A place for translation technologies in disaster settings: the case of the 2011 Great East Japan Earthquake

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Introduction

This chapter uses the case of foreign nationals resident in Japan during the 2011 Great East Japan Earthquake (hereafter, the 2011 disaster) to discuss the role played by translation technologies in this emergency and to explore the part that translation technologies could play in future disasters in Japan. The chapter begins with a brief introduction to translation technologies. It provides the reader with an overview of key terms, historical developments, and future prospects in the field that are relevant to the ideas discussed in this research. The chapter continues with an outline of the 2011 disaster that provides the context necessary to argue that translation technologies were relevant to the experiences of the foreign residents who make up the case. Next, a review of the existing literature is carried out to position the research presented in this chapter in current academic debates and to show that carrying out such research is of academic interest. The data used in this chapter were gathered as part of a broader project, so an outline of the methodology used in that project is given before the findings relating to these data are then presented and discussed. The chapter closes by drawing some broad conclusions from the discussion and by indicating potential avenues for future research.

Overview of Translation Technologies

A variety of technologies can be used to satisfy translation needs. In addition to general-purpose computerised tools, such as word processors, Internet search engines, and electronic dictionaries (Bowker 2002), translation memories, terminology management systems, audiovisual translation tools, and machine translation are translation-specific technologies that are also in common use. These latter technologies are of particular relevance to this chapter, but may not be well known to all readers. The following explanation is provided for the benefit of readers who are unfamiliar with translation technologies.

A translation memory (TM) is a tool '...in which previous translations are stored in the computer and retrieved as a function of their similarity to the current text being translated' (Somers 2003, p. 14). In other words, this type of technology acts as a digital database of previous translation efforts that can be easily and speedily re-used by the translator. TM was first developed in the 1970s, commercialised in the 1990s and is now in common use in the translation industry (Somers 2003, p. 31). Also in common use by translators working with specialised subject fields – for instance, dealing with complex legal or scientific texts – are terminology management systems. These systems ensure greater consistency in the use of specialised terms, facilitate the extraction of specialised terms from texts, and assist in the recording, storage and retrieval of these terms (Bowker 2003, p. 49). Other tools frequently used by translators are concerned with screen-based audiovisual content requiring language transfer (Negroponte 1991 cited in Pérez González 2009, p. 13). These audiovisual translation tools are used by the translator in this transfer to create, among other things, subtitles,

voice-overs, narrations, audio descriptions, and simultaneous interpretations (Pérez González 2009).

While the human translator retains a large amount of control over the translation process in the above technologies, machine translation (MT) places a greater emphasis on automation of translation. In MT, computer programs are used to translate texts from one natural language into another automatically (Ping 2009, p. 162). Early approaches to MT were based on linguistic rules or representations of meaning and were of varying levels of sophistication (Koehn 2010). Increased computing power, data storage, and digital language resources encouraged researchers to explore ways for computer programs to translate by finding the best matching segments in large corpora of digital texts aligned with their translations (Ping 2009). The dominant MT paradigm currently is statistical; probabilities and models of the languages involved are applied to massive digital corpora to select the most probable translations of the words and phrases to be translated (Koehn 2010).

Whatever the MT approach used, it is important for readers to note that different levels of translation quality can be useful. For instance, many users of MT systems just want to have enough meaning carried over to get a gist of the text they are interested in (Koehn 2010). Additionally, the improvement of rough, first-pass MT output by human intervention (often called post-editing) is now common practice in many translation workflows (O'Brien et al. 2014).

A final development in translation technologies that is relevant to this chapter is hybridisation. MT is increasingly being integrated into TM along with other technologies to create a

single translation workflow (Koehn 2010). At the same time, MT is being combined with speech recognition and speech synthesis and is being adapted for use on mobile devices to expand the application of MT to the translation of spoken events, such as telephone conversations, audio broadcasts or live announcements (Ping 2009, Koehn 2010).

This overview provided context about the object of inquiry in this research – translation technologies. It is also important to understand the context of the disaster events on which this research is based.

Outline of the 2011 Disaster

In Japan on March 11, 2011 a powerful earthquake, created a massive tsunami that set off a serious nuclear disaster. The deadliest of the three threats was the tsunami, and approximately 92% of fatalities in the disaster were by drowning (UNESCO 2012, p. 3), but at the time of writing the nuclear accident continues to be a volatile situation that authorities are attempting to control (Sample 2013). The worst of the damage affected the fishing villages and rural areas of Japan's north-eastern Tohoku region, in particular Iwate, Miyagi and Fukushima Prefectures (IFRC 2013). 15,887 people lost their lives, 2,615 are still unaccounted for, and 6,150 were injured (National Police Agency of Japan 2014). 41 of the fatalities in this disaster were recorded as having a nationality other than Japanese; three quarters of these foreign fatalities were Chinese or Korean (Ministry of Health, Labour and Welfare of Japan 2012). The numbers of foreign residents registered in Japan dropped dramatically following the disaster, and 41,207 fewer foreign nationals were resident in Japan by the end of March 2011 than had been there at the start of the year; in the three worst-affected

prefectures, the number of foreign residents dropped on average 14.3 per cent (Ministry of Justice of Japan 2012). The estimated economic losses from the disaster are put at some US$220 billion and recovery operations are predicted to be on-going until 2020 (UNESCO 2012, p. 3). In short, a catastrophic disaster that impacted massively on Japanese nationals but also affected the lives of foreign nationals resident in Japan created varied and important communication needs over a long period of time. However, can it be assumed that technology was relevant to such communication?

