Safecast or the Production of Collective Intelligence on Radiation Risks after 3.11 セーフキャスト　3. 11後の放射線リスクについて集団知能を生み出す

Yasuhito Abe

Abstract: Safecast is a network of concerned citizens created after 3.11 to measure nuclear radiation and provide these measurements in real time on the Internet. This is one among many instances of the production of information on radiation risks after 3.11. While Safecast has contributed to the collective intelligence on these risks, its members have claimed that such measurements and data are "politically neutral".

Keywords: Fukushima Nuclear Disaster, Radiation, Collective knowledge, Citizen Initiative, DIY

3.11, Internet and DIY radiation measurement

Since the Fukushima nuclear accident, many ordinary citizens have engaged in DIY (do-it-yourself) radiation measuring, and have circulated the data over the Internet. Considerable effort has been invested in studying citizen science movements in previous man-made environmental disasters.[1] But as has been often emphasized in the case of 3.11, a great variety of groups of people have generated all sorts of information on nuclear risks, using the Internet and social media. This is the first "known" major nuclear disaster since the advent of the Internet and social media. Whereas citizens engaged in generating information about nuclear risks after nuclear disasters such as Chernobyl, 3.11 opened the door for an alternative kind of collective production and circulation of nuclear risk information *via the Internet and social media*. The question then is: To what extent have the Internet and social media provided people with significant opportunities to produce and share information about nuclear risks? There is great diversity with respect to the agencies, motivations, focus areas, goals, and strategies employed by a number of individuals and organizations, all of which could be placed under the collective banner of "post-Fukushima DIY networks." Amid this vast landscape, this article focuses on the specific case of Safecast, for two reasons. First, Safecast, like many other post-Fukushima DIY networks, tactically harnesses the Internet and social media in order to generate information about nuclear risks. Second, Safecast plays a leading role in generating information about nuclear radiation in Japan and beyond. While it is difficult to generalize the findings of this research, which are based on discourse analysis of Safecast's website[2] and fieldwork in Japan, the article sketches some of the characteristics of post-Fukushima DIY networks.

Japan has witnessed a surge of practices aimed at assessing nuclear risk since the Fukushima crisis began. Heterogeneous groups of people such as government officials, local legislators, journalists, activists, and academics have contributed to this surge by measuring radiation and discussing its impact on health. As early as March 13, 2011, Geiger counter readings were broadcast via U-Stream. On March 17, Dr. Ichimiya Ryō, a researcher at the High Energy Accelerator Research Organization, created a website called "Radio

Monitor 311," which summarizes radiation monitoring data and graphs related to the Fukushima nuclear accident (Nihon Saiken Initiative, 2012). These initiatives helped fill the gap in information created by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), which was relatively slow to put its own mapping of nuclear radiation online.

Japanese scientists have generated radically different nuclear risk knowledge. For example, as has become very well known, Dr. Yamashita Shunichi, Professor of Nagasaki University, stated in Fukushima that nuclear radiation would not affect people who are smiling, and stressed the urgent need to relieve public anxieties about the nuclear accident (Spiegel, 2011). On the other hand, Dr. Koide Hiroaki, Assistant Professor of Kyoto University, urged the Japanese government to evacuate people from the whole prefecture of Fukushima to avoid unnecessary exposure (Koide, 2011). Contradictory information has thus been widely circulated via media and social media. As a result, Japanese citizens have been struggling to determine the most reliable information on nuclear radiation and what decisions they should take to protect their health and safety.

Given these difficulties, many people have utilized Geiger counters to identify the imperceptible and more specifically *quantifiable* dangers of radiation. It should be noted that Japanese mass media may have partially helped these post-Fukushima DIY networks emerge. On May 15 2011, for example, Nihon Hōsō Kyōkai (NHK) broadcast a documentary that featured the ways in which Japanese scientists have mapped nuclear radiation contamination.[3] Japan's media ecology may have similarly paved the ways for concerned citizens to get involved in DIY networks.

To understand these networks, it is helpful to contextualize them in terms of "sociotechnical systems".[4] Whereas Geiger counters make it possible to produce narratives of nuclear risk as *numbers*, measurement data *per se* cannot be a useful resource for nuclear risk knowledge production. The *socio*technical elements-volunteer Geiger counter users and social media users among others-are necessary to produce specific types of nuclear risk knowledge. As Paul N. Edwards puts it, knowledge is "an enduring, widely shared sociotechnical system," which holds "robust networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds."[5] Because such a sociotechnical system involves various institutions, practices, norms and beliefs as well, it is much more than "just technical" and therefore creates "social" tensions.[6] Following on Edwards, Safecast can be seen as one element of the production of knowledge on nuclear risks, including Geiger counters, the Internet, social media, mass media, scientists, engineers, international organizations, public health officials, local governments, Safecast, and other DIY networks among others.

