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LITERATURE REVIEW Open Access

A Structural Review on Disaster Management Models and Their Contributions

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Abstract

This qualitative study aimed to undertake a critical examination of the models by thematic analysis to determine their contribution to disaster management. A review and analysis of the literature were used. The models were studied to explore their contribution to disaster management and to identify any significant constraints or challenges which could limit the ability of the models to carry out appropriate disaster risk reduction actions. The study found that such models are indispensable because they simplify and improve disaster management. Additionally, they may support planners, managers, and practitioners in reaching proper decisions, making them valuable and necessary decision-making support tools. The study also found that the four key phases of disaster management – mitigation, preparedness, response, and recovery – constitute the basis of the majority of models. The study also showed that each model has an advantage that distinguishes it from the other models. The findings also confirmed the doubts raised about the limitations and concerns associated with the models. Concerns included future disasters' unpredictability, the models' prescriptive nature, and the impact on businesses. The findings also indicated that certain planners, managers, and practitioners had a limited understanding of the use of models in disaster management. As such, they appear to have overlooked the use of models while dealing with disasters. Hence, the study recommends that the models should be employed in all disaster management phases. The study also recommends that the findings are utilized as a basis for further research into the potential use of disaster management models.

Keywords: disaster; management; models; contribution; disaster management models.

Introduction

Disasters are among the most serious problems facing all countries of the world. As such, a remarkable global trend towards growing deaths, casualties, and economic losses resulting from disasters has been seen in recent years. Kraas (2008) states that the main reasons for this increase in disasters are increasing urbanisation, extreme weather, climate change, wars, massive population growth, and political, economic, and social disturbances.

Regions that have been impacted by disasters or are prone to disasters represent a significant threat to sustainable development. Therefore, appropriate disaster management should be practised to avoid or reduce the effects of disasters if sustainable development is to be achieved. Disaster management is a process that includes a variety of activities and actions aimed at preventing or reducing the negative effects of disasters, ensuring early aid to victims, and achieving recovery (Othman and Beydoun, 2012). Each of these aims is achieved during one or more of the disaster management phases.

Despite the availability of several disaster management models, disasters are frequently managed inefficiently. Asgary (2006) states that disaster management is a newly developed discipline and profession. Thus, those in charge of managing disasters should continue to improve their models so that it remains a professional and scientific discipline. Accordingly, researchers have attempted to develop models for disaster management over the years to help understand the activities and elements of the disaster management cycle. Pre-disaster mitigation and preparedness activities minimise at-risk areas' vulnerabilities to a great extent and help increase the effectiveness of post-disaster efforts. The adage that "prevention is better than cure" supports what was mentioned above about disaster management models (Minhans, 2010).

The term "model" is defined as "a system of functions and conditions that yield formal results" (Klein and Romero, 2007, p.243). Some researchers and experts believe that models are necessary for effective disaster management (Salazar, 2016). Several models have been formed to help governments and disaster agencies prepare for and respond to disasters (Speakman, 2011). Asghar et al. (2006) stated that (Kelly,1999) was the first to advocate using models in disaster management to explain, understand, describe, and investigate disasters.

The authors of this study do not intend to offer a new model for disaster management; rather, they aim to further existing knowledge on disaster management models. Through qualitative analysis as a research method, this study investigates existing literature on the topic to evaluate the contribution of models in disaster management. Thus, this study focuses on two main objectives:

- To Explore the importance of disaster management models.
- To identify the most common groups of disaster management models

Methods

It is important to thoroughly examine the study's aims, objectives, and questions before deciding on a research methodology. As a result, the authors have adopted constructivist and interpretivist theories related to ontological and epistemological perspectives. A qualitative method is the most suitable methodology for getting the information required to answer the study questions for the following reasons:

Firstly, the author's epistemological and ontological perspectives demand it. For example, Schwandt (1994) states that humans generate or create knowledge rather than find or discover it. Furthermore, according to Schwandt (1994), who cited Guba and Lincoln (1989), knowledge generation is an attempt to understand an experience. Therefore, there is a need for a qualitative method of investigation because of the assumption that knowledge may be obtained by collecting, analysing, and interpreting qualitative data to test hypotheses or develop new theories.