Japan is an information-rich, digitally-enabled society and was ranked 8 out of 155 countries in an information and communication technology development index in 2011 (International Telecommunication Union 2012, p. 21). While problems with power and connectivity hampered the use of technology in the early stages of the disaster (Ministry of Internal Affairs and Communication of Japan 2011), there is evidence for a digital communicative scene at the time. For instance, technology companies such as Google and Yahoo! made crisis information pages – containing news reports, early warnings, safety-confirmation messages, person finders, and so on – available during the disaster (Google Crisis Response 2012). In addition, local and national government authorities began to disseminate messages more and more using information and communication technologies, such as Twitter, dedicated websites, and specialised radio broadcasts (Kaigo 2012). Accepting, then, that technology may have enabled some of the communication in the 2011 disaster, were there foreign residents of Japan at the time that may have needed this communication to be linguistically mediated?

Though the worst of the disaster was concentrated on Japan's north-eastern Tohoku region, the officially-designated disaster zone spread over much of the eastern half of Japan's main island. This is evidenced by the fact that Japan's *1947 Disaster Relief Act* was applied to give relief to areas contained in the following ten prefectures: Iwate, Miyagi, Fukushima, Aomori, Ibaraki, Tochigi, Chiba, Tokyo, Niigata and Nagano (Ministry of Health, Labour and Welfare of Japan 2011). As all mid-term to long-term foreign residents (mainly those who are not tourists, short-term business travellers or diplomats) have a legal obligation to register their place of residence with local government authorities (Immigration Bureau of Japan 2012), official records can be used to estimate the number of foreign residents that may have been in these ten prefectures at the time of the disaster. Figures for 2011 indicate that about 670,000 foreign nationals from more than 150 different countries were registered as being resident in the prefectures that were affected by the disaster (E-Stat 2011).[1] It should be remembered, too, that an unrecorded number of other foreign nationals, including short-term visitors and undocumented economic migrants largely from East Asia, would also have been in the disaster zone when the earthquake hit (Earthquake Information 2011).[2]

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[1] These records are available (in Japanese) from: http://www.e-stat.go.jp/SG1/estat/GL08020102.do?_toGL08020102_&tclassID=000001048666&cycleCode=7&requestSender=estat&tstatCode=000001018034 [Accessed 29 August 2014].
The precise records of foreign residents are as follows:

- Three worst-affected prefectures (Iwate, Miyagi, Fukushima) = 28,830 residents;
- Remaining disaster-hit prefectures (Aomori, Ibaraki, Tochigi, Chiba, Tokyo, Niigata and Nagano) = 649,704 residents.

[2] In addition to official and unofficial foreign residents, foreign troops and humanitarian responders were also present in the disaster zone. The US

In summary, in the 2011 disaster, complex communication was being carried out, some of it using various technologies, and a significant number of foreign residents from a variety of linguistic backgrounds would likely have been involved in this communication. While many foreign residents were competent in Japanese, many were not. Moreover, even linguistically competent foreign residents had their identities and responses tied to linguistic and cultural contexts beyond Japan. Foreign residents interviewed for this research project revealed that they looked to foreign embassies for guidance on how to respond to the disaster, consumed significant amounts of information on the disaster from overseas sources, and maintained important contacts with family and friends overseas about the disaster. Thus, it is reasonable to assume that a significant portion of foreign residents would have needed some linguistic mediation at certain points in the disaster. However, can this need for linguistic mediation be shown empirically? If such a need existed, what role did translation technologies play in satisfying this need? And could that role be expanded and improved on in the event of future disasters in Japan? Before attempting to answer these questions, the next section will position this inquiry in the existing literature on translation technology and disaster and attempt to justify that such an inquiry is academically worthy.

Military sent approximately 16,000 troops to assist Japan, and more than twenty other countries, territories, and organisations had teams on the ground at the initial stage (Woodrow Wilson International Center for Scholars 2012, Japanese Red Cross Society 2012).

Literature Review

There is only limited evidence for scholarship on the use of translation technologies in times of disaster in the translation studies literature. Moreover, the study of linguistic mediation – be it through translation or interpreting – has still only been dealt with marginally in the field.[3] An examination of some related disciplines provides access to a larger body of literature on this object of inquiry.

