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Chapter

Technology and Disaster Relief: The Türkiye-Syria Earthquake Case Study

Selcen Ozturkcan

Abstract

This chapter examines how technology has been used in relief efforts following the devastating earthquakes that struck southeast Turkey and northern and western Syria in February 2023. With over 50,000 deaths and 100,000 injuries, the earthquakes presented one of the worst disasters of the century, requiring significant aid and relief efforts. Examples of AI and social media use cases in accelerating and amplifying rescue and humanitarian relief efforts are presented. Emerging technologies like robots, virtual and augmented reality, the Internet of Things (IoT), and blockchain technology have the potential to revolutionize disaster relief work in the years to come. The chapter also explores the potential for new technologies, such as the metaverse, to simulate earthquakes and train people on how to respond to them. The conclusion summarizes the importance of technology in disaster relief efforts and highlights the need to continue investing in, testing, and scaling up technological solutions to ensure better preparedness for future disasters.

Keywords: disaster management, emerging technologies, relief efforts, innovation, Kahramanmaraş earthquake, search and rescue

1. Introduction

In early February 2023, a series of devastating earthquakes struck southeast Turkey and northern and western Syria, causing unprecedented devastation [1, 2]. Relief efforts were still underway at the time of this research, and official registries indicated that the quakes killed over 50,000 people and injured at least another 100,000 [3]. As one of the worst disasters of the century, relief efforts relied heavily on digital and emerging technologies such as open-source websites, while artificial intelligence, social media, and blockchain technology significantly aided relief efforts. Social media has been used to share vital information and organize aid, with trapped individuals tweeting messages with their location. Unfortunately, some people resorted to communicating their final words to their loved ones, especially when the quake-hit region experienced sub-zero temperatures, resulting in hypothermia among survivors trapped beneath the rubble. Both technological and traditional methods of assistance were used in front-line relief efforts. Disaster management has become increasingly reliant on technology, including disaster response, assessment,

and management. Additional apps are likely to be developed as specific needs arise, and blockchain technology will aid in the distribution of monetary aid. AI-powered chatbots can quickly and accurately answer people's questions about relief efforts and assistance programs, and AI could be used to monitor earthquake-prone areas and predict future incidents. The metaverse will be used to simulate earthquakes and train people how to respond to them. Technology is increasingly playing a role in disaster relief efforts, accelerating and amplifying rescue and humanitarian relief efforts and, as a result, saving lives. Technology can help communities become more resilient to future disasters by allowing aid organizations and agencies to invest in, test, and scale up solutions, ensuring that those in charge of relief efforts are better prepared to deal with future disasters. Technology has proven to improve survival chances in a world where natural disasters are all too common. The author dedicates this research to earthquake victims in order to spark a discussion about how to better prepare for future similar relief efforts.

The devastating double earthquake that struck the Kahramanmaraş region on February 6, 2023, exemplifies how technology is increasingly assisting in short-, medium-, and long-term relief efforts in disaster-affected areas. The level of devastation caused by the two earthquakes, which registered 7.8 and 7.5 on the Richter scale, is difficult to comprehend. It is estimated that 10 provinces will be affected, with the destruction spanning more than 50,000 square kilometers. The World Health Organization declared it the worst disaster to strike its 53-country Europe region in a century on February 15. The Secretary-General of the United Nations, António Guterres, referred to the event as an “*epic natural disaster*” as he issued the first of two urgent appeals for those affected.

The chapter is organized with a review of currently used technologies followed by a discussion of potential technologies that could be used. The conclusion includes final remarks and a summary.

2. AI/Emerging tech disaster relief

In recent years, technology has played an increasingly important role in disaster management, including the response to disasters, the assessment of disasters, and the management of disasters. The application of technology in the field of disaster management has proven to be of critical importance in terms of accelerating and amplifying rescue and humanitarian relief efforts, saving lives, and making affected communities more resilient to the occurrence of future disasters.

For instance, artificial intelligence (AI) has been put to use to keep an eye on areas that are prone to earthquakes, forecast the occurrence of future disasters, and provide people with prompt and accurate answers to their questions regarding relief efforts and assistance programs. Chatbots that are powered by AI are especially helpful in circumstances where there is a high volume of people asking for information. This enables human resources to be reallocated to other activities that are equally important.

Platforms for social media have also proven to be useful tools in disaster management, particularly in regions where traditional communication channels have been disrupted. This is especially true in the case of areas that have been hit particularly hard. The use of social media has allowed for the dissemination of vital information as well as the organization of support, with people who are buried under the rubble tweeting messages that include their location.

