

# Providing of Scientific Information in the Nuclear Accident Settle on Fukushima Daiichi Nuclear Plant Accident after 2011 Tohoku Earthquake

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**Keywords:** Risk Communication, Crisis Communication, Disaster Communication, Science Communication, Social Media, Information Seeking.

**Abstract:** On March 11, 2011, the east coast of Japan was struck by a major earthquake. Right after the earthquake and tsunami, three nuclear reactors lost power, causing a core meltdown, and the release of radioactive materials into the atmosphere. The disaster and following the nuclear power plant accident is unprecedented in history. The crisis communication especially about scientific information was abundantly mixed. In this article, I would like to review the communication between people and the government, providing mass media and how people seeking the information. In crisis situation, people don't know what they want to know but they want to know something about their concern. In the crisis, people utilize the internet especially social network sites. That is interactive media. And a new NPO, Science Media Center Japan provide scientific information rapidly. The Q&A style information that was provided by SMCI gained mass acceptance.

## 1 INTRODUCTION

As the world watched, in the aftermath of the devastating earthquake in 2011 in Japan, three nuclear reactors lost power, causing a core meltdown and the release of radioactive materials into the atmosphere.

In this crisis, information distribution was thrown into extreme confusion, even within the nucleus of the government.

At the same time, the disaster was the first widespread disaster since Japanese people had started using social networking sites (SNS). People uploaded as much information from twitter and facebook than from online news by news paper company. (Section 2.3).

In this paper, I would like to explore what people wanted to know immediately after the accident and the earthquake disaster.

The question that now arises is whether the old media, such as newspapers, and the new media, such as SNS, can address the public's information needs? Then, I devote some space to the discussion of what

kind of information content and style was easily comprehensible for people a week immediately following the severe nuclear accident at the Fukushima Daiichi nuclear power plant.

## 2 LITERATURE REVIEW

### 2.1 Information from the Government

The East Japan earthquake on March 11<sup>th</sup> is the largest earthquake in recorded history in Japan, and it caused a nuclear accident.

In addition to rescuing a significant number of the tsunami victims, government had to deal with an uncontrollable Level 7 nuclear reactor that had lost power, never before encountered in Japanese history.

There was no nuclear power expert in the office of the Prime Minister until March 13<sup>th</sup>. In the meeting room set up for disaster-related events, there were only two phone lines and no fax machine. Even mobile phone reception was nonexistent. The

nucleus of the government collected information from the TV in the room. (2012, Asahi) Despite of no accurate information, the government announced “No problem. It will be all right”. And just after that it had revealed intractable problem happened. It recurred. This is how the Japanese government lost its country’s trust. (2012 Endo)

## 2.2 Information from Mass Media

At the crisis situation in which Japanese government and Tokyo Electric Power Co., Inc. (TEPCO: which has Fukushima Daiichi nuclear power plant run) were not be able to what had happened for nuclear reactor, news report from mass media lagged and got confused. (2012 Endo)

## 2.3 Information Seeking

From previous studies, it has been shown foreigners evacuating from Japan and the affected area made their decision mostly based on the demands from their families and relatives, and from individual judgment, not by their home country government advisories (2013 Kawasaki). They had confidence in the news from the Japanese mass media.

Questionnaire investigations immediately following the Earthquake, and aimed at people living in the Kanto region, which is comparatively near the Fukushima nuclear plant, showed emphasis on TV news by the Japan Broadcasting Corporation (2011 Nomura Research Institution) (Figure:1)

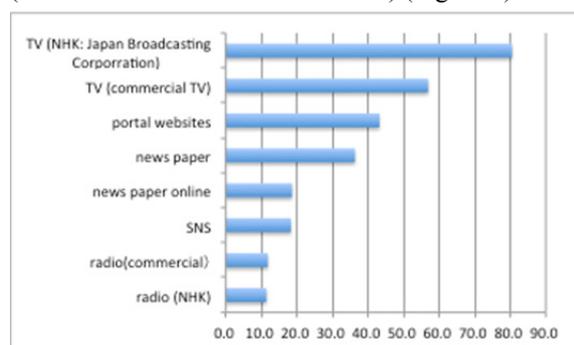


Figure 1: Important Media for information of the Earthquake. (N=3224).