Collective Intelligence

A starting point for this article was the statement made by one of my interviewees, a leader at Safecast, that the fundamental philosophy of Safecast is well formulated in *The power of pull: How small moves, smartly made, can set big things in motion*. Written by business consultants, this book suggested the concept of pull as "the ability to draw out people and resources as needed to address opportunities and challenges."[7] The authors have identified three levels of pull: Access, attract, and achieve. By access, they mean "the ability to fluidly find and get to the people and resources when and where we need them."[8] Then, in order to "attract" talented individuals, there is a need to increase the probability of serendipitous encounters with new people at the edge of one's areas of interest effectively

through the use of social media. Moreover, attaining the third level of pull ("achieve") necessarily involves participation in what they call "creation spaces" which "allow large numbers of participants, often in the millions, to come together to test and refine the practices required to master this third level of pull-achieving their potential more effectively."[9]

The power of pull draws on the notion of collective intelligence, which, for the last ten years, has been examined by scholars of different arenas.[10] In a seminal article, French Philosopher Pierre Lévy characterized collective intelligence as "a form of *universally distributed intelligence*, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills." Its basis and goal "is the mutual recognition and enrichment of individuals rather than the cult of fetishized or hypostatized communities."[11] This understanding of collective intelligence suggests that under certain conditions, people and computers could be connected to work together such that they act more intelligently than any person, group, and computer.[12] More recently, Lévy has emphasized the role of "creative conversation" which "transforms implicit personal and local know-how into explicit knowledge codified in a collective memory (…) distributed work of production, filtering, categorization and evaluation of data."[13] As such, Lévy shows that collective intelligence is essentially an ethical practice.

A "Global Sensor Network"

As one of the post-Fukushima DIY networks, Safecast has significantly contributed to generating information on nuclear risks in Japan and beyond. Safecast sees itself as "a global sensor network for collecting and sharing radiation measurements to empower people with data about their environments[14]" and offers online space on which volunteer Geiger counter users can upload their collected data. Based on the idea of Creative Commons, its highest priority is aggregating data on nuclear radiation around the globe and making them available to the public for free:

> Safecast supports the idea that more data-freely available data-is better. Our goal is not to single out any individual source of data as untrustworthy, but rather to contribute to the existing measurement data and make it more robust. *Multiple sources of data are always better and more accurate when aggregated*.[15]

In order to generate better information about nuclear risks, Safecast indicates that it is necessary to aggregate more data from multiple sources. As argued by the journalist James Surowiecki in his *Wisdom of the crowds* (2004), the diversity of opinion, independence, decentralization, and aggregation are key conditions to make collective judgment most effective. By extension, Safecast assumes that as long as radiation measurement data are created via similar Geiger counters and as far as the massive volume of data is aggregated from multiple sources independently, they are likely to be accurate. By January 2014, Safecast had aggregated and published more than ten million measurement data points in Japan and beyond. In so doing, Safecast claims that it generates information on nuclear risks not only for Japan but also for China, South Korea, Macao, Australia, Ireland, Austria, and the United States among others.

Moreover, Safecast has become fertile ground for collective intelligence at work. In the wake of the nuclear accident, three key founders of Safecast--Sean Bonner (Los Angeles), Joi Ito (Boston/Dubai/Tokyo), and Pieter Franken (Tokyo)-talked about a lack of radiation data via the Internet[16], and became determined to build Geiger counters with Tokyo Hacker Space, an online collective "made up of programmers, engineers, IT administrators, artists, chefs, musicians, and people interested in geek culture."[17] Since then, Safecast has evolved into one of the best-known post-Fukushima DIY networks by getting different groups of people involved such as computer engineers, journalists, scientists, and scholars. Given such a variety of technological expertise, Safecast has developed Geiger counters as a technology to collect radiation measurement data effectively. On March 22, 2013 Safecast announced the release of a portable and inexpensive measurement device named "the bGeigie Nano Kit," which is a small device, a lunchbox-shaped or "bentoboxed shaped" Geiger counter (bGeigie).[18]

As a part of the Momoko Ito Foundation, a nonprofit organization established to foster US-Japan relations thorough new information technology, Safecast received a grant from the John S. and James L. Knight Foundation. One of the active members noted in my interview that a member of the foundation had considerable experience in writing grant applications, which helped Safecast win the grant.[19] Moreover, from its office in Shibuya, Tokyo, Safecast collaborates with other institutions such as the Scanning Earth Project at Keio University, International Medcom, Uncorked Studios, and Global Survey Corp, among others. Another interviewee summarized the essence of Safecast's organizational culture as a mix of Japanese "Otaku" and "Western culture."[20] It means that Safecasts members are extremely enthusiastic about data collection without seeking hegemony within the network ("Otaku culture"), while encouraging trial and error – a trait of "Western culture".