In addition, the use of websites that are powered by open-source software has made it simpler for organizations that provide humanitarian aid to collaborate on their efforts and disseminate information to the general public. Open-source websites offer a platform for the development of new applications that are tailored to meet the requirements of a particular disaster. This can be especially helpful in circumstances in which time is of the essence.

In addition, developing technologies such as the metaverse can be used to simulate the effects of earthquakes and teach people how to respond appropriately in the event of one. The metaverse can also be used to create virtual relief centers, which are places where communities that have been affected by a disaster can go to receive essential services like food, shelter, and medical care.

In general, technology has evolved into a tool that is essential for disaster management, and it is without a doubt that continued investment and the development of innovative technologies will continue to play an essential part in the process of preventing loss of life and mitigating the effects of natural disasters.

It's difficult to imagine anything going wrong that would be worse for the millions of people affected by the recent earthquakes [4]. On the other hand, digital technologies and other emerging technologies have greatly aided relief efforts. Since the early 2000s, emerging technologies have been used in disaster relief operations and have since become an essential component of these operations. One of the things that distinguishes the Turkish-Syrian relief efforts is the scale of their use of open-source websites, artificial intelligence, and social media. The following sections will present a case study of the technologies that were adapted for use in relief efforts following the earthquakes in Turkey and Syria.

2.1 Social media

The coordination of support efforts and the dissemination of vital information through social media platforms were central to the rescue operations. In some instances, people who were buried under debris tweeted their location and shared these tweets with users with large followings who demanded and hoped to be heard by rescuers. Using streamed social media data, volunteer teams have verified the accuracy of information that rescue operations can use to save lives. Unfortunately, not all of those who were able to send information from beneath the rubble were fortunate enough to receive aid, and some chose to express their profoundly tragic farewells via social media platforms. Even those who were not directly injured by the collapsing buildings during the earthquakes perished from hypothermia brought on by the subzero temperatures that followed. Those who remained trapped under the rubble for days while rescuers struggled to determine where to extend a helping hand in the vast affected area chose to either scream for help or say their final goodbyes.

In recent years, social media has proven to be an invaluable resource for disaster management [5–8]. During a crisis, social media platforms like Twitter, Facebook, and Instagram are increasingly being used to disseminate critical information and coordinate relief efforts. Social media, in addition to facilitating communication between victims and rescuers, aids in the verification of information. Volunteer teams can use live social media data to confirm victim location and status, which can then be used to direct rescue efforts.

However, it was not always with the best intentions that social media was resorted to in the aftermath of the devastating earthquakes. Scammers took advantage of social media platforms for their benefit, as a BBC investigation revealed [9].

Accordingly, scammers circulated appeals for donations to fake charities on Twitter and TikTok, using unrelated imagery and links to fraudulent PayPal accounts and cryptocurrency wallets. Other experts reported similar scams on Telegram and Facebook, too [10]. Consequently, TikTok and PayPal released statements expressing their condolences and commitment to preventing fraudulent activities on their platforms. TikTok actively reminded its viewers to report suspicious behavior while PayPal diligently scrutinized and banned accounts. The aim was to ensure donations went to their intended causes and kept people safe during the challenging period.

With its ability to facilitate communication, coordinate relief efforts, and verify information, social media has become an indispensable tool for disaster management. During these times, however, it is critical to remain vigilant against fraudulent activity and social media misuse.

2.2 High-pitched whistle application

Other technologies, in addition to social media platforms, were used in disaster relief efforts. One notable technological advancement was the use of high-pitched whistle applications designed for stranded individuals. Many people were trapped under rubble in the aftermath of the earthquakes, unable to communicate with rescuers. The whistle apps enabled these people to use their mobile devices to signal for help even when there was no reception.

Unfortunately, the earthquake-affected region also experienced connectivity issues due to extensive infrastructure damage. As a result, those with cell phones could not always send text messages, but they could use the sound-making feature to communicate with anyone who was near the rubble. This also conserved the survivors' limited energy, as yelling for assistance for an extended period of time could be quite draining.

Several whistle applications were released free of charge in response to the disaster. To provide context, one such app developed by Dmitsoft had more than 5 million downloads [11]. These apps were essential in assisting people in requesting assistance when they were unable to communicate verbally or via text message due to the circumstances in which they found themselves. Rescue workers were also able to locate survivors more quickly thanks to the use of these apps, which ultimately had the potential to save lives.

