NOLEGEIN Journal of
Business Risk Management

ISSN: 2582-287X
Volume 6, Issue 1, 2023
DOI (Journal): 10.37591/NJBRM

http://mbajournals.in/index.php/JoDBCM/index

Review NJBRM

Effective Disaster Management with the Use of Information Technology

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Abstract

Effective disaster management is essential for minimizing the damage caused by natural or man-made disasters. In recent years, technology has played a critical and crucial role in improving disaster management processes all across the globe. This article aims to explore the various technologies that can be used for effective disaster management and their benefits. The study begins by discussing the different types of disasters that can occur and their impacts. It then explores the role of technology in disaster management, highlighting the benefits of using technology to mitigate the impact of disasters. The article explores the difficulties that arise when putting technology-based disaster management options into practice and offers solutions. It provides a succinct illustration of how information technology is used during several stages of disaster management, such as response, recovery, preparedness, and risk reduction. A comprehensive view of information technology utilization throughout all phases of disaster management is absent, and discussions of its application in each step are dispersed. The study highlights the importance of using technologies such as satellite imagery, drones, social media, and communication technologies for effective disaster management. These technologies can help in identifying affected areas, assessing the damage, and providing relief to affected people. Systems for storing, processing, and transmitting information are indispensable. They perform more efficiently and faster than any other source of communication, which ultimately gives them an upper hand in rescuing operations. The study concludes that the use of technology in disaster management can greatly improve the efficiency and effectiveness of relief efforts. However, it is crucial to ensure that these technologies are accessible and user-friendly for all stakeholders involved in disaster management. Furthermore, collaboration and coordination among various stakeholders, including government agencies, NGOs, and the private sector, are essential for the successful implementation of technology-based disaster management solutions.

Keywords: Disaster management, information technology, disaster response, satellite imagery, drones, technologies.

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Received Date: June 13, 2023
Accepted Date: July 05, 2023
Published Date: July 20, 2023

Citation: Sama Jain, Asmi Mishra, Vikash Chaudhary, Atul Garg, Ansh Garg, Anushka Nag. Effective Disaster Management with the Use of Information Technology. NOLEGEIN Journal of Business Risk Management. 2023; 6(1): 15–19p.

INTRODUCTION

What is a Disaster and Why Disaster Management is Needed?

When a risk, whether created by nature or by man, affects a community, it becomes a disaster. A disaster is the outcome of a hazard combined with the vulnerability of a weak civilization. It is occasionally questioned how important disasters and disaster management are in the modern world [1]. Why do we need to worry about it so much? Disaster has, after all, existed for at least as long as recorded history, if not longer. People have faced disaster for generations. Life has gone on despite their suffering and recovery from the repercussions. In essence, this is accurate. However, certain

elements must be taken into account in regard to the contemporary difficulties that catastrophe management faces [2].

AFFECTS OF DISASTERS

The main effects of disasters are loss of life and property. There are thousands of people losses their life and a huge economic loss. According to 2014 report and survey of United States of America, since 2010, 4.3 billon people have been affected by disasters, which claimed 1.3 million lives and cost $2 trillion in economic losses. Thus, the management of disaster and handling of the disaster resources are very important to reduce the loss of life and property [3].

What may be referred to as the classic disaster threat has not decreased much. Most of the earlier issues still exist and are still dangerous [4]. There are still ongoing natural disasters such as earthquakes, cyclones, volcanic eruptions, tsunamis, wildfires, floods, landslides, and drought. Major accidents, for example, are one of its basic man-made analogues. These catastrophes continue to result in terrible human casualties, monetary and societal losses, and environmental harm. Disasters can have terrible impacts, including the loss of lives, destruction of infrastructure, and disruption of the economy [5].

Thus, effective disaster management strategies are essential to minimize the impact of disasters and ensure rapid response and recovery. A variety of tasks are involved in disaster management, such as preparation, response, and recovery. The success of disaster management initiatives depends on each of these components [6].

- Mitigation describes the steps taken in advance of a disaster to lessen its effects. Mitigation measures may include building codes, land-use planning, and hazard identification and mapping. For example, in earthquake-prone areas, building codes may require reinforced concrete structures to withstand seismic activity.
- Planning and implementing responses to disasters with the aim of being prepared are part of preparation. Preparedness activities may include the development of emergency response plans, training and exercises for emergency responders, and the stockpiling of essential supplies.
- Response is the term used to describe the measures conducted both during and shortly following a disaster to save lives, save property, and provide for the fundamental necessities of survivors. The goal of response is to provide immediate assistance to those affected by a disaster and stabilize the situation as quickly as possible. It includes search and rescue operations, evacuation of affected populations, and the provision of emergency medical care and shelter to the victims and survivors.
- Recovery involves the long-term process of rebuilding after a disaster. Its goal is to return affected communities to a state of normalcy and rebuild their resilience to future disasters. It includes may include the repair of damaged infrastructure, the provision of financial assistance to affected communities, and the restoration of essential services.

If these are managed and planned properly then the effects of the disaster can be reduced to the greater extent.

