 Problems with Governmental Organizations

The organizational problem is this: for responding to the disaster, emergency response headquarters were settled by at least three different levels of governmental organizations as follows:

1) local government: cities and towns
2) prefecture (identical to state)
3) nation

All of them operated independently. For instance, one day the medical teams of the prefectural emergency response headquarter told us that we should set up a network connection in one of the shelters. We asked the network engineers from Tokyo to go and set up, so they did. When they visited the shelter, they found out that the shelter helpers were not the official manager of the shelter. They had to ask the official manager, the city council. While they were setting up, the city council asked them to come and see the officers at the temporary city council office, and so they did. The network engineers were questioned by the local city officers why they were setting up the network at that particular shelter whereas another shelter would need it more. After the discussion, they came to an agreement as follows:

i. The engineers can locate any system for networking as long as they could remove those systems easily afterwards to put the place back as it was when the shelter would be closed in a-few-month time.
ii. It was agreed by all the people in the shelter and the helpers in setting up networks and providing them with PCs.
iii. Those systems would be removed promptly when the shelter was closed.

Once they had this agreement, it became easy for the engineers to set up networks in any shelter in that city; they could get permission by only one phone call to the local officers.

This case raised us two issues as follows:

(I) We needed to ask the two following local government organizations for permissionto setup a network connection:
  1. city government
  2. city's emergency response headquarters
(II) The prefecture's emergency response headquarters is a temporary section of the prefecture composed of people from many different organizations such as local police, the Self Defense Forces, the Coast Guard, medical doctors and local government officers.

Regarding (I) above, during an emergency, decision making in cities is done independently from the prefecture. Before an action is made one needs to negotiate with the local government who manages a shelter or any building in which networking would be needed. Although the prefecture-wide decision is made by the prefecture, the local management is controlled heavily by the most local government. Networking in a shelter is a matter for the management of the shelter and it should be permitted by the local town or city, neither by the prefecture nor by the nation.

For (II), the prefecture emergency response headquarter is such a temporary section that its decisions were not accepted easily by the local city officers due to the lack of trust. They trust the prefectural ordinary officers, not the temporary ones.

3.2.3 Problems with Decision Making on Networking

As we described in Section 2.3.2, networks were set up by the engineers throughout the prefecture. In the beginning, based on the request from the medical team, we asked those engineers where to set up the networks. We provided the basic lifeline information to them, however, what they did was to research the local information by themselves to ensure the status of the target place; research included visiting the place, such as a shelter, ensuring who was the administrator of the place, and getting permission from the administrating organization – usually the local government. Accordingly they knew much better about the local requirements than we did.

Gradually, decisions came to be made mainly by the engineers; we were left being not so sure of why those sites were selected for installing network connections. They were too busy to explain. We ended up having little communication with them.

The job functions of such an engineer ended up as follows:

i. To decide what place to install a network connection based

on the request from the local government or the people in the shelter
ii. To ensure the status of the target place, including the availability of 3G connections, power supply and who wanted the network connections.
iii. To get permission from the administrator of the place
iv. To arrange and get the necessary equipment and technical support personnel such as routers, an antenna for satellite communications if necessary, PCs and printers.
v. To arrange the transport; usually they drove a car by themselves
vi. To make a report for every connection to their own project or company

As discussed above, they had so many details to deal with that we could not help out them as they expected. That would be one of the reasons for them to be disappointed by the lack of local support. In the beginning they wanted us to get some more local teachers and students at our university to help them out. We tried, but we could not get such help, because not so many researchers and teachers were as committed to disaster relief as those network engineers from Tokyo were. And when the teachers were not committed, they would never ask their students to help.

Gradually the engineers lost motivation to report their detailed activity to us. They lost interest in getting together to sort things out. Moreover, the engineers were too much exhausted to make such a report every time after they drove far and set up networks. It was extra work for them to report us as well as to their own project and company.

Meanwhile we sent our report on our daily activities by email to the people on the mailing list – this made me personally to only get two hours sleep every day in March and April. Reporting was hard for everyone. However, we were told by the people who experience such a support at disaster in past that it would be necessary to make a record of our activities during the emergency.

Once the engineers started working by themselves without our help, they were too confident in their own decisions in terms of networking to get any suggestion or comment at all from others. They trusted themselves and not us.

3.3 Problem Description

We need to study what sort of communication is required just after disaster. According to National Research Council [9] risk communications is "an interactive process of exchange of information and opinion among individuals, groups, and institutions." Risk communications have been studied to a great extent [10], but focused mainly on the future risks.

Initially we presume that disaster communications are more immediate in dealing with real incidents; they are considered as a part of emergency management [11].

Disaster communications include many different entities such as sufferers, volunteers, administrative offices and supporters from organizations or by individual. All of them have different viewpoints and different background. For disaster support, they need to discuss the issues on the same table. They would have the same purpose but it might be hard to cooperate with each other. From our experiences, disaster communications have the following nature:

1. Heterogeneity of people
2. Most of us are novices
3. Communications with unknown people
4. Need for decision-making in changing circumstances
5. Hard to see the true needs
6. No appreciation

For 1 in the above, we have to communicate with people who are different in many aspects, such as background, from the ones we usually deal with. Furthermore, fatigue may well cause different reactions from people's usual cognitive behavior. Also, some may work on a volunteer basis while the others may be operating with a more business oriented viewpoint.