2.3 WhatsApp helpline and bot

During the rescue and relief operations, WhatsApp helplines played a vital role in disseminating information about relief efforts, rescue operations, and volunteering opportunities. Local non-profit organizations, such as the AKUT Search and Rescue Association of Turkey and the AHBAP, established WhatsApp helplines to offer assistance and support to those affected by the earthquake [12]. For instance, AHBAP released a statement that read, *"If you have an urgent need in earthquake areas or want to support those affected by the disaster, write 'Hello' to our WhatsApp support line"* [13]. After sending a message with "Hello," the individual would receive two options: asking for help or providing support.

To prevent the spread of misinformation and ensure an accurate information, Meta partnered with AKUT to establish a WhatsApp helpline to provide assistance and information to individuals affected by the disaster [14]. The helpline allowed individuals to message a designated number on WhatsApp with the word "Hello" and receive relevant information.

In addition to the WhatsApp helplines, several organizations, and individuals released WhatsApp bots to support during the disaster. The Deprembot [15], for instance, was one such bot that allowed people to easily reach the nearest aid points by simply sending their location. By leveraging location-based services, such bots could help people in need and streamline relief efforts, allowing rescue teams to quickly identify those in need of assistance and reach them in the shortest possible time. Moreover, such bots could help reduce the number of unnecessary calls or messages, freeing up lines of communication for urgent requests and ensuring the information was provided to the right channels. As technology continued to evolve, these bots could be further improved, potentially integrating with other emergency response systems to provide even more comprehensive support during natural disasters.

WhatsApp helplines and bots provide a quick and accessible way for individuals to receive assistance and information during a disaster [16, 17]. They were particularly helpful for those who may not have had access to other means of communication or who were struggling to navigate the complex and rapidly changing relief efforts.

2.4 Cryptocurrency

In the aftermath of the disaster, the cryptocurrency community came together to donate millions of dollars in crypto assets to support relief efforts. On Twitter, Haluk Levent, the founder of AHBAP and a local artist, stated that there was a widespread desire among people globally to contribute to charitable causes using cryptocurrency. The local non-profit organization, AHBAP, received over \$3 million in donations, as reported by blockchain analytics firm, Chainalysis, which estimates that the total crypto donations sent to Turkey and Syria exceeded \$5 million. Cryptocurrency exchange, Binance, pledged \$5 million in donated funds, and the total value of cryptocurrency tokens pledged by various crypto firms was found to exceed \$10 million by blockchain analytics firm, Elliptic [18].

Despite the admirable intention of crypto advocates to offer financial relief in the aftermath of natural disasters, questions have been raised about the real-world utility of crypto assets. Critics argued that although cryptocurrencies enabled near-real-time transactions, they failed to provide practical financial solutions in daily life. For example, locals in Turkey still needed to convert their crypto assets into Turkish lira and withdrew the converted fiat to their bank accounts, which could be a cumbersome process in times of crisis. Furthermore, some traders reported difficulties in releasing funds from popular exchanges, highlighting the need for more efficient and reliable financial mechanisms in emergency situations.

In addition to these solutions based on blockchain, a number of other initiatives have emerged to harness the power of technology in order to support efforts being made to aid victims of natural disasters. For instance, a number of different crowdsourcing campaigns to raise money for victims of natural disasters have been launched on social media platforms such as Twitter and Facebook. In addition, some nongovernmental organizations (NGOs) and community-based organizations in the area have created websites and mobile applications to disseminate information regarding available resources, shelter locations, and volunteer opportunities.

2.5 Open-source hubs

In order to facilitate quicker loading times, a large number of open-source crisis assistance websites and platforms have been developed and created using fundamental

HTML. A portion of the funding for the beginning stages of these projects came from crowdsourcing. These platforms included heatmaps for rescue services, which used information gathered from calls for help to identify the locations of survivors buried in rubble; databases of blood donors; links to providers of temporary accommodation, food, and clothing; lists of people known to be trapped in the rubble or in need of urgent medical or humanitarian assistance (which were generated using AI to sort through scattered data); and apps that matched volunteers with those in need of help.