The major journals in the field of translation studies – *Perspectives, Translation & Interpreting, Target, Meta, Lingua, The Translator,* and *Language in Society* – contain no articles about the 2011 disaster at the time of writing. A search of the Elsevier Scopus and Google Scholar databases using a combination of the search terms 'translation', 'technology', and 'disaster' or 'emergency' revealed only two published works (Hester, Shaw and Biewald 2010, Sutherlin 2013). Both works describe how technology aided crowd-sourced translation processes during the 2010 Haiti Earthquake. While work on the linguistic mediation of isolated disasters can be found in the literature – see, for instance, Harding (2012) for a treatment of the Beslan hostage disaster – the most substantial body of

[3] Translation and interpreting can be defined as performing the same function of '…reexpressing in one language what has been expressed in another' (Gile 1995, p. 2). However, the terms are usually differentiated by the mode in which this function is carried out: translation focuses on reexpressing information in a written mode while interpreting focuses on reexpressing information in a spoken mode. It should be remembered, though, that this strict duality cannot always be sustained and that the boundaries between these two activities can sometimes be blurred (Munday 2009, p. 9). In this chapter, linguistic mediation is used as a superordinate term for both translation and interpreting to take into account these potentially blurred boundaries.

academic research on the linguistic mediation of sudden-onset disasters is related to the 2010 Haiti Earthquake. In this disaster, the majority of emergency responders spoke languages other than Haitian Creole and French, the official languages of Haiti (Harvard Humanitarian Initiative 2011). In an effort to facilitate communication between the residents of Haiti and the responders, technologically-proficient volunteer organisations based outside of Haiti used various technology platforms to process the content generated by Haitians to create maps, translate text messages, create person-finder tools, and build machine translation engines (Lewis 2010, Morrow et al. 2011, Munro 2013).

The strongest evidence for scholarship on linguistic mediation in a Japanese disaster context comes from Japanese authors writing about collaborative volunteer translation and community interpreting published in the journals of other academic disciplines (Kageura et al. 2011, Mizuno 2012, Naito 2012, Tsuruta 2011).[4] To find other works on linguistic mediation and disaster, it is necessary to look to works in other disciplines. Japanese studies, communications studies, sociology, and disaster studies have all dealt with the experience of foreign nationals in Japan when disaster hits, but the linguistic issues that they encounter are dealt with only tangentially and the role of translation technology in these experiences is not discussed (e.g., Carroll 2012, Kaigo 2012, Talleraas and Sugahara 2011, Ohara-Hirano 2012, Wall 2011, Kyoto University Disaster Prevention Research Institute 2012).

[4] Community interpreting refers to the interpreting carried out in situations where members of the general public come into contact with providers of public services, such as the police, the judiciary, and the health and social services (Wadensjö 2009, p. 43).

Thus, while there has been academic interest in community interpreting or collaborative volunteer translation in times of disaster, and while some of this work has focused specifically on a Japanese context, none of this research has attempted to establish the real needs for such linguistic mediation and none of it has explored in broader terms the contribution that translation technology could make in times of disaster. This is the gap that the present research project attempts to fill. Before describing some of the findings of this research, the next section will briefly outline how the project has been carried out.

Methodology

The findings in this chapter have been derived from a broader case study which explores the translation phenomenon using the case of foreign nationals resident in East Japan at the time of the 2011 disaster. The study aims to better understand how these people gathered information and communicated during the disaster, to find out how linguistic mediation formed a part of these communicative activities, and to explore the importance of linguistic mediation in this context.

As a result of the constructivist philosophical underpinnings of the research project, the goal in participant recruitment was not randomised selection or sampling. The participants were introduced to the researcher by friends and associates or by the participants themselves. In all, 28 participants who identified themselves as a foreign national in a Japanese context and were resident in East Japan at the outbreak of the disaster agreed to participate in the case study. The participants represent 12 nationalities (Irish, Dutch, French, German, Sudanese, Tunisian, Chinese, Bangladeshi, American, Canadian, Australian, and

New Zealander) who were resident in 5 different cities in disaster-affected prefectures (Sendai, Furukawa, Tokai, Mito, Tokyo), who are in their 20s, 30s, 40s and 50s, possess a variety of linguistic abilities, and had varied occupations at the time of the disaster, including language teacher, student, engineer, diplomat, local government employee, company executive, office administrator, interpreter, consultant, and restaurant owner.

The face-to-face, individual interviews that make up the core primary data of this project took place in Ireland, Japan, and New Zealand between July and October 2013, but 25 of these 28 interviews were held in Japan during an intensive, four-week period of data-gathering from September 18 to October 13, 2013. Each interview was scheduled to take about 60 minutes, though the duration was at times shorter or longer depending on the interviewee's convenience. The interviews were largely a semi-structured, dialogic process; the interviewer framed the dialogue in each interview towards certain key topics (the participant's experience of the disaster, their communicative and linguistic needs, and their sense of community) while at the same time encouraging apparently unrelated anecdotes and tangents. It was hoped that these digressions would provide a deeper understanding of how each participant connected the various key topics together in their own life worlds. Ethical approval was granted by the relevant university research ethics committee, and all participants read a plain language statement and signed an informed consent form.