Many people reported or wrote using social networking services following the disaster. One report had said there were 1200 tweets per minute in Tokyo alone within the first hour (2012 Miura)

For certain, information from SNS added weight to the online news by newspaper companies. (2011 Nomura Research Institution)

On the other hand, the increased degree of confidence in the information send out from individuals was around the same as those decreased degree of confidence in the information send out from individuals. (2011 Nomura Research Institution)

Seeking information on Internet is superior in several terms. That is to say, in breaking reports, diversity of contents, and interactivity. Sometimes we can get off-the-record or background information, but on the other hand, we have to be aware of misinformation or false reports. We have to be held responsible for the judgement capacity.

## 2.4 Science Media Centre of Japan

The Science Media Centre of Japan (SMCJ) was established in 2010 as an independent, general association. Its mission is supporting those who report about science. It collects and sends out expert comments on scientific topics that are of public interest within hours of the news happening. Originally it had been funded as a three year research and development project by Japan's Research Institute of Science and Technology for Society (RISTEX). But RISTEX gave flexibility, allowing the SMCJ to work as an independent, non-profit organization as similar as the United Kingdom, Australia, New Zealand and Canada.

At the time of the accident, the SMCJ office in Tokyo had been struck by the earthquake. On March 11<sup>th</sup>, many scientists living around Tokyo also fell victim to the earthquake, making it difficult to contact them. The SMCJ staff started to check the information which was written by scientists or experts about the nuclear power plant, radioactive material, and similar topics on twitter. The SMCJ then collected information into a Q&A style report on the SMCJ's web site, and released it as a Science Alert for their twitter followers.

The number of unique visitors on the SMCJ

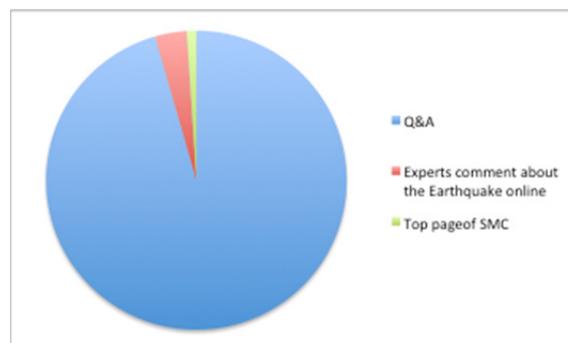


Figure 2: Page Views from March 11<sup>th</sup> to 31<sup>st</sup>.

website recorded in the month following the march 11 Japan earthquake showed a rapid rise (\*1) The number is 1362140 from March 11<sup>th</sup> to 31<sup>st</sup>, and almost of them are for the Q&A.(Figure : 2)

The SMCJ was presented with an award by the National Institute of Science and Technology Policy (NISTEP) for its activities to mediate between experts and people who were affected by the crisis.

### 3 METHOD

The analyses for this study are based on two sets of data collected from (1) the SMCJ website, and (2) the website operated by a joint project including DRS, DPRI, Kyoto University, DCRC, and Tohoku University in Japan (2).

We compared those two data qualitatively.

Data (1) Science Alerts articles from “ the collection of Q&A about nuclear power”

Data (2) each Science Alert articles

Data (3) Trends Words from “TR(\*2) Analysis of Online Japanese News Information on the 2011 Great Tohoku Earthquake Disaster through Yahoo! Japan”. TR inform us hot topic of the news at the time.

Firstly, we analyzed Science Alerts which were released at the time. The most-read article was “ the collection of Q&A about nuclear power”. There are the other Science Alerts on SMCJ website, but the page views of “Q&A” stands out the most. The collection was made by SMCJ staff. ( Section 2.4 ).