Aside from the previously mentioned relief efforts, several open-source hubs and platforms were used to aid in crisis response. The platforms created served as crisis mapping tools, tracking and sharing information about rescue efforts in real time. It enabled citizens to report trapped individuals, damaged infrastructure, and other critical information via various channels such as SMS, email, and social media. The collected data was then visualized on a map, allowing rescue teams to identify areas that required immediate assistance. During the disaster response, another useful platform was ihtiyacharitasi.org (translates as the need map), which helped manage donations, volunteers, and aid requests.

Furthermore, the open-source community was instrumental in developing tools and resources to aid in disaster relief efforts. Several 3D printing communities, for example, collaborated to create open-source designs for prosthetics and medical equipment that could be produced quickly and cheaply. These initiatives show the power of open-source collaboration in responding to crises and developing innovative solutions to meet urgent needs.

2.6 Satellite imagery

Satellite imagery remained one of the most valuable resources used to assist organizations working in disaster areas [19, 20]. The imagery enabled relief organizations to assess the state of infrastructure and pinpoint the hardest-hit areas, which is critical for ensuring the efficient delivery of aid [21]. In the aftermath of the earthquakes, several resources provided free access to all their technologies to aid organizations operating in the disaster zone. Similar to past disasters, satellite imagery was utilized to offer a broader perspective of the affected area.

The xView2 program, an open-source project sponsored and developed by the Pentagon's Defense Innovation Unit and Carnegie Mellon University's Software Engineering Institute in 2019, collaborated with various research partners, including Microsoft and the University of California, Berkeley. By using machine-learning algorithms in conjunction with satellite imagery, xView2 could identify building and infrastructure damage in the disaster area and categorize its severity more quickly than current methods. This enabled first responders and recovery experts to quickly assess the situation and coordinate reconstruction efforts over time, as seen in Turkey, where the platform was used by multiple organizations in response to the earthquake. Despite its potential, the technology is not without challenges. The model heavily relies on satellite imagery, which is only available during the day and when there is no cloud cover. Additionally, satellite images have an aerial perspective, which makes it difficult to identify damage on the sides of buildings. Furthermore, getting on-the-ground organizations to trust and use an AI solution has been challenging, as traditional first responders are not always familiar with new technology. Nevertheless, xView2 has proved to be an improvement over traditional disaster assessment systems, allowing organizations to create a shared map of the affected area in minutes, coordinate and prioritize responses, and ultimately save time and lives [22].

2.7 Drone

Unmanned aerial vehicles (UAVs), also known as drones, were used to aid in search and rescue operations. These drones captured footage of the affected areas and were outfitted with sensors to assess the extent of building damage. One such sensor detected high levels of methane, which assisted in identifying buildings at risk of explosion due to faulty gas supplies [23]. As part of their humanitarian efforts, several drone manufacturers and the Spanish government sent drones to Turkey.

Drones were used to deliver essential supplies to hard-to-reach areas, in addition to assisting in search and rescue operations. Drones have gained popularity in disaster relief operations in recent years due to their ability to bypass roadblocks and provide a bird's eye view of the affected area [24, 25]. Drones can deliver small items like medicine, food, and communication equipment to those in need, reducing the risk to first responders and speeding up aid delivery. Drones were used to deliver essential supplies to people trapped in the rubble following the earthquake in Turkey, making it possible to quickly provide assistance to those in need in hard-to-reach areas. Drone delivery in disaster zones, on the other hand, can be difficult because it requires careful coordination with other relief efforts on the ground to avoid collisions and disruptions to rescue operations. Despite these obstacles, the use of drones in disaster relief has demonstrated enormous potential for providing critical assistance to those in need.

2.8 Microwave radar

NASA's FINDER technology was used to detect any human heartbeats trapped under debris, which uses microwave radar sensors to remotely detect heartbeats and respiration in order to find survivors in the rubble [26]. Shortly after the earthquake, the technology was transported to the disaster area. It was developed at NASA's Jet Propulsion Laboratory in California and was also used following the 2010 Haiti earthquake. Its ability to distinguish between human and machine motion - and even between humans and animals - proved critical in the chaotic and urgent environment of search and rescue [27, 28]. Its prototypes were built inside a medium-sized Pelican case, which was tough enough to transport the equipment during natural disasters [29].

3. Future of disaster relief technology

The devastation caused by earthquakes in Southeast Turkey as well as northern and western Syria highlighted the importance of investing in disaster relief technology. While significant progress has been made in the use of emerging technologies to aid in relief efforts, more can be done to improve the efficiency and efficacy of these technologies in disaster relief operations. The subsections that follow outline some ideas for how disaster relief technology might evolve in the future.