The number of interviews in this case study is not large, but this number was a function of the time and resources available to the researcher, the aims of the research, and the theories of

knowledge and reality held by the communities to which the project is being addressed (Fielding 2003). In case studies, particularly those adopting a constructivist philosophy, the number of interviews should continue until multiple perspectives on the phenomenon under examination have been accessed (Stake 1995), and, where possible, until additional interviews are no longer providing significant, new data (Yin 2014). The diversity in participant profiles outlined above along with the systematic interconnectedness in the interview data for this case study convinced the author that such conditions had been met. It should be noted, too, that these 28 interviews took place some 30 months after the onset of the 2011 disaster. The timing of research interventions in disasters should not be considered in isolation, but in tandem with issues of safety, access to participants, the readiness of participants to agree to interview, and the ethical appropriateness of the intervention. Thus, while disaster-related interviews can be carried out anywhere from immediately to up to five years post-disaster, it is felt that the early recovery phase of a disaster (usually within a year of onset) is optimal (Stallings 2002, p. 83-86). In short, the timing of the interviews in this case study was less than optimal, but well within the bounds established in other disaster research.

The analytical strategy adopted for this project was a form of thematic analysis operationalised from Braun and Clarke (2006). In this operationalisation, themes were developed over six phases that progressed from participant-led to interpretive to abstract analysis. The first phase entailed multiple re-readings of hard copies of the interview transcripts to generate a list of potential codes that displayed features of interest to the research. The second phase involved creating a rule-for-inclusion for each

potential code and then proceeding through the interview data (this time using QSR's NVivo 10 software) to highlight any passages that satisfied the rule. Once the coding had been completed for the interview data, the same coding rules were used to work through all the secondary data. These data included official reports and surveys on the disaster produced by various governmental bodies and research institutes, other grey literature on the disaster written by a number of emergency response and humanitarian organisations, and an illustrative corpus of actual communication dating back to the disaster period created by the author. The third phase involved combining the coded primary and secondary data into larger groups to produce themes. Again, a rule-for-inclusion process was used for this step. The main objectives of the fourth phase were to refine and further define the themes and to re-read the hard-copies of the data with these themes in mind. Following any necessary adjustments, the fifth phase introduced abstract analysis and involved the production of a thematic map and thesis argument linked to the relevant academic literature. The sixth and final phase involved the write-up of the report.

Findings

This section provides an overview of the needs for linguistic mediation in the 2011 disaster that participants mentioned at interview. Other linguistic needs, of course, may have existed. The purpose of this section is not to come up with an exhaustive inventory, but rather to point to areas where translation technologies made a contribution in the 2011 disaster or could make a contribution in any future disasters in Japan.

Table 1 details the specific qualitative data revealed to the researcher at interview and organises these data in a typology of

linguistic mediation needs. The data can be summarised under five main findings: a need for linguistic mediation – both translation and interpreting – was observed in the 2011 disaster; the greatest need for such mediation was to allow foreign nationals to develop 'situation awareness'; a recurring theme in participant accounts was the need for the mediation of live speech by other people in the disaster setting who offered their language skills in a voluntary capacity; significant amounts of mediation were carried out under the auspices of television networks and local government offices; problematizing linguistic mediation in the 2011 disaster revealed not just an overall lack of mediation efforts but also problems with the consistency and speed of the translation that was carried out. In these findings, the technical term 'situation awareness' may be new to the reader. Situation awareness is a concept used in the study of emergency response to talk about how people individually and collectively gather and analyse information in complex and changing circumstances in order to understand and cope with a situation (Endsley and Garland 2000, Vieweg 2012).

Table 1 Linguistic mediation needs in the 2011 disaster identified by participants in this study