Secondly, the study claims to be investigating a complicated reality. According to Hollinshead (2004), the qualitative method seeks to be unique and time-consuming in its pursuit of information. Thirdly, a qualitative method makes it possible for the data to be linked, collected and analysed and for conclusions to be obtained. Lastly, since disasters are based on instability, non-linearity, and complexity, they require a qualitative method.

Thus, the study adopted a qualitative approach that began with a literature review followed by content analysis. The authors conducted a literature review to understand the contribution of models in disaster management. According to Hsieh and Shannon (2005), a literature review is a popular qualitative method used for analysing

literature that may comprise texts or images, and where scholars employed content analysis as a tool to analyse trends in texts in a systematic method (Hasan et al., 2019). It is primarily focused on what words, phrases, or sentences mean, what they mean to other people, and what they signify in context (Chakraborty et al., 2014). In addition, it is focused on the link between text and the cause for its recurrence, which is what content analysis is all about (Yu et al., 2011).

A scoping search of literature in scientific databases was conducted. Google Scholar and Scopus were the primary scientific databases used to collect relevant publications. Journal papers and articles, as well as books, conference presentations, and other pertinent publications, were also analysed. Disaster management models, the structure of disaster management, disaster management plans, and disaster management frameworks were among the keywords used to find the required disaster management models. Publications that did not include the keywords listed above were excluded.

Through a survey of the literature and analysis of the various papers, it was noted that no article or book included all disaster management models. Therefore, in order to explore all known disaster management models, a three-stage methodology was adopted. The first stage comprised collecting disaster management models, followed by the second stage, which included analysing and classifying the models. Finally, the third stage discussed the models.

Motivation

Although different and newer models have been developed throughout recent years, they have always been criticised. According to Alexander (1997, 2002), models have not progressed significantly because death tolls of disasters have not decreased enough themselves. Other factors include the absence of large-scale technology transfers, and inadequate disaster relief. In a later study, Alexander (2016) discusses the problems that researchers, scholars, and practitioners tend to face when exploring or planning for disaster risk reduction. He believes that the disaster theory requires a substantial revision to account for trends in the contemporary world.

According to Asghar et al. (2006) all models created have deficiencies and weaknesses. For instance, the majority of models are based on the four phases of disasters: mitigation, preparedness, response, and recovery. In addition, some models do not include all aspects of disaster management, such as risk management and risk assessment. Thus, in order for disaster management models to remain a “roadmap” that simplifies the complicated reality of disasters, they should include all disaster management aspects.

Some models failed to provide an acceptable answer to the issues and challenges each disaster confronts. For example, while comprehensive risk analyses tend to be emphasised, it appears that the unpredictable nature and scale of future disasters make prediction complicated. Furthermore, they tend to take a “one-size-fits-all” approach, ignoring the variables specific to each disaster, including cultural variations, governments, and resources, possibly in an effort to be universally compatible. Moreover, the models’ prescriptive, step-by-step design ignores disasters’ complex and frequently chaotic features, which, by their very nature, seldom go as planned (Speakman, 2011).

Despite an increase in disaster frequency, the use of models continues to be misunderstood. Platt (2015) argues that disaster managers and practitioners rarely employ models. Some of them are sceptical about the contribution of models in disaster management. They also don't seem to have enough information about using and implementing the models. Therefore, it is assumed that the approach to disaster management, in general, has been less successful and effective because the models are not well understood or applied appropriately.

This study also assumes that governments and communities will continue to incur massive losses if the models are not used or deemed unsuitable for managing disasters. As such, the usability and application of models in disaster management have to be improved.

Results

Literature that included disaster management models has been reviewed and analysed. It was found that Asghar et al. (2006) describe four types of models: logical, causal, integrated, and uncategorised. However, Nojavan et al. (2018) argue that some models were not suitable to be included in any of the previous groups, so a group was proposed, which was called "combinatorial models"; these were made up of a mixture of logical, causal and integrated models. As a result, this study divides disaster management models into five categories: logical models, causal models, integrated models, combinatorial models, and uncategorised models. These five groups are illustrated in Figure 1.