3.1 Virtual and augmented reality

Virtual and augmented reality technologies can be used to simulate disaster scenarios, allowing those who may be involved in relief operations to receive training and education [30]. Responders can practice their skills and improve their response

times by creating a virtual environment that simulates disaster conditions. Virtual reality can also be used to create building and other structure simulations, allowing responders to practice rescue operations in a safe and controlled environment.

In addition to training and education, virtual and augmented reality (VR/AR) technologies can be used to improve relief efforts in a variety of ways [31]. One such method is to use VR/AR simulations to aid in disaster preparedness planning, which may serve the call for building resilient communities [32]. These simulations can assist disaster planners and responders in better understanding the layout of the disaster area and developing more effective response strategies [33].

Another potential application for VR/AR is to aid in remote disaster assessments. Responders and aid organizations can use virtual reality/augmented reality headsets to assess the damage and needs of disaster-stricken areas without physically being present. This can save valuable time and resources, especially if traveling to the disaster area is difficult or dangerous.

Furthermore, virtual reality and augmented reality can be used to improve communication between responders and victims. Responders can better understand the situation on the ground and communicate with victims to provide aid and support using VR/AR. Responders, for example, can use AR to overlay information such as safe and unsafe areas, directions to safety, or hazards to avoid onto their view of the disaster area. This data can then be shared with victims and relief organizations to help coordinate relief efforts.

Overall, virtual reality and augmented reality technologies have enormous potential to aid in disaster response and relief efforts. As these technologies advance, they are likely to become an increasingly important tool in disaster preparedness and response efforts.

3.2 Internet of Things (IoT)

The Internet of Things (IoT) is a network of interconnected devices that can communicate and exchange data with one another. IoT devices can be used to monitor and collect data from disaster-affected areas in the context of disaster relief. Sensors, for example, can be installed in buildings to detect structural damage and assess the risk of collapse [34, 35]. IoT devices can also be used to track the movement of people and supplies, providing responders with real-time data that can be used to more effectively coordinate relief efforts.

In addition to its use in disaster relief efforts, IoT has a plethora of other applications. For example, IoT devices such as smart helmets or wearable sensors can be used to monitor first responders' vital signs and location in real time, ensuring their safety during rescue operations. Additionally, IoT-enabled drones can be deployed to capture footage and collect data from difficult-to-reach areas that human responders may find too dangerous to access.

Furthermore, during disaster relief operations, IoT can aid in logistics and supply chain management. IoT sensors and devices can be used to monitor and track the movement of supplies and equipment to ensure that they arrive on time. This can help to avoid delays and ensure that resources are used efficiently.

The development of early warning systems is another potential application of IoT in disaster relief. Data can be collected and analyzed to predict and detect potential disasters by deploying IoT sensors in high-risk areas such as flood-prone areas or earthquake zones [36]. This can allow for valuable preparation and evacuation time, potentially saving lives.

However, while IoT technology has many advantages for disaster relief efforts, it also has some drawbacks. Massive amounts of data generated by IoT devices, for example, must be analyzed and processed in real-time, which can be a daunting task. Furthermore, ensuring the security and privacy of sensitive data collected by IoT devices can be difficult, especially during disasters when access to secure networks may be limited. Despite these obstacles, the potential benefits of IoT in disaster relief make it an exciting area for further research and development.

3.3 Blockchain technology

The use of blockchain technology can improve the transparency and accountability of relief efforts [37]. Blockchain technology can ensure that funds are distributed fairly and that aid reaches those who need it most by creating a decentralized ledger that records all transactions related to relief efforts. By creating smart contracts that automatically release funds to specific organizations or individuals, blockchain technology can also be used to facilitate the distribution of aid [38].

Blockchain technology is increasingly being used in disaster relief efforts to aid in the distribution of monetary aid. Blockchain, the technology underlying cryptocurrencies such as Bitcoin, is a decentralized ledger that can be used to securely and transparently track financial transactions. Following the earthquake, organizations and individuals all over the world donated money to aid relief efforts. Many people, however, were concerned that their contributions would not reach those in need or would be subject to fraud or corruption. Blockchain technology can assist in addressing these concerns by providing a secure and transparent method of tracking donations and ensuring that they reach their intended recipients. Blockchain-based systems can also assist organizations in more efficiently distributing funds by eliminating intermediaries and lowering transaction costs. The platform could aim to provide donors with a transparent and secure way to contribute to disaster relief efforts, ensuring that funds are allocated effectively and efficiently. It can use smart contracts, which are self-executing computer programs that automatically carry out the terms of a contract, to track donations and ensure that they are used for their intended purpose, to provide donors with real-time updates on the impact of their donations, and, eventually, to track the progress of relief efforts.