We studied how it was made, and then we examined the contents in detail.

Secondly, we analyzed the data (3) for TW (trends words) between 12:00 March 13<sup>th</sup> to 19<sup>th</sup> , and from March 21<sup>st</sup> to 28<sup>th</sup>. The words were derived from Yahoo News Topics written in Japanese as of then.

### 4 FINDINGS

In regards to Data1, the source of information was gathered on the web, particularly from Twitter. SMCJ staff had always followed reliable scientists, and gathered information from tweets written by physicists and engineers. At the same time the staff checked what kind of information was needed, or in other words, what kind of questions were being asked more on Twitter.

A summary of that information was then presented in a Q&A style. There are 32 Q&As in the

collection, and each Q&A can be classified into one of four categories in terms of contents. That is, a) ask for advice about individual action, b) ask for general knowledge, c) ask for present circumstances, or d) authentication about hearsay information. (Table 1)

Looking at the topics of each Q&A; radial ray, iodine, exposure, water spray, and evacuation are visible.

From Data (1) analysis, the largest category is d) authentication about hearsay information, and the second largest is b) ask for general knowledge. By March 15<sup>th</sup>, category a) and c) were growing. (Figure 3)

SMCJ staff made their collection taking into consideration the question tweets on the time line. The Q&A style was derived naturally.

Table 1: The Number of Q&A by category.

Category	Number
a	3
b	10
c	5
d	14

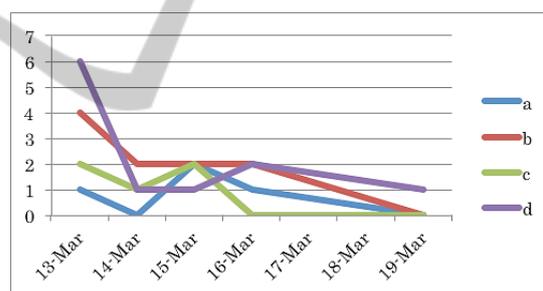


Figure 3: The Number of Q&A by category from day to day.

Table 2: Topic of Science Alerts from 13<sup>th</sup> to 19<sup>th</sup>.

13 <sup>th</sup>	relief goods, theft, power outage, hypocenter , health information, disaster medical care, radiation, decontamination, iodine, mental health-care, direction of the wind, radiation, exposure, evacuation, going out, Geiger counter, reactor, cooling, seawater, fresh water, boracic acid, hydrogen explosion, meltdown
16 <sup>th</sup>	radiation, monitoring, people with disabilities, elderly people, vulnerable groups
18 <sup>th</sup>	exposure, power outage, reactor, radiation, in air, Chernobyl, vegetable, water
19 <sup>th</sup>	radiation, contamination

From Data (2), we derived the key word of each Science Alerts (\*3). The key words inform us the topics of the articles.

From Data (3), comparing table 3 with table 4 TWs of table 3 are about the accident of the nuclear power plant, while TWs from Table 4 are more specific and more related to people's health problem.

Table 3: TW from 13<sup>th</sup> to 19<sup>th</sup>.

<a href="#">2011/03/19 12:00</a>	water spray	pool	Japan	rice	Niigata
<a href="#">2011/03/18 12:00</a>	Niigata	Japan	hospital	support	dialysis
<a href="#">2011/03/17 12:00</a>	prefecture	tsunami	affected	support	prefecture
<a href="#">2011/03/16 12:00</a>	tsunami	Sievert	handling	exposure	exposure
<a href="#">2011/03/15 12:00</a>	pool	pressure	handling	tsunami	reactor
<a href="#">2011/03/14 12:00</a>	handling	think	exposure	pressure	seawater
<a href="#">2011/03/13 12:00</a>	handling	explosion	tsunami	think	responsible

Table 4: TW from 21<sup>st</sup> to 28<sup>th</sup>.