Since this study does not aim to review and discuss disaster management models in detail, only a number of models belonging to these five groups were analysed. The chosen models are displayed in the following table.

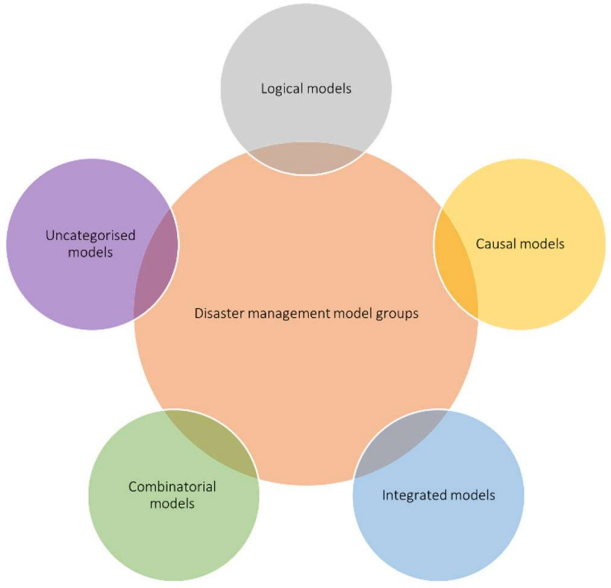

Figure 1. Classification of Disaster Management Model Groups.

Table 1. Groups of Disaster Management Models.

Logical Models		
Name of Model	Author and Year of Publication	Description
Iceberg model	Heinrich (1941)	The most critical aspect of this model is its focus on structure and the appearance of a model template.
Lechat model	Lechat (1990)	This model begins with disaster preparedness and finishes with disaster recovery.
The five-stage model	Mitroff and Pearson (1993)	The detection and learning processes are emphasised in this model.
Traditional model	DPLG-2 (1998)	The various phases of disaster management run in a sequential order in this model but with differing degrees of focus.
Expand and contract model	DPLG-2 (1998)	The distinction of this traditional model is that the action sequences occur simultaneously.
Circular model	Kelly (1999)	The ability of this model to learn from actual disasters is its most significant aspect.
Mitroff model	Mitroff (2000)	This is a proactive model that focuses mainly on the learning stage.
The four-phase disaster management model	Kimberly (2003)	The response phase is the most significant part of this model. It focuses on disasters in healthcare facilities and requires appropriately trained staff.
The four-stage model of Tuscaloosa	Tuscaloosa (2003)	This model revolves around the response phase.
Two-part model	Hosseini and Jedi (2006)	A variety of operational and logistical elements are contained in this model. As a result, it is referred to as a two-part model.
Gupta stair model	Gupta (2010)	Pre-disaster phases are not given significant consideration in this model.
Contreras model	Contreras (2016)	Several indicators have been established in this model to measure disaster vulnerability. However, the most critical aspect of this model is its focus on disaster recovery.
Causal Models		
Name of Model	Author and Year of Publication	Description
Littlejohn six-stage model	Littlejohn (1983)	This model is a framework for disaster management that includes fundamental guidelines.
Fink's comprehensive audit model	Fink (1986)	This model predicts what occurrences might lead to a disaster, so action plans can be created and scenarios developed.

Crunch cause model	Asian Disaster Preparedness Centre (2000)	This model presents a foundation for understanding the causes of a disaster. Its structure is explained by the equation: Hazard + Vulnerability = Disaster Risk.
Pressure and release (PAR) model	Blaikie et al. (2005)	This model employs preventative actions in an attempt to reduce the risk of disaster.