Aside from cryptocurrency donations, the blockchain technology underlying these digital assets can also provide practical disaster management solutions. For example, blockchain-based platforms can aid in the establishment of a secure and transparent supply chain of relief goods from donors to recipients. Using blockchain, all parties involved can track the movement of goods, ensuring that they reach their intended recipients and lowering the risk of corruption or fraud.

Furthermore, blockchain technology can be used to build decentralized crowdfunding platforms that can raise funds for disaster relief efforts without the use of intermediaries. Donors can contribute directly to the cause through these platforms, reducing transaction fees and ensuring that donations reach their intended recipients. This approach may also facilitate global giving, as donors from all over the world will be able to contribute to the relief effort without having to worry about currency conversion or international transfer fees.

3.4 AI-powered chatbots

AI-powered chatbots can be used in disaster relief efforts to quickly and accurately answer people's questions about relief efforts and assistance programs [39].

Chatbots are computer programs that use artificial intelligence to simulate human-to-human conversations. People often have many questions about relief efforts and assistance programs in the aftermath of a disaster, but it can be difficult for organizations to provide timely and accurate answers to all of them. Chatbots can help fill this void by providing quick and accurate responses to frequently asked questions. In addition to providing real-time information on relief efforts and assistance programs, it can also provide affected individuals with quick and easy access to information. In exchange, the chatbot could collect data on the needs of affected individuals. This data-driven information could then be used to better tailor relief efforts.

3.5 Rescue robots

Rescue robots could be used in earthquake-prone cities [40]. During disaster relief operations, robots can perform a variety of tasks such as search and rescue, building inspection, and debris removal [41]. There are numerous rescue robots available, each with its own set of capabilities while some may face difficulties in urban environments due to uneven terrain, unstable structures, and debris. Regardless, rescue robots can play an important role in search and rescue operations, especially when human rescuers are unable to enter damaged buildings safely.

A comprehensive overview of the types of robots currently available for disaster relief efforts, including ground-based robots, aerial drones, and snake-like robots, is presented by Li et al. [41]. Ground-based robots, for example, could navigate through rubble and debris to find and rescue survivors, whereas aerial drones could provide a bird's-eye view of the disaster area and locate survivors from above. With their ability to slither through tight spaces, snake-like robots could be especially useful for searching through collapsed buildings and other confined spaces. Using rescue robots in disaster relief efforts is fraught with difficulties and constraints, owing to the need for power and communication infrastructure, as well as the limitations of current robot technologies. While rescue robots may be useful in disaster relief efforts, they should not be viewed as a replacement for human rescuers.

Overall, the use of rescue robots in disaster relief efforts has the potential to significantly improve response times and the likelihood of rescuing survivors. However, more research and development are required to improve the capabilities and effectiveness of rescue robots.

4. Conclusion

Early in the month of February 2023, a series of earthquakes that struck Southeast Turkey and northern and western Syria served as a harrowing reminder of the devastation that can be caused by natural disasters. The subsequent relief efforts, on the other hand, served to highlight the growing importance of technology in relief operations following natural disasters. Emerging technologies, such as social media, satellite imagery powered by artificial intelligence, and cryptocurrencies, have all played an important part in rescue and humanitarian relief efforts, helping to save lives and alleviate the suffering of those who have been impacted. This chapter provided a summary of the technologies that were utilized and elaborated on the other technologies that could be useful in disaster relief efforts.

Even though there is still more work that can be done to improve the effectiveness and efficiency of disaster relief technology, the progress that has been made up to

this point is encouraging. Emerging technologies like robots, virtual and augmented reality, the Internet of Things (IoT), and blockchain technology have the potential to revolutionize disaster relief work in the years to come. This bodes well for the future of disaster relief technology. We can ensure that communities all over the world are better prepared to deal with future disasters and that relief efforts are more effective in saving lives and reducing suffering if we invest in these technologies and continue to innovate. This can be accomplished by continuing to innovate and also by continuing to invest.

