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Emergency Information Management & Disaster Preparedness on the Internet

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Abstract

This is an initial inventory of advantages and disadvantages of use of the Internet for information dissemination purposes during emergencies, crises or disasters. It consists of case studies of two recent earthquakes. "The" Internet withstood, while radio stations did not and electricity and telephone networks kept breaking down. Increased emergency use of the Internet in the future brings up questions of information quality and reliability and indicates the importance of investigating this medium further as a communication channel for crisis situations.

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1. INTRODUCTION

In 1985 I participated as an observer during a simulated disaster management exercise in the county of Östergötland in Sweden. Together with colleagues from the National Defence Research Establishment we carried out an evaluation of the performance of the rescue team.

The data collection methods used were: audiotapes from radio communications, video tapes, two sets of questionnaires to participants and to people living in the "disaster" area, observations, photos, audiotapes from the place of "accident". We found, among other things, that improvements within the use of communication technology, to and from, and within the emergency rescue team could be made. Furthermore improvements concerning the information provided to relatives of "the injured", people living within the disaster area, media or the public could have been made as well[1].

This is part of the background why I wanted to study how information technologies (IT), such as the Internet, other computer networks or BBSs (Bulletin Board Systems) of different kinds have been, or will become, a valuable support of communication needs before, during and after emergencies, disasters, crises or catastrophies. In this paper IT is mainly focused on the Internet. I investigate the use of the Internet in two crisis situations, where the Internet withstood and other forms of communication failed.

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2. THE USE OF THE INTERNET IN CRISIS SITUATIONS - Two case studies

Computer networks are, one would hope, not the only communication channel available. All the traditional communication channels like face to face communication, telephone, radio, tv, fax can and will hopefully be used too, provided they are available. In Kobe 1995, the telephone networks kept breaking down, while the

Internet stayed intact just as it did during the California earthquake in 1989. A lot of other things in California are however designed to work through earthquakes.

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2.1 The Kobe earthquake

During the earthquake in Kobe in Japan, January 17, 1995, Sony provided a WWW server that is still reachable. On their Kansai Area Earthquake Information site there is a list of dozens of available Internet addresses related to the quake in Kobe [2].

This is an excerpt (quoted with the permission from the author) from a news article "Shaken, but not stirred" by *Martyn Williams*, who writes Net guides for MTV Text and NBC Text, and currently lives in Japan. The article explains how people used the Internet:

"At 5.46 am local time on January 17, a massive earthquake hit Kobe in Japan. It was the country's biggest natural disaster for 60 years. ***Telephone lines across the city were immediately cut, and those that remained were overloaded in minutes.*** *Soon afterwards, international telephone circuits into Japan were filled to capacity with frantic relatives calling the area to check on loved ones.*

Amazingly, the Internet link to the Kobe City University of Foreign Studies survived relatively unscathed, as did the university's local computer network, so in the days that followed, **the Internet provided a vital communications link to the rest of the planet**.

A couple of hours after the quake, Net users logged into Internet Relay Chat and gathered on the #kobe channel to find out the latest news. Users in Japan were busy sitting at their terminals sending the latest information as it was simultaneously being broadcast on local TV and radio, while Japanese students around the globe listened in and asked for more specific details.

The first thing relatives and friends wanted to know was whether their loved ones were safe, but because many of the telephone lines were down, surviving lines were jammed solid **. Even the Japanese embassies around the world didn't know what was going on. Internet users, however, were getting the information and re-distributing it at incredible speed**. Staff at Japanese phone company NTT, for example, were typing in **the list of dead** as it was being broadcast by national TV and placing it on a hastily set up **mail server. Anyone who sent a message to the server was immediately e-mailed the latest list."** [3] (my italicizing)

"The City University of Foreign Studies in Kobe, surprised to find its network up and running as normal, also started displaying details of the disaster on its Web pages. The information included a hurriedly designed summary of the extent of the damage and photographs of the city taken by a faculty member. More importantly, the mayor's office used the area ***to appeal for volunteers and medical staff****. Within hours of the quake, the University had set up a special e-mail address which people could use to offer their assistance.*

Giant electronics company Sony brought all the services on the Web together via an earthquake Home Page. Within a few days, the information from Kobe was supplemented by access to the newsgroups, logs of IRC channels, and pages of information from the police and emergency authorities. Surprisingly, much of the information was intended for people on the ground in Kobe - the phone lines were still largely inoperative, so one of the best ways of communicating locally remained over the Net.