Topic:	Mode:	Mediators:	Locus:	Problem:
Warning about the disaster				
• Automated early warning systems	• Electronic text • Recorded speech	• Staff of subscribing networks	• Japan Meteorological Agency's Earthquake Early Warning System • TV, radio, mobile phone & municipal networks (PA systems) subscribed to it	• Lack of linguistic mediation of TV and municipal warnings
• Maps displayed on emergency news broadcasts and websites	• Electronic text	• Staff of TV networks	• TV networks	• Lack of linguistic mediation of captions, colour coding of warnings only explained in Japanese
Instructing people how to respond				
• General public address announcements (evacuations, delays, explaining power-saving)	• Live speech	• Train station staff • Municipal staff • Office staff	• Train stations • Municipal offices • Office buildings	• Lack of linguistic mediation • Incomprehensible delivery of foreign language translations • Poor sound quality
• Controlled evacuation notices (not over public address system)	• Live speech	• Staff of the parks and public facilities	• Theme parks • Large public spaces and buildings	• Limited language abilities of staff
• Instructions from Japanese local authorities to international emergency responders	• Live speech	• Volunteer interpreters (professional and non-professional)	• Transportation to disaster zone • Disaster zone search and rescue sites	• Cultural and political barriers
• Instructing volunteers in response and recovery tasks	• Live speech	• Local volunteer organisers • Other foreign volunteers	• Homes, businesses, and streets in the disaster zone	• Limited language abilities of local organisers and foreign volunteers
Developing 'situation awareness' in the disaster				
• Confirming safety with and reporting location of foreign nationals to local authorities	• Live speech	• Municipal staff • Emergency responders • Other foreign nationals	• Disaster zone evacuation centres • Disaster zone municipal offices	• Limited language abilities of local authorities and foreign nationals • Cultural barriers
• Content of news broadcasts on TV and streamed online (especially areas hit, by what, and fatalities and missing)	• Live speech • Electronic text	• Staff of TV networks • Bilingual volunteers streaming live interpreting of news broadcasts and subtitling news programs	• TV networks • Homes of volunteer interpreters	• Lack of linguistic mediation • Japanese-only captions and subtitles
• Content of press conferences	• Live speech • Electronic text	• Professional interpreters • Multilingual journalists	• Government offices	• Lack of linguistic mediation • Content translated and distributed by multilingual journalists over social media useful but limited in scope
• Public transport timetables and routes, especially for evacuating	• Printed text • Electronic text	• Municipal staff • Foreign volunteers	• Municipal helpdesks and helplines	• Information updated constantly • Consistency of translation
• Where to go for emergency supplies, opening, stocking and rationing at stores	• Printed text • Live speech	• Other foreign nationals	• Homes, businesses, and streets in the disaster zone	• Information updated constantly
• Explaining the Japanese seismic intensity scale	• Printed text • Electronic text	• Municipal staff • Foreign volunteers	• Municipal offices	• Cultural barriers
• Reporting rates of radioactivity in particular geographic areas and river routes to see water contamination	• Live speech • Electronic text	• Governmental staff • Electric company staff • Foreign volunteers	• Japanese national and prefectural governments • Tokyo Electric Power Co. • IAEA • TV networks	• Technical vocabulary (difficult to understood even when translated) • Lack of context in translations • Poor terminology management
• Nuclear technology and its operation	• Live speech	• Academic experts	• TV networks • Public meetings	• Lack of linguistic mediation • Limited language ability of academic experts
• Food labels, especially places of origin	• Printed text	• Other foreign nationals	• Supermarkets, restaurants	• Lack of linguistic mediation
• Content of Japanese ministerial websites	• Electronic text	• Governmental staff	• Japanese ministries	• Lack of linguistic mediation • Slow to deliver translations • Poor quality translations
Administering the disaster				
• Forms and procedures required to become a volunteer	• Printed text • Electronic text	• Local volunteer organisers • Other foreign volunteers	• Homes, businesses, and streets in the disaster zone	• Lack of linguistic mediation
• Forms and procedures required to make claims for insurance, rebuilding, returning home, etc.	• Printed text • Electronic text	• Municipal staff • Foreign volunteers	• Municipal helpdesks and helplines	• Consistency of translation difficult to maintain • Poor terminology management
Supporting others through the disaster				
• Giving condolences or showing empathy appropriately	• Live speech	• Foreign volunteers	• Homes and businesses in the disaster zone	• Limited language abilities of foreign volunteers
• Twitter messages of support from around the world	• Electronic text	• Professional translators working in a voluntary capacity	• Web-based human translation platform headquartered in Tokyo	• Significant time and resources required to synthesise message platform and translation platform

Each finding developed from the data in Table 1 will now be explained in more detail.

Linguistic mediation was needed

A need for linguistic mediation in the 2011 disaster can be shown empirically by the interview data in this case study. A considerable variety of topics were said to need this mediation, and these topics have been aggregated by the author into five main types: warning about the disaster; instructing people how to respond; developing situation awareness of the disaster; administering the disaster; supporting others through the disaster. This typology of mediation needs follows a broad temporal progression that maps onto the recognised phases of a disaster: pre-event, lasting only seconds or minutes; event, lasting about one week after onset; response, lasting about one month after onset; and recovery, lasting about one year after onset (WHO Regional Office for the Western Pacific 2012, p. 58). That is to say that, generally speaking, warnings and instructions came in the early phases of the disaster, situation awareness was intensively required for the first month or so after onset, and administering and providing support for others became needed once the emergency has moved into the recovery phase. The data in Table 1, therefore, underscore that linguistic mediation was shown to be required at all phases of the 2011 disaster. Of course, it should be remembered that the various elements of this typology may not have followed such a smooth progression and may have occurred simultaneously, overlapped, and so on. It is hoped, though, that a loss of contextual detail is compensated for by easier analysis.