Author details

Selcen Ozturkcan^{1,2}

1 Linnaeus University, Växjö, Sweden

2 Sabancı University, Istanbul, Turkey

*Address all correspondence to: selcen.ozturkcan@lnu.se; selcen@sabanciuniv.edu

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References

- [1] Dal Zilio L, Ampuero J-P. Earthquake doublet in Turkey and Syria. *Communications Earth & Environment*. 2023;**4**(1):71
- [2] Naddaf M. Turkey-Syria earthquake: What scientists know. *Nature*. 2023;**ePub**(ePub):ePub-ePub
- [3] Ozbilgin M, Erbil C, Şimşek Demirbağ K, Demirbağ O, Tanriverdi V. Afet Yönetiminde Sorumluluğun Yeniden İnşası: Deprem. *Sosyal Dramalar: Sosyal Politikalar*; 2023. p. 4
- [4] Ahmed SK, Dhama K, Abdulqadir SO, Omar RM, Ahmed DR, Chakraborty C, et al. The mental health of people in Turkey-Syria earthquake-affected areas needs urgent attention. *Asian Journal of Psychiatry*. 2023;**84**:103573
- [5] Wong-Villacres M, Velasquez CM, Kumar N. Social media for earthquake response: Unpacking its limitations with care. *Proceedings of the ACM on Human-Computer Interaction*. 2017;**1**(CSCW):112
- [6] Yates D, Paquette S. Emergency knowledge management and social media technologies: A case study of the 2010 Haitian earthquake. *International Journal of Information Management*. 2011;**31**(1):6-13
- [7] Kaigo M. Social media usage during disasters and social capital: Twitter and the Great East Japan earthquake. *Keio Communication Review*. 2012;**34**(1):19-35
- [8] Topno PN. Social media: An effective tool for disaster response. *Regional Cooperation Newsletter-South Asia*. 2016;**2016**:28
- [9] Gelbart H. Scammers profit from Turkey-Syria earthquake. *BBC News*. 2023:203. Available from: <https://www.bbc.com/news/world-europe-64599553>
- [10] Feingold S. Cyber Scams are Exploiting Türkiye-Syria Earthquake Relief Efforts. Here's What to Know: *World Economic Forum*; 2023. Available from: <https://www.weforum.org/agenda/2023/02/cyber-scams-exploit-turkey-syria-earthquake-relief/>
- [11] Özünaldım A. Tamindir. 2023. Available from: https://www.tamindir.com/blog/whistle-nedir_78968/
- [12] Bağcı D. Ahabap. WhatsApp Destek Hattı Açıldı: Destek Olmak ve Yardım Talep Etmek İçin 'Merhaba' Yazmanız Yeterli Onedio. 2023. Available from: <https://onedio.com/haber/ahbap-whatapp-destek-hatti-acildi-destek-olmak-ve-yardim-talep-etmek-icin-merhaba-yazmaniz-yeterli-1127385>
- [13] Ahabap. In: Twitter, editor. Deprem alanlarında acil bir ihtiyacınız varsa veya afetten etkilenenlere destek olmak istiyorsanız WhatsApp destek hatımıza "Merhaba" yazın. Available from: <https://wame/908502423642023>
- [14] Bolat EY. Meta'dan Kahramanmaraş depremi için yardım! : Shiftdelete. 2023. Available from: <https://shiftdelete.net/meta-kahramanmaras-depremi-icin-yapilan-yardimlari-acikladi>
- [15] DepremBot. DepremBot. 2023. Available from: <http://deprembot.com/>
- [16] Bhuvana N, Aram IA. Facebook and Whatsapp as disaster management tools during the Chennai (India) floods of 2015. *International Journal of Disaster Risk Reduction*. 2019;**39**:101135