Particularly noteworthy is the role of social media in attracting concerned people to Safecast. For example, one of the active members noted that while reading his Twitter home timeline in the immediate aftermath of the disaster, he happened to find a Twitter user who needed his technical knowledge and skills. He immediately contacted the user via Twitter and, ultimately, started to get involved in the DIY network.[21] While "offline" networks undoubtedly matter for the agile development of Safecast, it should be noted that social media also play a role in enhancing collective intelligence.

In addition, Safecast harnesses the Internet and social media to generate specific nuclear risk-related information for both English and Japanese readers, whereas some information is available in English only. On the website, for example, Safecast discusses news related to nuclear risk and generates narratives about nuclear risk in the following way. For example, as reported by a "safecaster" living in Chiba Prefecture:

> Since the beginning of the accident, many sources have been quoted that the psychological impact is likely to be the most significant. Sadly, certain parties with a vested interest see this as inferior to physical impacts. To some observers, only the fatality count matters. I do believe it is inappropriate and possibly even unethical to measure disasters by comparing the number of casualties. I agree that, at least for now, the mental consequences for residents are likely to be more significant than the physical ones.[22]

This account argues that physical consequences can be clearly distinguished from mental impacts and suggests the primacy of the latter. While this account does not necessarily represent the opinion of every "safecaster", this discourse on nuclear risk may be seen as a part of Safecast's moral and epistemological claims. Moreover, Safecast harnesses Facebook and Twitter to report its daily activities and distributes measurement data to concerned citizens. Thus, Safecast harnesses the Internet and social media to get engaged in generating information about nuclear risks.

With such an extraordinarily high volume of data on nuclear radiation, it is important to examine Safecast's view of measurement data:

> Safecast is not anti nuclear, or pro nuclear – we are pro data. Data is apolitical. Safecast was created because we identified a lack of data and realized we could help fill that gap. Our goal is simply to provide more information, data where it didn't exist so that people can make more informed decisions based on fact rather than the fear and speculation that comes from uninformed rumor.[23]

As such, Safecast views itself as a pro-data organization; data speak for themselves because they are "apolitical." While Safecast allows people to download "raw" radiation measurements for free, it should be underscored that it also *manipulates* and *re-presents* them. As Safecast admits, it does not simply *provide* unprocessed measurement information and data. For example, Safecast *visualizes* measurement data on its Map. The data are processed and categorized into six colored layers, allowing viewers to see the radiation visualized on the user-friendly map. Since the visualized data are processed and categorized by Safecast, it is different from information on nuclear risk produced by volunteer Geiger-counter users at their specific measurement spots. While making "raw" measurement open to the public, Safecast also re-presents individual measurement data and, technically speaking, constructs a different kind of nuclear risk information on the map via the Internet.

As a "pro-data organization", Safecast generates information about nuclear risk by harnessing measurement data in multiple ways. Whereas Safecast initially claimed not to "work with any government or government agency directly" precisely because they try to "remain independent and uninfluenced by politics of any kind,"[24] Safecast announced on September 15, 2012 that its radiation measurements were

partially adopted by Fukushima Prefecture, to help create the world radiation map. While both Safecast Map and Fukushima's world radiation map use the same data, their ways of data representation are radically different. For instance, Fukushima's version indicates there has been only one datum seen in Los Angeles, whereas Safecast Map represents more nuanced data there. In doing so, Safecast contributed to generating information about nuclear risks in different ways, which indicates that the consequences of measurement data may not necessarily be socially or politically neutral.

Finally, Safecast provides an Application Programming Interface (API), allowing people to access "raw" measurement data. More importantly, Safecast presents useful options on measurement data, such as geo-location information and time of uploads. Such information not only makes it possible to locate when and where each datum was captured and uploaded, but also allows people to process the huge volume of "raw" measurement data for their own ends. Put differently, Safecast makes it possible for people to generate information about nuclear risks for their own use by using the open "raw" measurement data.

Here is an example. I examined how Safecast generated measurement data in the town of Okuma, where the Fukushima Daiichi nuclear plant is located. Data collection was conducted on November 24, 2012. The data were retrieved using a geo-location service provided by the National Land Information Division of the National and Regional Policy Bureau of Japan. Overall, the geo-location service provided 2,125 data points within the latitude and longitude of Okuma, showing that the whole area of the town is located from 37.37377 to 37.43163 degrees north latitude and from 140.9389 to 141.0346 degrees east longitude. Based on the information provided, the number of Safecast's monthly radiation measurements was counted. Figure 1 shows the number of monthly measurements in Okuma from March 2011 to November 2012.