Developing situation awareness was key

The greatest need for linguistic mediation was felt when foreign residents were trying to develop situation awareness in the 2011 disaster. In doing so, they came repeatedly into contact with the dominant language and culture of the disaster – i.e., Japanese – and therefore felt a greater need for mediation. Participants spoke of being able to get by using sign language and pictures or by copying the actions of those around them at the earliest phases of the disaster. However, it was in trying to find out more complex information about what was going on, especially about the nuclear disaster, and to make decisions on how to respond that they felt the need for more linguistic help.

Mediation of live speech by volunteers featured frequently

A recurring pattern in the data was volunteers interpreting spontaneous acts of communication – often face-to-face, but sometimes over a television screen or public address system – for participants. Noticeably, the giving of instructions focused heavily on this 'live speech' mode of communication. The other communicative functions – warning, developing situation awareness, administering the disaster, supporting others – featured a greater variety of communicative modes, such as printed and electronic texts or recorded speech. The preponderance of live speech mediation in the 2011 disaster meant that the mediators needed to assist foreign residents were often volunteers on-the-ground. In support of findings in other research that not all volunteer translators or interpreters are untrained (see, for example, O'Hagan 2011), the data in this case study show that volunteer interpreters in the 2011 disaster were sometimes professional translators and interpreters working in a voluntary capacity. At other times, they were people in the disaster who possessed certain linguistic skills, and

not all of these people would have identified themselves as either professional interpreters or translators.

Television networks and local government played a key role
Overall, when looking at the category of location in these interview data, it would seem that the loci of linguistic mediation were extremely varied. One striking feature of this category, though, is that significant levels of linguistic mediation in the 2011 disaster were carried out under the auspices of television networks and local government offices. In other words, when participants in this study said they needed translations or interpretations, it was in the context of television news broadcasts, the websites of news organisations, and the websites of Japanese local government offices. Note, too, that participants did not talk about needing radio or various forms of social media translated or interpreted at the time. This finding is surprising based on the numerous mass media reports on the significance of social media in the disaster and based on the importance attributed to radio and – to a lesser extent – social media in surveys conducted in Japanese focusing on the experiences of Japanese nationals of the 2011 disaster (see, for instance, Mitsubishi Research Institute 2012).

Lack of mediation, consistency and speed were problems
A recurring pattern when problematising linguistic mediation in the accounts of participants in this case study was a simple lack of sufficient mediation. Participants repeatedly talked about translations or interpretations not being available when needed or about the language abilities of some mediators not being sufficient for the task. However, it can be seen from Table 1 that a lack of sufficient meditation was not the only problem that foreigners experienced when talking about their needs in the

2011 disaster. Two other problems mentioned were a lack of consistency in the mediation provided, particularly with respect to the management of technical terminology in official documentation, and slow delivery of mediation in an environment where information was being updated constantly.

While the interview data in this case study could not provide an exhaustive inventory of all the needs for linguistic mediation that were experienced by foreign residents in the 2011 disaster, the findings outlined in this section construct a framework to begin thinking about how translation technology could have contributed in the 2011 disaster and could contribute in future disasters. These are the topics that will be discussed in the following section.

Discussion

The findings in this case study allow two main arguments about translation technologies in the 2011 disaster to be put forward. The first is that the use of translation technologies was limited and the second is that, when translation technologies were used, they were focused on their application to television and online news.

Some reasons translation technology use was limited

One reason for the limited use of translation technology in the 2011 disaster was probably the preponderance of live-speech mediation needs. These needs can be seen in how active the professional and non-professional interpreter community in the Japanese locale was in the aftermath of the disaster. For instance, the searchable archives of one professional translation forum, Honyaku ML, show that calls for interpreters outweighed calls

for translations in the early stages of the emergency.[5] Live speech produces no text or recording and is often spontaneous, unplanned, and face-to-face. Thus, it lends itself well to mediation by humans but, at the present time, is dealt with less well by technology. Another reason for the limited use of translation technology is that any technology in times of disaster is dependent on functioning infrastructure and ample power supplies (Kaigo 2012). In the worst-hit areas of the disaster zone in the 2011 disaster, power was down and networks were congested or inoperable for extended periods (Ministry of Internal Affairs and Communication 2011). Also, as several participants pointed out in their accounts of the disaster, linguistic mediation requires investments of time, money, and specialised skills that may not be a priority in high-stress disaster situations where resources are already limited and where the needs of foreign residents may be relatively small compared to the needs of the overall affected population. It is worth emphasising here, though, that international first responders may not speak the local language of the disaster setting and may depend on linguistic mediation. This was the case in the 2011 disaster. For instance, a report prepared for the US Congress six days after onset explicitly mentions 10-member teams of translators, communication experts and combat medics being sent to Japan to help Japanese forces (Feickert and Chanlett-Avery 2011).