Initially, the biggest and most depressing task faced by the rescuers was trying to **work out how many had died**. A network of Net users in the area offered other Net users their time in helping to locate missing people - two special groups were set up on Usenet with this in mind, fj.misc.earthquake.people and tnn. disasters.earthquake, both of which were in Japanese.

A big problem for many desperately trying to search the list of the dead was the inability to load it into their computer because they required a Japanese word processor. A Net user **in Canada** therefore **translated** more than 1,000 **names into English**, while others offered to search the list for people who either didn't have Net access or who didn't own a Japanese word processor.

Even though the telephone system was hopelessly overloaded and cut in many places, throughout the two-week period after the quake, the Internet link to Kobe never failed and supplied many people with the latest info. In a thank-you message sent to all those who responded to the request for help, the mayor's office said they'd received more than **5,000 offers of assistance via e-mail**." [3] (my italicizing)

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2.2 The California 1989 earthquake

The following is a quote (published with the permission from the author) from an e-mail, that illustrates the robustness of "the" Internet, but also its drawbacks:

"For the 1989 earthquake, almost everything kept working. Enough traffic lights were out so that traffic was horrible, but traffic can be horrible lots of days anyhow. Some of the stores were closed for about 12 hours because of all the broken jars of Pine-Sol and grape jelly. The phones kept working. ***Electricity*** *was restored to half the people by about 10:00 at night, 5 hours after the quake, and some had never lost it.* ***Some radio stations worked, most didn't****, because their transmitters are far from civilization, and the cables to them crossed the quake zone. The Internet was designed to work through bombings, and there isn't actually such a thing as "THE" Internet. So of course, lots of it was working during both recent quakes in California (It worked for Saddam Hussein, too). The Internet is designed to work through war; doesn't do people at home or work much good if pipes are broken, electricity is out, and they're afraid to go indoors to work on the computer. It will probably be much better if people all have some kind of cellular hand-held units, but as long as the people's part of the Internet has to plug into the wall, it could be "working" but still "unavailable"* [4].

Comments: According to a world map of countries that have Internet access, Iraq had

no access in 1995 [5]. Some of the portable communication equipments from recent years are designed for direct satellite communication.

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3. ISSUES IN USING THE INTERNET IN CRISIS SITUATIONS

The Internet has been and will probably become a valuable asset, provided there is not a significant rate of illiteracy within the disaster area, that people understand the language used, that people can use the computers and the software, that people have physical access to both the net and computers, with both clients and servers up and not overloaded. One can not disregard completely that networks can be *fragile*.

Information spread during disasters and emergencies needs to be *correct*. During the earthquake in Kobe, there was a lot of contradictory information spread on the net. Some sources advised the people in the area to stay inside, other sources adviced them to go outside immediately [6].

During the Ukrainian Chernobyl nuclear accident in 1986 both the Swedish National Institute of Radiation Protection (SSI) and other Swedish authorities were criticized for the information given out to the public in Sweden [7].

The Soviet authorities were criticized even more for *not* spreading any information at all. The rest of the world first learned of history's worst nuclear accident from Sweden, because abnormal radiation levels were registered at one of the Swedish nuclear facilities [8].

For Europe, the Chernobyl nuclear accident is an interesting disaster to have in mind, when planning for disaster information dissemination in the future. The 1994 Estonia accident is another example.

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3.1 Advantages with Internet use

The proliferation of information on the Internet is enormous and its potential for an information dispenser or meeting place under crisis situations is very important.

One *advantage* with public BBSs or WWW servers is that people responsible for information dissemination during disasters might be *relieved of some of the pressures from the public and the press or media* by providing one way information electronically, but not allowing any direct inquiries from the public (or media). The result could be that responsible authorities need not be disturbed to such an extent that it will interfere severely with their own attempts in trying to find out what is happening or while trying to figure out and plan what actions to take. The message: *"NO INQUIRIES TO US, please. We have no more information. Listen to the radio, watch TVs, or ask appropriate govermental /administrative agencies. Thanks"* [2] can be seen as a sign that information providers can be overloaded in such

situations.