Integrated Models		
Name of Model	Author and Year of Publication	Description
Onion model	Mitroff et al. (1987)	This model lays out a framework for crisis preparedness in organisations.
McConkey linear model	McConkey (1987)	In four stages, the McConkey model gives considerable emphasis to pre-disaster management.
The Deming cycle model (PDCA model)	Aguayo (1991)	The PDCA model was created as a continuous improvement cycle of planning, implementing, and assessing.
Manitoba Health model	Manitoba Health Disaster Management (2002)	This model provides a balance between preparedness and resilience in order to adapt to the disaster's specific requirements.
Integrated model	Moe and Pathranarakul (2006)	This model demonstrates the necessity of both proactive and reactive measures in the management of natural disasters.
McEntire et al. integrated model	McEntire et al. (2010)	This integrated model for modelling vulnerability takes into account social science research, engineering, and physics.
Integrated system-oriented Model	Meshkati and Tabibzadeh (2016)	This model's most distinguishing characteristic is its focus on emergency response.
Monitoring and evaluating framework for disaster risk management	Scott et al. (2016)	This model is a one-of-a-kind framework for monitoring and assessing disaster risk management plans that such programmes may use to track the effects of their interventions and, in turn, increase standards in their field.

Combinatorial Models		
Name of Model	Author and Year of Publication	Description
Cuny comprehensive model	Cuny (1998)	Cuny presented one of the most comprehensive disaster management cycles. Using a combination of logical, integrated, and causal models, this model addresses the managerial and administrative procedures of disaster management.
Risk management proactive model	Australian Development Gateway (2008)	This model aims to blend logical and integrated models.

Disaster risk management framework (DRMF) model	Baas et al. (2008)	The three stages in this model are risk reduction, response, and recovery.
Wheel-shape disaster management model	Rowshandel Arbatani et al. (2008)	This model, which is based on the disaster cycle, is one of the complete disaster management models. It is made up of a mix of logical and integrated models.
Risk management model	Zimmermann and Stössel (2011); BPDMP (2013)	This model aims to improve community resilience and reduce the risk of the disaster by combining logical and integrated models.
Saldana-Zorrilla model	Saldana-Zorrilla Saldana (2015)	This model proposes a guideline for risk management and enhancing risk reduction strategies and planning.
Institutional model for collaborative disaster risk management	Tau et al. (2016)	This model combines the theoretical, political, and technological aspects of disaster risk reduction.
Uncategorised Models		
Name of Model	Author and Year of Publication	Description
Fink's four-stage model of a crisis lifecycle	Fink (1986); Penrose (2000)	This model covers mitigation aspects and crisis analysis.
Crisis management model	González-Herrero and Pratt (1996)	According to this model, we may control the disaster's outcomes by taking pre-disaster actions.
Ibrahim et al.'s model	Ibrahim et al. (2003); Shaluf et al. (2003)	This model illustrates the stages that could lead to a technological disaster.
Pagoda model	Okada (2004)	In this model, the city is considered a significant five-stage system.
Octopus model	Shi et al. (2011)	This model suggests that risk management should be built on a multidimensional system since disasters are complex processes.
Statoil model	Statoil (2013)	This model is reactive since it starts its actions as soon as a disaster occurs and continues until the situation is back to its pre-disaster state.

The first group is logical models. They were defined as simple designs of the main phases of disaster management that emphasised the essential procedures. The traditional model (1998) was one of the most popular and well-known logical models. The disaster management cycle was divided into three phases in the traditional model: before, during, and after a disaster. The pre-disaster phase included mitigation, prevention, and preparedness. Activities during a disaster included response and reaction. Post-disaster activities included recovery, repairing infrastructure, and restoring public services (ADPC, 2000).

The second group was causal models. These models were concerned with understanding the underlying causes of disasters. One of the most popular causal models was the Crunch cause model (2000), which proposed a framework for understanding disaster causes. This model was built on the principle that disaster vulnerability can be influenced by a variety of factors. Lives, property, infrastructure, and the environment were examples of

elements at risk. Due to this, the model identified community vulnerability and its underlying causes and estimated risky situations (Nojavan et al., 2018).