This is not to say that no evidence was found for the use of translation technologies in the 2011 disaster. For example, technology companies such as Google and Yahoo! used MT to

[5] Honyaku ML is available from: http://honyaku-archive.org/advanced-search/?s=&d1=2011-03-11&d2=2011-04-12&sub=&b= [Accessed 29 August 2014].

make their crisis information pages available in Japanese, English, Chinese and Korean (Google Crisis Response 2012). In another effort, volunteers worked together to create a map called sinsai.info that made use of the Ushahidi crisis-mapping software platform similar to that used in Haiti (Appleby 2013). This map took social media messages – mostly via Twitter – and displayed them using the GPS information contained in the messages, having translated them using the Google Translate API. Translation technologies were also used to enable interpreting at a distance. For instance, one online interpretation service called Babelverse provided its platform for free to crisis workers and bilingual volunteers. In the first two days of operation more than 100 volunteers provided about 400 hours of interpreting.[6]

Television and online news was a likely focus for translation technology

Two clear patterns in the case data were that the greatest need for linguistic mediation was the need for assistance in developing situation awareness and that television and online news were the key channels through which foreign residents tried to satisfy this need. As can be seen in Table 1, the topics requiring linguistic mediation that were dealt with by television and online news organisations often involved the use of electronic texts and of audiovisual content. Thus, it is reasonable to assume that the professional translators and interpreters involved in the production of television news broadcasts and online news websites would have taken advantage of a variety of translation technologies to prepare multilingual scripts,

[6] Babelverse explains its crisis response efforts here: http://babelverse.com/blog/2011/12/the-babelverse-story-crisis-response/ [Accessed 29 August 2014].

caption broadcasts, translate news articles, and so on. It is, therefore, in the consumption of television and online news that participants in this case study were mostly likely to have benefited from the intervention of translation technologies. Even so, it is a feature of disasters that resources are limited. Recurring patterns in participant accounts were that television and online news were not linguistically mediated as often as they needed them to be, that unmediated captions caused them particular difficulty, and that mediation when it was available was slow to arrive. Thus, it is also reasonable to assume that, while translation technologies were likely applied to television and online news production, they may not have been applied evenly across time and space in the disaster, and that more could be done in preparation for future disasters to enable technology to contribute to what seems to be an important source of disaster-related information for foreign residents in Japan.

The discussion so far has indicated that, while linguistic mediation was needed in the 2011 disaster, translation technologies played only a small part in satisfying these needs. The remainder of this section will speculate on ways in which translation technologies could be used to benefit foreign residents in future disasters in Japan.

Use translation technology to encourage volunteer collaboration

A key finding of this case study is that volunteers attempted to satisfy many of the linguistic mediation needs that foreign residents experienced in the 2011 disaster. It would make sense, therefore, to continue to develop and make use of translation technologies to capture these volunteer efforts and to maximise their effect by enabling volunteers to more easily and effectively

collaborate. There is a long history of collaboration in translation, including translation of the bible, Finnegan's Wake and movies (O'Brien 2011). Theories and techniques for allowing translators to collaborate – especially at a distance through the use of information and communication technologies – are well developed. Examples of such techniques include collaborative translation platforms and community translation frameworks that could be adapted to disaster scenarios to allow volunteer human translators to work together. For instance, the following platforms and frameworks are currently in use in industry and the NPO sector and have missions to contribute to disaster relief: a Japan-based company, Gengo, provides a service that automatically allocates texts to be translated among thousands of qualified translators worldwide and was used in the 2011 disaster; another Japanese initiative, Minna no Hon'yaku (Translation for everyone by everyone), is a free, online crowdsourcing platform for translation and subtitling that hosts projects designed to prepare for future disasters; a tool called Kanjingo developed by the Centre for Global Intelligent Content based in Ireland allows translators to use their mobile devices to translate and post-edit small pieces of text, and has been designed with the work of disaster relief organisations, such as Translators without Borders, in mind.[7]

Use TMs to support local government efforts

Using technology to foster collaboration between volunteer translators has been a feature of academic debates on translation

[7] Gengo's service is explained here http://gengo.com/how-it-works/[Accessed 29 August 2014]. Minna no Hon'yaku is explained here http://en.trans-aid.jp/index.php/stat/aboutus [Accessed 29 August 2014]. Kanjingo is explained here http://www.cngl.ie/cngl-developing-mobile-app-for-real-time-translation/ [Accessed 29 August 2014].

and disaster since the 2010 Haiti Earthquake (for a comprehensive overview, see Harvard Humanitarian Initiative 2011). Based on the findings of this case study, though, it may be possible that translation technology could make other types of contribution in future disasters to satisfy the linguistic mediation needs of foreign nationals resident in Japan. In particular, this study revealed that local government offices and associated community organisations in Japan did much to mediate the disaster linguistically for the foreign residents in their local areas. It was also found that, in spite of these efforts, participants repeatedly claimed that the work done by local government offices suffered from problems of speed and consistency, especially in the management of technical terminology. As part of this research project, the author spoke to three local government bodies in Japan and found that they were unaware of even the most basic translation technologies. The particular benefits of translation technologies usually include faster production of translations, increased consistency in terminology, and higher rates of productivity (Choudhury and McConell 2013, p. 8). Instructing Japanese local government offices and associated community organisations in how to use freely available, open-source translation technologies like MT and TM is a contribution that volunteers with translation expertise and translation scholars could make in preparation for future disasters in Japan.