<a href="#">2011/03/28 12:00</a>	becquerel	spinach	iodine	harvest	turbine
<a href="#">2011/03/27 12:00</a>	becquerel	shipment	sectional chief	spinach	iodine
<a href="#">2011/03/26 12:00</a>	becquerel	shipment	spinach	iodine	vegetable
<a href="#">2011/03/25 12:00</a>	becquerel	shipment	iodine	spinach	water spray
<a href="#">2011/03/24 12:00</a>	shipment	becquerel	water spray	iodine	spinach
<a href="#">2011/03/23 12:00</a>	water spray	becquerel	shipment	iodine	spinach
<a href="#">2011/03/22 12:00</a>	water spray	shipment	iodine	pool	becquerel
<a href="#">2011/03/21 12:00</a>	water spray	pool	iodine	becquerel	tank

## 5 DISCUSSION AND IMPLICATION

The SMCJ staff made the collection taking into consideration question tweets on a time line. The Q&A style had been derived naturally. There were other styles of Science Alert on the SMCJ website, but the page view number of the "Q&A" stood out (25.9% of all 504822 PV from September 10, 2010 to October 10, 2012) (Table 5)

Table 5: Page Views of the SMCJ Web Sites.

Q&A	25.9%
About internal exposure by radiation	18.5%
Top page of SMC	8.48%
About the effect of low dose exposure for human body	3.97%

Here I would like to point out that people who were seeking information on the crisis by internet. For example, people who did not know what to do in wake of the nuclear power plant accident wanted to know what they should know. That is when people seek information, but they don't know what they want to know. Questions influence people to get wiser. Q&A style might perform a crucial role for getting big viewer numbers.

Comparing Data(3) with Data(2), news reports from news paper companies are delay. News relating health problem was starting to reveal from March 21 at last. On the other hand Science Alerts presented information which is relevant to personal health information from the very beginning.

Related to growing category a) and c) on the March 15, following the March 12 explosion at the Fukushima Daiichi nuclear plant Unit 1 on, the Japanese government repeated equivocal accounts. On March 14, Unit 3, exploded, followed by Unit 4 exploded on March 15. Embassies of foreign countries started making statements about evacuation.

People really want to know the circumstances (category c) and need advice (Category b) (2013 Endo).

Although the Japan Earthquake saw a significant use of SNS by TV and newspaper companies, it is considered "mass media", and so it is not easy to answer the public demands in a moment.

## 6 FUTURE RESEARCH

From what has been discussed above, we would like to state the following three points.

One, for mass media, rapid information services regarding science and technology are difficult. There needs to be some intermediate function for giving people information they need.

Second, for the public, it might be difficult to recognize what they should know and what they want to know. Finally, interactive information service like SNS are useful in crisis situations, but it is more useful when there are mediators who collect

information from experts and connect it to people's demands.

In the future, we would like to narrow down on what should be informed rapidly in nuclear plant accidents, by interviewing the experts and people who seek information through the Internet. Also, what kind of style is better to serve information in a crisis situation.

We have 50 more nuclear power plants in a tiny country. We do not expect another nuclear accident, but we have to prepare for a severe accident as long as we use nuclear power.

We hope you find the information in this template useful in the preparation of your submission.

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## 7 AUTHOR NOTES

(\*1) The unique visitor of SMCJ website was 3344 in February, and 1.36 million from 13 March to 31<sup>st</sup>

(\*2) TR system automatically extracts meaningful keywords sets from digital text datasets related to disasters. The method consists of the following two steps; 1) to identify keywords among documents about possibly significant disaster social phenomena and 2) to apply trend of the keywords in stock chart model and to provide daily summary as well as weekly.

(\*3) The process for extracting the key words is different from TR. TR Analysis of Online Japanese News Information is for dealing big data. On the other hand, the number of Science Alerts is few, small data. We cannot use TR system for analysis of science alert. So we chose the key word from each articles of Science Alerts to know what is the topic of the articles.

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