The third group was integrated models. Integrated models organised the necessary tasks to guarantee effective and efficient performance, and it has four components: risk assessment, hazard management, mitigation, and preparedness (Nojavan et al., 2018). The Manitoba Health model (2002) was one of the most common integrated models. It was made up of six major parts: a strategy plan, risk assessment, hazard management, mitigation, preparedness, and monitoring and evaluation. Each of these parts has its own actions and tasks. This model clearly separated the disaster management phases, which allowed disasters to be managed effectively. It also provided flexible links between processes and activities of disaster management (Nojavan et al., 2018).

Combinatorial models were the fourth type of model, and they combined logical, causal, and integrated models to develop a new disaster management model. The Cuny comprehensive model (1998), which combined the advantages of the three aforementioned model groups, was one of the combinatorial models. Finally, models that did not meet the criteria of the previous four groups fall within the scope of the fifth group, which was known as uncategorised models. These models were referred to as "uncategorised" since their design and format did not fall into any of the previous groups. Ibrahim et al.'s (2003) model was one of the most common uncategorised models. It focused on technological disaster management. It was divided into eight stages: occurrence of an error; increasing number of errors; warning; correction failure; upcoming disasters; triggering events; an emergency stage; and the disaster itself.

Discussion

The results of this study are examined in this section. It begins with a discussion of the importance of disaster management models, which is then followed by a discussion on the benefits of disaster management models.

The Importance of Disaster Management Models

Disaster management models are founded on the principle that disasters disrupt development and that it is the responsibility of disaster planners, managers, and practitioners to take adequate measures to recover development (Hussain, 2013). This implies that they are in charge of adopting and implementing these models. Yet, if models are not correctly implemented, even good models could be rendered ineffective. Kelly (1999) outlines four key reasons why disaster management models are needed:

1. A model can help to simplify complicated situations by assisting in the differentiation of important aspects. In addition, it becomes more considerable when dealing with disasters with strict time limits;
2. When real conditions are compared to a theoretical model, it is possible to better understand the present situation, which may help produce a more effective disaster planning process;
3. A disaster management model is an effective tool for measuring disaster activities;
4. A disaster management model supports the formation of a shared understanding among all parties concerned. It also makes it possible to integrate disaster management activities effectively.

By carefully examining the four main reasons for the need for models presented by Kelly (1999), one could be led to conclude that the employment of models is necessary and unavoidable. Effective disaster management models can clearly identify disaster activities and actions. As a result, if models are correctly applied, they can be quite valuable and helpful in disaster management.

Are Disaster Management Models Beneficial?

A model's utility as a practical disaster management tool cannot be overstated. Disasters can be better understood by comparing them to a theoretical model, which can lead to improved disaster planning and response. It has been noticed that in certain cases when disaster management models have been used, the models were shown to be relevant and highly effective. For example, in its instructions for its "participatory capacity and vulnerability

analysis" (PCVA), Oxfam employed various models as a framework for their disaster analysis (Hai and Smyth, 2012).

Models are not only used in small-impact disasters but have also been employed to deal with large-scale disasters. According to El-Quliti et al. (2016), a disaster recovery model was used in the aftermath of Saudi's 2009 earthquake (Al-Ais earthquake). Decision-making in the midst of a disaster is a unique situation and can have substantial effects on people and communities (Patterson et al., 2010); thus, models are important for making effective decisions. Such decisions include those made by decision-makers, disaster managers, and disaster planners (Platt, 2015). Therefore, models can be applied in the decision-making process while dealing with disasters, due to the involvement of decision-makers, leaders, planners, and practitioners in disaster management.

Frequent hurricanes that occurred in the United States of America, for example, hurricane Katrina in 2005, hurricane Sandy in 2012, and hurricane Harvey in 2017 were other huge disaster that illustrated the need to use proper models when planning and conducting response and recovery activities. Following on from this, a model for increasing disaster preparedness in health institutions was proposed (Paul and Batta, 2011). The model was used in the 2015 Jazan hospital fire accident in which at least 25 were killed, and more than 100 people were injured (Alshaabani, 2019). This model showed the feasibility of developing disaster preparedness plans in hospitals, with a focus on hospital capacity, medical staff, and ambulances. The Saudi Arabia flash floods which took place after 2011 were also examined using the Pressure and Release model, which helped managers and practitioners find previous, current, and prospective risks and vulnerabilities (Alrehaili, 2021 a; Alrehaili, 2021 b).