Future developments

A final discussion point raised by these findings relates to the facts that the ways people communicate and gather information in Japan are likely to change and that such technological developments may impact on the contribution to be made by translation technologies in future disasters. Speech-to-speech

translation and its mediation over mobile computing devices is one major focus. The U-STAR (Universal Speech Translation Advanced Research) Consortium is a research collaboration between institutes in 24 countries and regions of which Japan's National Institute of Information and Communications Technology (NICT) is a major member. It has developed an app called VoiceTra4U for mobile devices that combines speech recognition, speech synthesis and multilingual translation technologies with chat functions.[8] The main motivation for the development of this technology is to facilitate international travel, but U-STAR also predicts that this translation technology will be useful in live speech events in times of disaster. For instance, they envisage that a hand-held device equipped with VoiceTra4U could be used to translate responder instructions. NICT is also working on technologies to recognise and clear up static so that a mobile device could be used to recognise emergency news broadcasts, translate the content, and display multilingual captions.[9] While these technological developments focus on MT, mobile devices are also being used to harness the abilities of human translators. For example, a translation provider in Japan called Bricks Corporation is being sponsored by the Japan National Tourism Organization to provide free interpreting services over a dedicated helpline to foreign

[8] Information on the U-STAR Consortium can be found at http://ustar-consortium.com/index.html [Accessed 29 August 2014]; information on the VoiceTra4U app can be found at http://ustar-consortium.com/app/app.html#appOverview [Accessed 29 August 2014].

[9] An overview of some of NICT's future work, including this emergency-related research, is available in Japanese here http://www.soumu.go.jp/main_content/000272417.pdf [Accessed 29 August 2014].

residents in times of disaster or emergency.[10] Another possibility is presented by the changing ways in which people are communicating and gathering information using television technology. NHK (the Japanese national broadcaster) has developed Hybridcast, a platform that allows digital TV to be integrated with Internet-based content and that can be launched on mobile devices as well as television sets. In addition to program customisation, social television, and program recommendations, the system architecture also allows for the delivery of multilingual information over the Internet and the synchronisation of this information with the TV broadcast. This delivery is made possible by a multilingual subtitle server and speech-rate conversion audio server within the system (Ohmata et al. 2013). The benefits of customised, multilingual closed captioning of emergency television broadcasts could be immense, and this represents another promising avenue through which translation technology could contribute to future disaster response in Japan.

Conclusions and Future Work

In conclusion, this chapter has used empirical observations gathered in a case study of one disaster context, the 2011 disaster, to show that linguistic mediation (in the form of translation and interpreting) was needed by foreign nationals who were resident in Japan at the time. They needed help especially to develop a more sophisticated understanding of what was going on and received significant help from volunteer interpreters, television and online news broadcasts, and local

[10] A pamphlet explaining the service to be provided by Bricks Corporation can be found in Japanese on the website of the Japan National Tourism Organization here http://www.jnto.go.jp/jpn/downloads/FreeTranslation.pdf [Accessed 29 August 2014].

government authorities to do so. Translation technology played only a limited role in the provision of this assistance, and reasons for this were proposed. At the same time, the chapter acknowledged and discussed the contributions that translation technology did make and proposed ways in which these contributions could be expanded and improved on in future disasters.

Some additional findings in this case study suggest possible avenues for future work. This chapter discussed only the needs of foreign residents for linguistic mediation in the 2011 disaster. However, culture was also found to be a serious barrier to how foreign residents gathered information and communicated at the time. For instance, participants talked about cultural misunderstandings arising over the use of graphic information, the use of alarms and warning sounds, and the ways in which information was presented. One future stream of work could be to examine how translation technologies – in particular, those taken from the localisation industry – could suggest solutions to these challenges. Another recurrent pattern in the case study data was that some potentially useful mediation efforts went unused simply because foreign residents did not know they existed. For example, government websites were translated but were not consulted and telephone interpreting services were offered but were not called simply because these efforts were never advertised to the foreign communities who would have benefited from them. Thus, a further step could be to propose ways in which the translation technology platforms used in disasters could include a function to allow the producer of these mediation services to announce the completed work to relevant end-users, perhaps representatives of the embassies in the affected area.

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