- [17] Guntha R, Rao SN, Shivdas A. Lessons learned from deploying crowdsourced technology for disaster relief during Kerala floods. *Procedia Computer Science*. 2020;**171**:2410-2419
- [18] Chipolina S. Crypto's humanitarian sales pitch in Turkey and Syria. *Financial Times*. 2023. Available from: <https://www.ft.com/content/48b1a7c1-2a2f-47ab-8512-0c719be69c07>
- [19] Saito K, Spence RJ, Going C, Markus M. Using high-resolution satellite images for post-earthquake building damage assessment: A study following the 26 January 2001 Gujarat earthquake. *Earthquake Spectra*. 2004;**20**(1):145-169
- [20] Ji M, Liu L, Buchroithner M. Identifying collapsed buildings using post-earthquake satellite imagery and convolutional neural networks: A case study of the 2010 Haiti earthquake. *Remote Sensing*. 2018;**10**(11):1689
- [21] Guardian. Before and after satellite images show scale of earthquake destruction in Turkey. *Guardian*. 2023. Available from: <https://www.theguardian.com/world/2023/feb/08/before-and-after-satellite-images-pictures-turkey-syria-earthquake-destruction>
- [22] Page T-RM. How AI Can Actually be Helpful in Disaster Response: MIT Technology Review; 2023. Available from: <https://www.technologyreview.com/2023/02/20/1068824/ai-actually-helpful-disaster-response-turkey-syria-earthquake/>
- [23] Stewart E. Turkey-Syria Earthquake: How Technology is Aiding the Search for Survivors: *Enterprise Management 360*. em360tech. 2023. Available from: <https://em360tech.com/tech-article/turkey-syria-earthquake-how-technology-aiding-search-survivors>
- [24] Dukkanci O, Koberstein A, Kara BY. Drones for relief logistics under uncertainty after an earthquake. *European Journal of Operational Research*. 2023. DOI: 10.1016/j.ejor.2023.02.038
- [25] Restas A. Drone applications for supporting disaster management. *World Journal of Engineering and Technology*. 2015;**3**(03):316
- [26] NASA. FINDER Search and Rescue Technology Helped Save Lives in Nepal. 2015. Available from: <https://www.nasa.gov/jpl/finder-search-and-rescue-technology-helped-save-lives-in-nepal>
- [27] Lv H, Lu G, Jing X, Wang J. A new ultra-wideband radar for detecting survivors buried under earthquake rubbles. *Microwave and Optical Technology Letters*. 2010;**52**(11):2621-2624
- [28] Arai I, editor. Survivor search radar system for persons trapped under earthquake rubble. In: *APMC 2001 2001 Asia-Pacific Microwave Conference (Cat No 01TH8577)*. IEEE; 2001
- [29] Firtina N. FINDER: NASA tech detects heartbeats trapped under Turkey quake debris: *Interesting Engineer*. 2023. Available from: <https://interestingengineering.com/innovation/finder-nasa-tech-detects-heartbeats>
- [30] Behzadan AH, Dong S, Kamat VR. Augmented reality visualization: A review of civil infrastructure system applications. *Advanced Engineering Informatics*. 2015;**29**(2):252-267
- [31] Leebmann J. An augmented reality system for earthquake disaster response. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*. 2004;**34**(Part XXX)

- [32] Karanci A, Aksit B. Building disaster-resistant communities: lessons learned from past earthquakes in Turkey and suggestions for the future. *International Journal of Mass Emergencies & Disasters*. 2023;**18**:403-416
- [33] Yamashita N, Taki H, Soga M, editors. A learning support environment for earthquake disaster with a simulation of furniture falling by mobile AR. In: 2012 International Conference on Information Technology Based Higher Education and Training (ITHET). IEEE; 2012
- [34] Alphonsa A, Ravi G, editors. Earthquake early warning system by IOT using Wireless sensor networks. In: 2016 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET). IEEE; 2016
- [35] Zambrano AM, Perez I, Palau C, Esteve M. Technologies of internet of things applied to an earthquake early warning system. *Future Generation Computer Systems*. 2017;**75**:206-215
- [36] Babu V, Rajan V, editors. Flood and earthquake detection and rescue using IoT technology. In: 2019 International Conference on Communication and Electronics Systems (ICCES). IEEE; 2019
- [37] Farooq MS, Khan M, Abid A. A framework to make charity collection transparent and auditable using blockchain technology. *Computers & Electrical Engineering*. 2020;**83**:106588
- [38] Ghanghoria AS, Raja ASA, Bachche VJ, Rathi MN. Secure E-documents storage using blockchain. *International Research Journal of Engineering and Technology IRJET*. 2020;**7**:1972-1974
- [39] Ahmady SE, Uchida O, editors. Telegram-based chatbot application for foreign people in Japan to share disaster-related information in real-time. In: 2020 5th International Conference on Computer and Communication Systems (ICCCS). IEEE; 2020
- [40] G-JM K, Pirri F, Gianni M, Papadakis P, Pizzoli M, Sinha A, et al., editors. Rescue robots at earthquake-hit Mirandola, Italy: A field report. In: 2012 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR). IEEE; 2012
- [41] Li F, Hou S, Bu C, Qu B. Rescue robots for the urban earthquake environment. *Disaster Medicine and Public Health Preparedness*. 2023;**17**:e181