The models can also be used to help manage human-caused disasters. The employment of disaster management models proved effective in many man-made disasters. For example, the Chicago Tylenol murders occurred due to drug tampering in the Chicago metropolitan area in 1982. In addition, a pesticide factory in Bhopal, India, experienced a gas leak on 2 December 1984, and over 500,000 locals were affected by methyl isocyanate gas. Also, on 28 January 1986, seven astronauts were killed when the Challenger Space Shuttle exploded (Shrivastava, 1992). A model for coping with industrial disasters was proposed by Shrivastava (1992) in the aftermath of these three disasters. When we take a closer look at this model, it becomes evident that using Shrivastava's model in industrial disaster management could help reduce losses. For example, in Saudi Arabia, it was used in 2012 when a truck carrying fuel crashed into an intersection flyover in the east of Riyadh. The lorry hit a bridge pylon on Khureis Road, and the petrol it was carrying leaked into the surroundings, and then ignited. The blast killed 23 people and injured 135 (Alazmy et al., 2020).

In order to deal with all types of disasters, it is essential to avoid past mistakes by providing an effective disaster model that provides proper coordination among all stakeholders at all levels (Caymaz et al., 2013). Moreover, Moore et al. (2009) state that whatever disaster management model is adopted, the agency responsible for coordination should allocate disaster response roles and activities to all stakeholders. Thus, disaster agencies should be able to determine which stakeholders need to be involved and their responsibilities and duties in such disasters. The authors of this study believe that this approach represents a step in the right direction.

Despite the above arguments, Stetler (2001; 2010) presented a strong criticism against disaster management models, asserting that they are too prescriptive, specific, and restricted. As a result, some decision-makers, planners, managers, and practitioners have questioned the usefulness of such disaster management models. Yet, the authors still claim that models for disaster management are quite beneficial and valuable.

Findings

This study shows that disaster management models can contribute to effective disaster management and that appropriate models should be used to manage all types of disasters. Another significant finding was that models should be used by those responsible for dealing with disasters, such as planners, managers, and practitioners. This finding supports Kelly's (1999) claim that such models may be used to better understand disasters by identifying

the factors affecting it and comparing the theoretical model with the actual reality of the disaster, resulting in a better knowledge of the disaster and an improvement in its planning and management. Thus, it can be concluded that models are a necessary tool for disaster management.

Five groups of disaster management models were examined and discussed in this study. It was found that no particular disaster management group or model is preferred and accepted by all practitioners, although more than one model can be used simultaneously to cope with a particular disaster. The traditional (1998), expand and contract (1998), Crunch cause (2000) and Kimberly (2003) models were the most common among practitioners, with the traditional model being the most preferred. Each of these four models performs a particular role in disaster management, as each is uniquely different in its characteristics and response to disasters. However, each model has its limitations and deficiencies. For example, even though the first three models are simple to implement, Kimberly's four-phase disaster management model is likely to face obstacles since it requires particular knowledge and financing.

This study found that the disaster management models examined had some similarities. One similarity is that each model attempts to improve on the deficiencies of the others. The expand and contract model (1998), for example, attempts to challenge the standard disaster management continuum's phases sequence by performing the phases in parallel. Thus, the expand and contract model suggests that activities may be conducted simultaneously rather than sequentially. As such, this study supports Dube's (2015) conclusion that all actions in the expand and contract model may occur simultaneously.

The study also found that because most models focus on the four main phases of disaster management – mitigation, preparedness, response, and recovery – they are closely related to each other. This finding is consistent with Joyce et al. (2009), who found that most models are based on the four main phases of disaster management, with the exception of the Crunch cause model (2000), which neglects these phases in its design. Furthermore, the study found that each of the examined models may simply correct the deficiencies of other models. Additionally, it was found that all models have the same primary goal: to work as a decision-making support tool, hence increasing governments' and communities' responses to the hazards and risks of disasters. As a result, it can be concluded that the relationship between disaster management models should be carefully considered in order to use them properly.