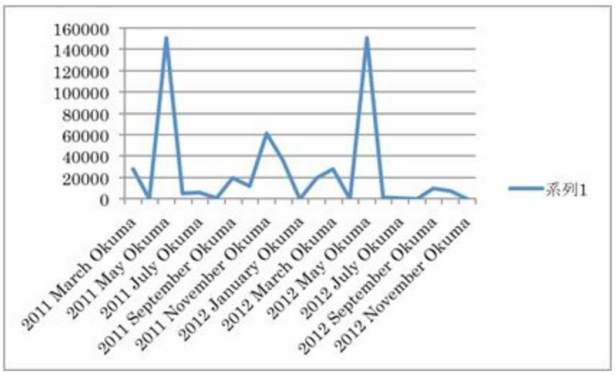

Figure 1: Monthly Measurements in Okuma from March 11, 2011 to November 24, 2012 (Source: Safecast). The Y-axis shows the monthly measurement data in Okuma town.

Thus, Safecast allows people to generate their own information related to nuclear risk. This figure shows that while 538,439 radiation measurement data points were collected in Okuma from March 11 2011 to November 24 2012, no radiation data were recorded in several months. This figure indicates the ways in which Safecast actually generated information about nuclear risk in Okuma, and shows that Safecast allowed people to produce a new type of information regarding nuclear risk.

Conclusion

Through the case of Safecast, this article tried to illustrate how different groups of people have engaged in the production of information on the risks of nuclear radiation since 3.11. Three key findings emerged. At first sight, Safecast played a significant role in producing and making public a huge volume of radiation measurement data. We might conclude that Safecast harnessed the power of collective intelligence. Second, whereas Safecast does not provide any comments on its measurement data, their data process and data

representation has generated multiple types of information about nuclear risks. Third, the consequences of measurement data may not be necessarily politically or socially neutral.

This study examines Safecast alone. In order to capture the role of Safecast in contributing to sociotechnical system about nuclear risks, it is important to investigate to what extent post-Fukushima DIY networks' measurement data could be legitimate scientific sources for nuclear risk knowledge. By the same token, it is necessary to analyze other post-Fukushima DIY networks including Hakatte Geiger[25] among others. Moreover, this study worked with rather abstract descriptions of the development of Safecast, and did not fully discuss the social consequences of Safecast's measurement data after 3.11. In the future, more engaged ethnography will be necessary to address these issues. However, the findings of this study indicate the important role of Safecast in shaping the aftermath of the Fukushima nuclear crisis.

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Notes

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[2] See here (http://map.safecast.org/).

[3] NHK ETV Tokushū Shuzaihan, 2012.

[4] Bijker et al, 2012.

[5] Edwards, 2010, p.17. See also Edwards,2003.

[6] Edwards et al 2013, p.13.

[7] Hagel *et al.* 2010, p.2.

[8] *Ibidem*, p.10.

[9] *Ibidem*, p.18.

[10] Benkler, 2006 & 2011; Bruns, 2008; Deuze, 2007; Gauntlett, 2011; Hagel et al, 2010; Jenkins, 2006a & 2006b; Literat, 2012; McGonigal, 2008; Nielsen, 2012; Noveck, 2009; Rheingold, 2002; Shirky, 2008; Surowiecki, 2004;Thomas & Brown, 2011; Weinberger, 2012.

[11] Lévy, 1997, p.13.

[12] As emphasized by Malone, 2013.

[13] Lévy 2011, p.107

[14] Safecast, 2013: December 31.

[15] Safecast, 2012. (Emphasis added)

[16] Safecast, (http://blog.safecast.org/history/) 2014, January 10.

[17] Tokyo Hacker Space (http://www.tokyohackerspace.org/en/about-tokyo-hackerspace), 2014 January 10.

[18] For more details, see here (http://blog.safecast.org/2013/03/the-bgeigie-nano-kit/).

[19] XY Tokyo, August 17, 2012.

[20] XX, Tokyo, August 20, 2012.

[21] XY, Tokyo, August 17, 2012.

[22] Dirk Rösler. "Eat, not eat. Go, not go. Escape, not escape. Do, not do. Stop, not stop. Decide for yourself" (http://blog.safecast.org/2012/10/report-from-abiko-eat-not-eat-go-not-go-escape-not-escape-do-not-do-stop-not-stop-decide-for-yourself/),

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[23] Safecast (http://blog.safecast.org/faq/data/), 2013.

[24] Safecast (http://blog.safecast.org/faq/data/), 2014.

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