

Chapter 17

The Role of Internet of Things (IoT) in Disaster Management

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ABSTRACT

The purpose of this book chapter is to delve into the role of the internet of things (IoT) in disaster management. Specifically, this chapter will address the following research questions and subjects: How can IoT be utilized in early warning systems for natural disasters? How does big data analytics contribute to disaster management when combined with IoT? Furthermore, a review of literature on the analysis of case studies involving IoT-based disaster management approaches will also be discussed.

INTRODUCTION

Disasters are events that can occur due to natural causes or man-made causes. Regardless of the cause, disasters often result in devastating outcomes in terms of human lives and the economy (Ray et al., 2017). The report by CRED (2023) states that a total of 387 natural hazards and disasters has been recorded worldwide, which resulted in the loss of 30,704 human lives along with 185 million affected individuals and an economic loss with the amount of US\$223.8 billion, according to the data Emergency Event Database EM-DAT has been collected.

Disaster management primarily involves developing strategies for decreasing the impact and consequences of the disasters, rather than eliminating the underlying threats, since disaster management is not solely concerned with the averting potential disasters but also with preparing for and responding to them when they occur (Wellington & Ramesh, 2017).

The Internet of Things (IoT) is an emerging paradigm which is a concept itself regarding to everyday objects will be enabling to communicate among each other along with the users, integrating into

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The Role of Internet of Things (IoT) in Disaster Management

the Internet (Bhosle et al., 2018). IoT has emerged as a promising solution for addressing challenges in various fields, thanks to its appealing features such as heterogeneity, interoperability, lightweight, and flexibility (Ray et al., 2017).

IoT has demonstrated its capability to offer solutions that are more substantial, scalable, portable and energy efficient in addressing a range of issues in disaster management. Driven by these issues, it becomes essential to have a solid understanding of how IoT is currently being utilized to monitor and manage disasters (Ray et al., 2017). Although IoT can't prevent disasters, it has the capability to assist in recognizing life-threatening hazards, provide early warning to authorities, and aid in rescue operations for those affected, resulting in saving lives, resources, and money. Emergency management and response can be improved by the utilization of IoT technologies, leading to significantly better results (Lembke, 2021).

The purpose of this book chapter is to explore the role of IoT in disaster management. Specifically, this book chapter will address the following research questions: How can IoT be used in early warning systems for natural disasters? How does big data analytics contribute to disaster management when combined with IoT? Furthermore, a review of literature on the analysis of case studies involving IoT-based disaster management approaches will be discussed.

METHODS

For this book chapter, the research involved collecting and analyzing existing literature reviews to gather relevant articles and publications to explore the role of IoT in disaster management. To ensure that multiple academic resources such as IEEE Xplore, Google Scholar, Yeditepe University Knowledge Center were used. The search terms used were "IoT in disaster management", "Role of IoT in disaster management", "IoT early in warning" and similar variations. The content of the selected articles and publications primarily focused on the usage, role, benefits, challenges, and overall contributions of IoT in disaster management.

DISASTER MANAGEMENT

Definition of Disaster Management

Coppola (2015) emphasizes what drives the idea of disaster management is to minimize the effects of disasters on human life, properties, and environment. It consists of actions as such mitigation of aftermath of disasters, making sure of people will be prepared for scenarios where disasters occur, plans the response to disasters, and assists people with recovery from disasters. Even though, disaster management cycle has been described in a range of terminology, it can be presented in an overall manner as the following:

Mitigation: The mitigation phase refers to actions that include programs specifically designed to mitigate the impact of disasters on a nation or community (Carter, 1991).

Carter (1991) describes mitigation actions as following:

- Implementation of construction regulations.
- Enforcement of regulations related to land use.

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