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A Structural Equation Model for Disaster Management and Business Continuity Performance in Organized Industrial Zones

Yasemin Ezgi Akyildiz ¹, Sevilay Demirkesen ¹, Mustafa Korkmaz ², Furkan Uysal ^{3,*}
and Emrah Tasdemir ³

¹ Department of Civil Engineering, Gebze Technical University, Gebze 41400, Kocaeli, Turkey; e.akyildiz@gtu.edu.tr (Y.E.A.); demirkesen@gtu.edu.tr (S.D.)

² Department of Civil Engineering, Igdir University, Igdir 76100, Igdir, Turkey; mustafa.korkmaz@igdir.edu.tr

³ College of Engineering and Technology, American University of the Middle East, Egaila 54200, Kuwait; emrah.tasdemir@aum.edu.kw

* Correspondence: furkan.uysal@aum.edu.kw

Abstract

Organized Industrial Zones (OIZs) are highly vulnerable to disasters and business continuity disruptions due to their intensive production activities, critical infrastructure connections, and the concentration of numerous businesses. However, studies that address disaster management and business continuity performance together in OIZs and quantitatively test the relationships among the variables affecting this performance are limited. This study aims to identify the key variables affecting this performance and to test the relationships among them within a holistic structural model. A conceptual framework based on the literature and a questionnaire were developed accordingly; data were collected from 81 participants with knowledge and experience in this field. The proposed model was analyzed using Structural Equation Modeling (SEM). The findings showed that management and leadership have a strong influence on mitigation and preparedness processes, and that disaster management performance can largely be shaped by response and recovery capacity. The results revealed that disaster management performance in OIZs is strengthened not only by mitigation and preparedness activities but also by transforming these activities into effective response and recovery capacity. This paper contributes to the literature by proposing an integrated model and provides practitioners with a framework for developing capacity for mitigation, preparation, coordination, response, and recovery.

Keywords: organized industrial zones; disaster management; business continuity; management and leadership; structural equation modeling



Academic Editor: Antonio Caggiano

Received: 23 June 2026

Revised: 19 July 2026

Accepted: 22 July 2026

Published: 26 July 2026

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1. Introduction

Disasters are defined as natural, technological, or human-induced event that causes physical, economic, and social losses for the whole or certain segments of society, halts or interrupts normal life and human activities, and for which the capacity of the affected society to cope is not sufficient [1]. They are commonly described as an occurrence that causes major damage and loss to human property or people themselves [2]. Disasters refer to an event that occurs suddenly as a result of the excessive effects of natural processes or technology, threatening life, well-being, material assets, and the environment, and potentially causing significant damage or loss of life [3,4]. These are multidimensional events that simultaneously create pressure on human safety, asset protection, and the sustainability

of business operations and pose serious risks to life safety, property, employment, and production continuity, particularly in OIZs where numerous businesses are concentrated. Therefore, to mitigate the impact of disasters in OIZs, there is a need for innovative, transparent, sustainable, and feasible approaches that encompass not only response capacity but also mitigation, preparedness, and recovery phases.

In response to this requirement, two primary approaches are available: disaster management, which seeks to minimize the effects of disasters on lives and property, and business continuity, which focuses on maintaining critical activities during disruptions and achieving rapid recovery [5]. Disaster management encompasses activities, plans, and system adjustments carried out before, during, and after disasters to prevent disasters and reduce their damage [6]. It is a multidimensional, interdisciplinary, stakeholder-based, dynamic, and complex management process that requires the use of all institutions, organizations, means, and resources of society in line with the strategic objectives and priorities [1]. Within this scope, the measures to be taken and the activities to be carried out should be planned, organized, coordinated, and effectively implemented [7]. Business continuity is an organization's ability to maintain its value-creating activities at a predetermined level and within a predetermined timeframe in the event of an interruption [5,8]. Disaster management and business continuity approaches in OIZs are often addressed separately; however, these two approaches should not be considered in isolation: measures ensuring life and property safety must be planned alongside the sustainability of operations. In-house Business Continuity Plans (BCPs) may not be sufficient on their own in large-scale disasters, and scenario-based planning at the zone level is necessary, especially in OIZs where shared infrastructure and dependencies are intense [9]. In this context, due to the need for shared infrastructure, logistics, and corporate coordination, management and continuity capacity must be addressed not only at the facility level but also at the zone level.