Judging from my own searches on "emergency" and "disaster" on the Internet, I have concluded that there is nowadays a much better information infrastructure out there compared to "the gopher era". The American emergency organizations were, however, early out to test gophers for information dissemination purposes. The quality of both the infrastructure and websites is increasingly getting better. Currently there are more servers and one can trace attempts to create surveys, to organize and sort information in a more elegant way. Some webmasters search the net regularly for relevant sites or other Internet addresses and list them on their homepages. This can be of great help to beginners and for those out there trying to get in contact with colleagues. However it still looks to be an anarchistic growth of the web with no control over who is there, why and how.

The amount of structured information on emergency management and disaster preparedness is growing on the Internet. More and more organizations join the web which is something that can create a good foundation for international cooperation concerning emergency management and disaster preparedness. The "home page of disaster" of is one of many examples of that [9].

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3.2 Disadvantages/Concerns

Since one drawback with dependence on the Internet is that most people do not have Internet access, other communication technologies like radio, television, satellite broadcasting, text-tv, fax servers, digital mobile telephones will still be the main information channels in case of future emergencies, crises or disasters. Disasters are not always earthquakes.

To compare technical *vulnerability* between satellite broadcasting, text-tv, fax servers, digital mobile telephones and the Internet can, however, be rather difficult. In order for organizations to be assured that they have access to reliable communication channels, "spreading the risk" can be a good insurance. That can be achieved by making sure one has access to *many information or communication channels*.

An example of a possible *disadvantage* with one-way electronic information dissemination, apart from the fact that users have to *request the information*, is that people in crisis often *need someone to talk to*. Most people need a more personal way of dealing with questions and answers or instructions. Therefore, it is advisable to publish lists of names and telephone numbers (*or e-mail addresses?*) of crisis team professionals that people can contact. These lists should be prepared and updated a long time before something actually happens.

A reasonable assumption is that most people would be happy to have access to any communication channel (of whatever kind) for correct and adequate information or to get in touch with *important others* during and after a crisis, emergency or disaster.

Another possible disadvantage with Internet use is that there is a big risk for *disinformation*. There has been (and there is a potential for) spreading of false or

incorrect information on the net. There is also a risk for *information overload*, that people get too much (or irrelevant) information or *no information* at all.

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3.3 Research or questions to be investigated

There will probably be an increased use of computer networks during actual emergencies, for instance to support commmunication between emergency organizations, police, medical services or other authorities. There will also be an increased use of Internet information to and from the public, the press and between dear and loved ones, since there are more and more users, computers, websites and e-mail addresses no wadays. What will happen, if the Internet gets so crowded that in order not to slow down traffic, perhaps authorities need to restrict the use of Internet for the public during emergencies? Would that be possible?

Network traffic load on the Internet needs to be considered. What capacity is needed? Traffic load is difficult to foresee and difficult to measure though. What *mobility* is needed? The language problem needs to be considered as well.

More research needs to be conducted on security/ authenticity as well as disturbances/ jamming/ detention on the Internet, if an increasing number of organizations become dependent on the Internet and demand secure and efficient communication even during emergencies.

Automatic alarms, evacuation roads, fire-plugs, handling of emergency messages are examples of rescue-related matters that can be supported further by IT and the Internet. There are many surveillance or control and command tasks that can be supported by the Internet (or other networks). An example of an alternative network is the French *Minitel* videotexsystem, which was designed also for emergency services. Has the Minitel emergency service been evaluated?

For educational or training purposes, different kinds of computer simulations can offer possibilities to practise something that (fortunately) does not happen very often. *Simulation and games* can be used in order to evaluate *disaster preparedness* (strategies, technologies, resources etc). Several companies around the world specialize in computer simulation and training. It is possible to get many ideas and contacts from just "surfing" on the Internet.