For 2, most of us are novices at what we are being asked to do. For instance, civil servants had to deal with supply chain management for goods distribution.

For 3, due to fatigue and always needing to do things in a rush, it is hard to communicate with the people whom one has never met before. It is easy for us to misunderstand.

For 4, since we face making quick decisions on matters with which we are inexperienced one cannot expect the best optimized solution. Since the people in need would often ask multiple sites for help, even if one would come up to them with a great effort to help out, the trouble might have already been sorted out by someone else.

For 5, we would get requests, but we need to remember that no one knows the true needs, even the person who makes such a request. That is why even if we solve the problem, we could not expect the best solution as the original request itself would not be a true need. We could provide solutions in terms of IT but it was hard to be sure that IT was actually part of the needed solution.

For 6, we should not expect appreciation from the others in disaster communications. People have no time because things keep happening one after another. One has multiple issues to deal with at the same time, so that even if one would like to thank another, it was likely to become preoccupied with another matter and miss the immediate chance to show appreciation and then later forget. Nevertheless, many people would expect some sign of appreciation and future communication could be compromised if thanks were not given. Perhaps some kind of communication tool would be of help solve this problem.

Moreover, from our experience, what we needed for disaster communications included speed, rhythm and trust. We needed speed, because everyone expects a prompt reply. For example, we were asked to produce an information system for goods and food distribution in three days. That was impossible. The best that we could do is to start creating whatever was requested and inform the requestor that we were working on it, so that the requester would feel the request was being addressed.

We need rhythm in our activity so that even when we receive almost impossible request, we would have some way to deal with it. We need to watch out for what could be possible. In the above example, soon after we were asked for the information system in three days, we came across the Sahana system which looked worth trying. We received many offers for the use of systems and tools from their creators. Although not all of them were used this

time, it is still important to get as much such information as possible so that we might find a solution. We need a way to do match making between requesters and suppliers.

4. Some Issues in Disaster Communications

In this section, we describe some of the issues in disaster communication. The first issue is the need for trust in disaster communications. The second issue introduces the work on information systems for emergency management.

4.1 Trust Issues

We identified the trust issues in disaster communications [28]. According to the Elaboration Likelihood Model (ELM) from psychology [12], when we receive a message, we would decide whether to accept the message or not by ourselves if we had motivation and competence. However, if we had neither motivation nor competence, we could not decide by ourselves but environmental issues such as how much we trust the message sender.

As we presented in the previous section, in disaster communications we need to deal with matters with which one has little experienced, to communicate strangers and to make decisions in such circumstances. We need to be able to assess our trust in the counterpart.

Trust has been researched as a multi-disciplinary concept. It has been researched in psychology, sociology and economics for long a long time. From psychological viewpoint, Deutsch defined trust in an interpersonal context [13]. Gambetta defined trust as a particular level of one's subjective probability that another's action would be favorable to oneself [14]. Lewis [15] identified two aspects of trust, the cognitive and emotional parts of trust.

Cognitive trust has been most identified with the factors with competence, integrity and benevolence [16], [17]. Earle et al. presented Salient Value Similarity (SVS) to include integrity and benevolence [18].

Slovic presented the asymmetry principle of trust; it is hard to gain trust from the others, but is easy to lose it [19]. In disaster communications it is easy to generate distrust in others and while becoming over confident in oneself. We need to work on how possibly we could get over distrust and overconfidence so that we could have a continuous disaster communications in a productive way.

Trust plays an important role in decision making. Stephens gives design elements, such as page layout, navigation, and graphics which affect the development of trust between buyers and sellers in e-commerce [20]. According to Riegelsberger et al., affective reactions influence consumer decision-making [21]. They presented a trust model based on the vast amount of literature survey [22] in which what sort of signal (message) and reaction one needs to exchange between two entities to construct trust. We could use this model for disaster communications in future.

More recently swift trust is researched. In a temporary group with a new set of members, the ad-hoc trust would be generated according to stereotype attributes of counterparts such as gender, age and native district and so on. We need to look more into this type of trust to understand the nature of disaster communications.

4.2 Emergency Management

Disaster communications are part of emergency management. According to the integrated disaster management cycle, the following basic phases are presented [11]:

1) Mitigation:
   pre-disaster actions to identify risks, reduce them, and thus reduce the negative effects of the identified type of disaster event on human life and personal property.
2) Preparedness:
   the actions taken prior to a possible disaster that enable the emergency managers and the public to be able to respond adequately when a disaster actually occurs.
3) Response:
   actions taken immediately prior to a foretold event, as well as during and after the disaster event, that help to reduce human and property losses.
4) Recovery:
   its objective is to enable the population affected to return to their "normal" social and economic activities.