Disaster risk assessment has been extensively studied across different disaster types and engineering scenarios, with recent work utilizing data-driven, machine learning-based, spatial, and early warning-focused approaches. An integrated risk analysis framework combining kernel density estimation, maximum entropy, zonation, and various machine learning models was proposed to analyze urban flood risk in the case of Xi'an, China [10]. An index system was created using R cluster-factor analysis to assess regional flood risk, and its spatial and temporal variation was analyzed using a random forest model improved with beluga whale optimization [11]. A multi-index fusion early-warning model based on micro-seismic monitoring data and Sen's slope-trend analysis method was developed to predict rock mass instability in high and steep annular-slope mining areas [12]. While these studies demonstrate the development of different methodological approaches in disaster risk assessment, they primarily focus on technical risk estimation, early warning, and risk mapping processes specific to certain types of disasters.

The literature reveals that disaster management and business continuity performance is related to elements such as risk assessment and scenario-based planning [9], preparedness training or exercises with information sharing and stakeholder participation [13], resilience- and preparedness-focused disaster management approaches [14], and multi-scale response requirements and interagency coordination [15]. However, the interaction among the variables that determine performance in the OIZ ecosystem and how this interaction shapes overall performance has not been sufficiently explained quantitatively in the literature. The model developed in this study aims to identify the variables and relationships that explain integrated performance at the zone level, accounting for interactions among the variables.

The study seeks to answer the following research questions: (i) What are the key variables that determine disaster management and business continuity performance in OIZs? (ii) How and to what extent do these variables influence each other? (iii) To what extent do these relationships explain the integrated performance at the zone level? Accordingly, the main purpose of the paper is to develop an integrated disaster management–business continuity framework for OIZs and to quantitatively test the relationships among the variables included in this framework. Towards this purpose: (1) variables determining performance are identified, (2) the validity and reliability of the proposed measurement structure are verified, (3) structural relationships among variables are tested, and (4) applicable roadmaps at the zone level are proposed based on the findings.

In this regard, the research examines the hypothesized relationships among the variables that determine disaster management and business continuity performance in OIZs. The paper aims not only to identify the fundamental variables but also to reveal quantitatively how these variables affect one another and to what extent. SEM was used to test the validity and reliability of the proposed measurement structure and the structural relationships. Furthermore, a questionnaire was designed based on the developed framework and administered to professionals working in the OIZ ecosystem to create a dataset for empirically testing the model. The study is expected to raise awareness of disasters and emergencies in OIZs and contribute to the development of DMP and BCP within a practical framework. It also quantitatively demonstrates the integrated performance at the zone level and the relationships among the variables that determine this performance. The paper proposes concrete roadmaps to reduce loss of life and property while preventing potential production and operational disruptions. Additionally, the proposed approach supports nationwide disaster management and business continuity efforts by providing a method adaptable across OIZs.

The paper begins with Section 2, which presents the study's context and rationale, based on the literature. This is followed by Section 3, which explains the conceptual framework, variables, and hypotheses. Section 4 introduces the data collection process and methodological steps; the data analysis and findings section reports the results of the analysis. The study concludes with Section 6, in which the findings are evaluated, and Section 7, in which the general conclusions are presented.

2. Research Background

OIZs are defined as clusters of enterprises that produce in cooperation with one another in standardized facility buildings, located in an area developed and segmented into parcels based on a thorough plan, and benefiting from common infrastructure services such as roads, transportation, and public utilities [16,17]. In OIZs, where numerous businesses operate through shared infrastructure, logistics systems, and corporate structures, addressing disaster management and business continuity solely at the level of individual enterprises is insufficient. This is because a disaster occurring at the zone level can cause widespread disruptions in production, employment, and supply chains through a chain reaction.

Considering the establishment and development stages of OIZs, it is clear that they play a crucial role in stimulating investments, increasing job opportunities, supporting local and regional development, and facilitating the transition to regular industrialization and urbanization [18]. Since disasters can cause serious physical, economic, social, cultural, and environmental losses in OIZs, it is necessary to accurately identify hazards and take the necessary precautions before they occur to ensure that industrial facilities can sustain their activities, continue to contribute to the national economy, create a labor force, and minimize

all other damages [19]. Therefore, beyond facility-level plans, disaster management and business continuity approaches must also be addressed at the zone level.

Disaster management is a collaborative effort by society aimed at preventing disasters, reducing their impacts, and responding effectively when they occur, with the ultimate goal of creating safer living environments for affected communities [1]. It is an interdisciplinary field that brings together practitioners and academics, volunteers and professionals, non-governmental organizations, government agencies, and international organizations to coordinate efforts to save lives and reduce losses under challenging conditions [20]. The primary aim is to minimize the social and physical impacts of large-scale events by reducing loss of life and damage to infrastructure and property [21–23]. Key objectives include effective preparedness, rapid response and recovery, efficient resource allocation, timely repair of damage and return to full functionality, and minimizing the negative impacts on society [24]. Disaster management, therefore, encompasses two sets of activities: mitigation and preparedness before a disaster, as part of disaster risk management, and response and recovery afterward, as part of disaster crisis management [24–27]. These four phases—mitigation, preparedness, response, and recovery—constitute the widely recognized disaster management cycle [3,24–35]. Previous studies demonstrate that the stages of mitigation, preparedness, response, and recovery provide an important framework for disaster management [19,36–46].