The study found that models are a beneficial and important technique for ensuring effective and successful disaster management. They can be employed to simplify, explain, and clarify disaster management. This finding confirms the viewpoint of Platt (2015), who considers models as a disaster management technique that may help in making suitable decisions for effectively coping with disasters. It also matches Wada et al. (2014), who concluded that developing disaster management techniques in the form of models was critical for managing disasters.

It was also found that models were beneficial and valuable in coping with major disasters such as hurricanes, earthquakes, volcanoes, floods, fires, and terrorist attacks. The models used for these increased the understanding of each disaster and the diverse roles of the stakeholders concerned, which lead to adequate preparation and implementation of suitable decisions, allowing these disasters to be dealt with more successfully. This, therefore, proves that using disaster management models represent a distinctive and valuable contribution to managing disasters.

Finally, the study also found that, while models are a valuable technique for disaster management, they are useless if no serious attempts are made to implement them. Therefore, models should be appropriately used to be more useful, which includes combining them so that the strengths of one model compensate for the deficiencies of another.

Conclusion

Disaster management models were reviewed in this study and thematic categorisation and analysis were used to achieve the aim and objectives of the study. Firstly, existing disaster management models were collected. Secondly, thematic analysis was used to extract and categorise the themes of each model. Lastly, the limitations of the models were highlighted.

In this study, conclusions can be derived from the findings. The first conclusion is that the models appear to be beneficial in certain cases and circumstances, but it is clear that they are not generally applicable and cannot be used in all types of disasters. Therein is the challenge. Disasters are not the same; each disaster is unique, with its own challenges and difficulties, requiring different techniques, methods, and management strategies. Hence, it is impossible to control disasters using strict and rigid instructions since they often come unexpectedly and do not follow regular patterns. Their management is also complicated since they are complex and can cause cascading disasters and crises.

This study also found five groups of disaster management models: logical models, causal models, integrated models, combinatorial models, and uncategorised models. However, each group or model has a feature that distinguishes it from others. It can also be concluded that Kimberly's four-phase disaster management model (2003) might not be suitable for use in developing countries because it requires large funding and a high level of experience and knowledge and is designed to deal with disasters that occur in health facilities.

This study also concluded that there is a strong correlation between many of the disaster management models. For example, all the models try to reduce the negative effects of a disaster. Additionally, many of the models are similar in that they are designed to deal with the four main phases of disasters: mitigation, preparedness, response, and recovery. Furthermore, each disaster management model is designed to attempt to address the weaknesses of previous models. Thus, another conclusion of the study was that new disaster management models are indispensable and should continue to be developed.

Furthermore, the study also concluded that disaster management models are created to guide practitioners, managers, and policymakers before, during, and after a disaster. The rationale for this is because the economic and social consequences of a disaster on a country may be severe; thus, avoiding disasters or, at the absolute least, responding quickly to and recovering from them, is extremely desired. However, the disaster management models analysed in this study have limitations and deficiencies and are inappropriate for all types of disasters.

Lastly, the authors of this study still need to do a lot of work in this field. They intend to expand on this study by doing further research into disaster management models, with the hope to encourage agencies and communities to manage disasters through these models.

Recommendations

Based on the above conclusions, the study came up with several recommendations. Firstly, it strongly recommends that all stakeholders use these models in disaster management. Secondly, it also recommends that researchers and scientists continue to develop old models and create new models for disaster management that can address the shortcomings and weaknesses of previous models. Thirdly, it further recommends that managers and practitioners combine more than one model when managing complex disasters. Finally, this study may be valuable and useful for governments, emergency agencies, academics, decision-makers, planners, managers, and practitioners who work in the field, and therefore, it is recommended that they use this study to explore and develop disaster management processes.

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Competing interests

The authors state that they have no financial or personal relationships that may have affected their decision to write this paper.

Disclaimer

The authors declare that the paper has not been previously published and is not under consideration elsewhere.

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