1 and 2 above are required long before we have a disaster, while response and then recovery are required after the disaster. Our work was categorized as the one in both immediate response and sustained response to a disaster. Indeed, most of what we reported from our support activities is listed by Quarantelli as the following requirements in which community disasters were qualitatively and quantitatively different from routine emergencies [11], [30]:

- Organizations have to relate quickly to far more and unfamiliar entities. Coordinating information and actions is complex.
- All groups may be monitored and given orders by disaster management entities that may not even exist in routine times.
- Different performance standards are applied.
- The dividing line between "public" and "private" property disappears.

Turoff introduced the historical background of emergency management information systems (EMIS) [23]. White et al. looked into the use of Social Network Services (SNS) for emergency management [24].

4.3 SNS Issues

Social media and SNS are used to a great extent at disaster this time. Facebook and twitter are used in emergency managers [24] as well as ordinary people to get information.

At disaster this time, some bogus rumors were spread around. Tanaka looked into the rumor problem from the view point of critical thinking [34]. Chen and Sakamoto also look into the problem [35]. We also look into why people would retweet [36].

According to a doctor [37] who worked at the medical section at the Iwate Prefecture Response headquarter, however, at the very beginning of disaster, one would appreciate any information even if some are bogus — i.e., any information is better than no information. We need to take into account on who would make decision on which information to take and which to discard at emergency.

5. Some of Our Current Work

We introduce some of our current work for disaster communi-

cation perhaps for longer term in the recovery phase than the one we reported in previous sections. The first one is our trial on setting up a store system at a temporary housing in Iwate [31], [32]. The survivors are still coping with inconvenience in their daily life. We tried and helped them out with our trial store system and have found some issues.

The second one is a recovery watcher system which will let the people keep watching how the suffered area is changing by setting up a camera [33].

5.1 A Store System at a Temporary Housing

As the location of temporary housing is decided presumably according to the availability of space in which a hundred small houses could be built, they are located far from town without easy access to shops and transport services in disaster area. Survivors living at such housing found it inconvenient for daily shopping. Mobile shop services are coming once or twice a week. Some could go and buy good at supermarket by car. Many cars and drivers have gone this time. Elderly women without driver's license are left.

We tried and solve this problem by setting up a self-service system with a prepaid card. An experimental system has been running in our laboratory environment for several years for a use by students. The interface is a bar cord reader with which prepaid card would be read as well as the ones for items at a store. **Figure 3** shows the store in a temporary housing with 74 flats at Aka Mae, Miyako City.

The system includes the front end servers for a store as well as the management client system at our university site. The information on goods would be input at the university and sent it to the server at Aka Mae. The goods are sent from the university to Aka Mae by use a delivery service. The system is located in Aka Mae at the common room in the temporary housing. The manager of temporary housing offers voluntarily as the shop manager at Aka Mae. The work is funded by the Iwate Prefectural University as well as Sanriku Fund, Iwate Prefecture at the moment.

5.2 A Recovery Watcher

It takes long time to recover and reconstruct the towns and cities at disaster area. Meanwhile the interests into such recovery and reconstructions would be faded out outside the disaster area. This way we came up with the idea on recovery watcher to keep people being aware of what is happening.

In the beginning, we use the u-stream service and located a camera at the town hall of Yamada, Iwate. It takes some bandwidth, so we implemented an image-base system and record images in a calendar [33]. We also located the system in Kamaishi City as well. Currently a system only presents an image, but in future, we would need to incorporate more sophisticated social media service so that viewers can leave their comments.

Fig. 3 Our experimental system at Aka Mae.

Elevant [29] is working on sharing weather information. Presumably natural disaster could be considered a kind of the weather, so that a service for sharing weather information could be used at disaster. Indeed, one of our findings was that at disaster people would not use a new interface of a system; they prefer an interface which they get used to. If we provide a service to share weather information for a daily use, we could possibly make use of it for disaster.

For a long run, we could use this sort of sharing service to convey the warning information at disaster. One of the big issues at the disaster was that one needed to get out of Tsunami as soon as possible without caring your family members — i.e., we needs to help ourselves first. This old wisdom was not passed correctly from generation to generation and brought the tragedy again. The Sanriku district was attacked by Tsunami once thirty to fifty years again and again. The question is how one can convey such a warning to remind people daily. One of the solutions could be such a weather sharing site. We need more research on sustainability of information delivery sites.

6. Conclusions

In this paper, we reported our experiences from our support activities just after the Tohoku earthquake and Tsunami on March 11th, 2011 and our initial work on disaster communications derived from our experiences. Quite often officers in local governments as well as some in the prefectural emergency response headquarters office, regard that fairness is most important in the management of support. From our experiences what we required was speed, rhythm and trust in disaster communications. Even if it would not be fair to everyone, we found that our prompt and timely support worked out when we provided the affected places with PCs and printers.

We also presented that trust is an important issue in disaster communications. More work is required on ways we could implement trust issues in disaster communications.

From a sociological viewpoint, Yamagishi [25], [26] gave Japanese oriented characteristics compared to the concept of trust. In disaster communications we might need to consider such cultural differences.

We need to have further study on disaster communication to proceed as exploration in terms of social science [27]. Moreover, more documentation on what had happened is required to be published world-wide so that we can work on these important issues in more global manner [11].

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