The management of disaster also includes the management of resources such as:

- Troop management
- Transportation management
- Route management
- Database management
- Arms management
- Medical support management

EVOLUTION OF INTERNET OF THINGS

In terms of communication evolution of the Internet, IoT has become the benchmark. In the current form, this language has gained control over billions of devices by utilizing sensors to assist their

operational efficiency [7]. Since the last few years, there has been a sharp increase in the use of or adaptation to new technologies due to the connection of these sensor devices, which provide a significant amount of data that is analyzed for additional cognitive understanding. By the year 2020, it was predicted that there will be roughly 50 billion users connected to the Internet, and this goal was also met [8].

LITERATURE SURVEY

Background of IoT-Enabled Disaster Management System

IoT is the foundation of disaster management systems that are enabled by IoT. To determine if the Coca-Cola in the cane was hot or cold in 1982, four students at Carnegie Mellon created the Arpanet-linked coke apparatus [9]. The primary question to be answered was how many Coke bottles were still in that queue, as well as how long it would have taken. It is referred to as "chilled" if it is kept on the system line for that long of a time. The fingerprint interface will be used throughout this entire system to serve clients. This experiment inspires numerous academics and professionals to develop globally interconnected appliances. IBM scientists proposed and patented Ultra-High Frequency (UHF) and Rfid Tags (RFID) at the start of the 1990s, allowing for faster data transmission over greater distances. IBM ran a number of trial projects in the middle of the 1990s, but they were never able to commercialize this ground-breaking breakthrough due to the problems that forced them to auction off their patents to Intermec barcode technology. Due to the price of the technology at the time and the available power, Intermec RFID systems are implementing various iterations of this innovation; nonetheless, it has not yet been widely adopted as Intermac had hoped. Professors David Brock and Sanjay Sharma suggested using RFID tags to track the various items in the supply chain for this incident, but they ultimately chose to use bar code tags instead because they were cheaper to produce and had larger, more expensive memory capacities. The FID tags connected to the data link have been added to the database and made online available. The Internet of Things was reportedly initially introduced by Ashton, Executive Director, at the MIT ID Centre in 1999, according to several studies and magazines. According to Aston, the Internet of Things has the ability to alter the environment more frequently than the Internet has. However, other investigations asserted that Neil Gerstenfeld's research group was also the first to discuss the IoT concept and the book's title, "When Things Start to Think" [10].

OBJECTIVE

To study about the effective ways of disaster management with the concepts of technology and classic theories. It is studied to minimize the impacts and losses of ever growing rate of disasters all across the globe.

FINDINGS

Existing Technologies

- Remote sensing and GIS in disaster management Remote sensing is the measurement or acquisition of data about a phenomenon or an item by a recording device that is not physically or intimately in contact with the phenomenon or thing. In actuality, remote sensing is the use of any equipment for gathering environmental data from a distance (such as from an aircraft, spacecraft, satellite, or ship). Thus, it is crucial to monitor a specific geographic area using satellites for earth observation, weather monitoring, and aerial photography.
- Raspberry PI, which is a hardware used in sensor technology, is used in American army for disaster management. The raspberry pi which is highly used in sensing the geographical areas. The raspberry uses the JAVA technology in it. The disadvantage of raspberry pi is the it is highly expensive.

Proposed Methods

- *Troop management*: According to the range, that is, the effectiveness of the disaster the troop that is to be used for the rescue operation is calculated. This is used to accurately calculate the troop members needed for the rescue operation according to the population of the affected people.

- *Medical support*: This component also entails of all the details of the hospitals and the medical support that are available across the disaster affected area. This gives the details about the doctors, causalities available, special facilities in the hospitals, and so on.
- *Arms management*: This method also consists of the module to manage the arms that are required for the rescue operation. The arms are allocated according to the troop members and the effectiveness of the disaster occurred in the particular area.
- *Rehabilitation resources management*: This method deals with the module that is used to manage the resources that are required for the rehabilitation purpose. The resources include the food, sheltering materials, basic medical support according to the population and effectiveness of the disasters.
- *Maintaining the history*: The method also facilitates maintain the history of the previous history of the troop, the person who leads the group, the success rates of the troop, failure rates, area they are served in, total members of the troop, level of arms used by the troop during previous rescue operations, loss of life, and so forth, to select the best rescue team for the disaster.
- *Maintaining the history of the disaster effected areas*: This method deals with the history and geographical status and condition of the disaster affected areas. This is very much used in effectively handling the disaster. It also contains the details of population of the particular area. The area that can be selected by the user. The frequently affected areas are maintained with more details.

CONCLUSION

Disasters are occurrences that significantly affect both people and the environment. Disaster is something that cannot be prevented, but disaster preparedness is in our hands. Disaster management, which includes government intervention, the private sector, and proper planning that includes funding. This management tool gives you the chance to prepare for, stop, and mitigate the effects of a disaster. The worst effect can be completely or partially mitigated by preparation, early warning, and allocation of resources according to the need. The government or the state community has to manage this disaster; thus, this above-proposed application can be used to manage and know about various resources, including the very important troops, transportation, arms, and so on, according to the effectiveness of the disasters. This also helps us maintain the history of the disaster in that particular area and to know the details of the troops. As a result, we can determine how successful the rescue effort was. Thus, the implementation of this application, which helps efficiently handle and manage the disaster and rehabilitation work.

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