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3.4 Communication and global monitoring systems

Information access in all its forms: computer data on the Internet, mobile voice communications over satellite constellations, remote-sensing images from space and location data from GPS satellites will be critical to the success of both military and emergency organizations as well as the US aerospace industry. The launching of commercial remote sensing satellites will greatly expand the content of the Internet or "the information superhighway", according to Ronald H Brown, US Secretary of Commerce. [10]

Differential GPS (Global Positioning System) can be used to keep track of vehicles, ships and other recources during rescue missions. It is also possible to create quick world wide satellite communication channels for rescue teams and other emergency organizations.

There is no world-wide institution promoting a global disaster warning service, therefore the Global Emergency Observation and Warning (GEOWARN) system is proposed to fill the gaps in current earth-sensing, data processing, and information spreading for disaster warning and relief. The purpose of the GEOWARN system is to diminish the impact of disasters on human society. This will be achieved by creating a global monitoring system to provide disaster warning and relief support.

The system will be open to all nations for humanitarian purposes and is proposed to be implemented over the next decade. GEOWARN maintains the option to apply for UN Specialized Agency status. The organisation will cooperate in a non-competitive manner with existing organizations in various fields including remote sensing, meteorology, telecommunications and relief organizations.

The highest priority disasters (according to GEOWARN) are:

* earthquakes
* floods
* droughts
* insect infestations
* crop diseases
* major tropical wind storms (hurricanes, cyclones and typhoons) [11] (all of which are rare in countries like Sweden)

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4. IMPLICATIONS FOR SWEDISH ORGANIZATIONS

Some people in Sweden are convinced that the Swedish terrestial telephone system will stay intact during for example war. That needs to be investigated. Telephone systems can be very vulnerable, just like radio and TV stations during an "information war". The CNN Broadcasting Company came out as winners during the Gulf war, at least according to themselves, meaning that the war was at the same time a success for satellite communication.

Besides organizational home page presentations, Swedish emergency organizations should be able to use the Internet in different ways. Through the Internet they could get acquainted with trends within their professional fields and get updated quickly in several areas: from information on disasters or emergencies, organizational changes, to marketing of new products. They could also use the Internet mainly to get in contact with colleagues and keep up communication all over the world.

Swedish emergency organizations ought to consider using the Internet as a complement to existing communication channels. Not one of the professionals from the field that I

have interviewed was negative to the use of new information technology, but rather were reluctant or simply not sufficiently acquainted with the Internet. Swedish communities, like Helsingborg (who has linked information from their fire department to the community home page as well), have however been connected to the Internet for quite some time now.

During times of economical difficulties, Swedish communities cannot disregard educational and other costs. One of the fire officers, that I have interviewed, mentioned that they had had a young computer educated person within the group responsible for their computer resources, but unfortunately this person was no longer within the organization [13]. Another person from the field answered that they need to be assured that the Internet is a secure and reliable communication channel.

Mailing lists during disasters could aim at providing information such as:

1. Who is offering assistance (skills/goods/shelters/etc.)?
2. Who is receiving/requesting offers for assistance?
3. What skills/specialities/goods are currently needed?
4. How to go about offering assistance?
5. Reports/discussions about practical experiences and problems" [12]

What usage Swedish emergency organizations can see is worth investigating. It is important to remember that we have *not seen all the potential uses of the Internet yet*, neither in Sweden nor in the rest of "the global village".

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5. CONCLUSIONS

Judging from Martyn Williams's article [8] above on Kobe, dependence on terrestial telephone systems is not recommendable during earthquakes. As the article shows, one of the best ways of communicating locally remained over the Internet.

The Internet might be one of, hopefully, many communication channels in future crises, emergencies or disasters.

The proliferation of information on the Internet is enormous and its potential for an information dispenser or meeting place under crisis situations is very important. Issues such as reliability and information quality are crucial.

A major drawback, however is that a majority of the people in the world do not have access to the Internet.

The amount of well structured information covering emergency management and disaster preparedness is growing on the Internet. More and more organizations join the web which is something that can create a good foundation for international cooperation concerning emergency management and disaster preparedness.

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6. FUTURE WORK

Studies of how Swedish emergency organizations view, or apply new information or communication technology, will hopefully be subject for further studies, just as possible other information technologies, that may arise in the future. How information technologies should be used in order to support disaster relief is also worth investigating.

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