This conceptual framework becomes applicable once disaster management processes are transformed into plans [47]. Disaster Management Plan (DMP) is a comprehensive plan document that identifies hazards in advance to reduce risks and prepare for disasters before they strike [48–50]. It organizes the distribution of duties and authorities, coordination, and communication methods to ensure timely assistance during a disaster; and includes training, drills, and regular testing. Emergency Action Plan (EAP) involves organizing and carrying out necessary actions and procedures quickly and effectively to protect human life, property, and other activities from the impacts of unusual events with minimal loss and damage before and during the events [1]. EAP aims to increase people's risk awareness in the face of disasters and emergencies, ensure they respond appropriately during an incident, and incorporate various practices to enhance safety by preventing hazardous behaviors [51]. Studies highlighting the importance of DMP and EAP applications in industrial facilities include the formulation of plans based on risk analysis of leakage scenarios in chemical process industries [48] and the development of evacuation plans in chemical plants using transportation network simulations [52]. DMPs are not prepared at the national and zone levels and remain specific to individual facilities, and these plans should be created in detail [53]. These findings indicate that while DMP and EAP applications at the facility level are important, they alone may be limited in meeting the planning needs in complex industrial systems with high levels of shared infrastructure, logistics, and institutional dependencies, such as OIZs, and therefore need to be extended beyond the facility level to the zone level [9].

The continuity of business operations should be considered as a concept that complements disaster management approaches to maintain critical processes at an acceptable level and ensure rapid recovery. Business continuity is the ability of an organization to sustain the delivery of products and services at an acceptable rate and in a predetermined capacity during a disruption [8]. A single standard plan is not recommended for business continuity; each organization should develop a detailed BCP tailored to its specific circumstances. As the business environment and dependence on technology change, BCP should be dynamic and adapt to these changes [54]. BCP is documented guidance that helps an organization respond to disruption and maintain, recover, and restore the delivery of products and services in line with business continuity objectives [8]. BCP enables

organizations to be prepared for risks that may cause business interruptions or stoppages that affect the continuity of their activities, to respond to events in a pre-planned manner, to identify critical activity processes, to overcome crises easily, and to make organizations operational [55].

The literature review shows that studies are mainly conducted on small and medium-sized enterprises [56–62] and companies in various industrial sectors, including manufacturing [63], oil and gas facilities [64], petrochemical complexes [65,66], the energy sector [67], and the electrical industry [64]. However, in the context of OIZ, the coexistence of different sectors, common infrastructure systems, and inter-company interdependencies underscores the importance of considering disaster management and business continuity not only through internal plans but also through inter-stakeholder coordination and information sharing at the zone level. In fact, a study examining information dependencies among stakeholders in Thailand's industrial zones following the 2011 flood disaster demonstrated that stakeholder-focused coordination and information sharing are critical for business continuity at the zone level [68]. Nevertheless, a structured keyword search in Scopus and Web of Science confirmed that studies specific to OIZs, where shared infrastructure, logistics networks, and interdependence are decisive, remain limited [9,13,68–77].

Disaster management and business continuity literature show that performance in these areas should not be evaluated using a single output indicator; it is more appropriate to treat it as a multidimensional structure [8,78]. In this context, existing studies emphasize that interrelated dimensions such as risk and scenario-based planning [1,79], impact analysis [5,80], life safety and the functionality of critical community lifelines [81,82], early recovery and return to normal [83,84], and management capacity [85,86] shape performance. In line with this perspective, the variables used in this study were derived from these recurring dimensions in the literature, and the theoretical basis of the model was strengthened within this framework.

Disaster management and business continuity performance capacity in OIZs exhibits a multidimensional structure [8,78]. Therefore, there is a significant need to integrate the variables representing this capacity into a holistic model and to quantitatively test the relationships among them. To address this gap in the literature, this study proposes an integrated structural model that combines variables representing disaster management and business continuity performance of OIZs and aims to test the relationships among these variables empirically using SEM. Therefore, the paper aims not only to determine which variables are important but also to present an evidence-based framework at the OIZ level by quantitatively revealing the interactions among these variables in terms of their direction and magnitude.

3. Research Framework

The framework proposed in this study encompasses variables related to disaster management and business continuity performance. Based on a comprehensive literature review of studies on disaster management and business continuity performance, four latent variables and 19 observed variables were derived. All these latent and observed variables are identified and explained below. The conceptual framework, along with the developed valid indicators, is presented in Figure 1.

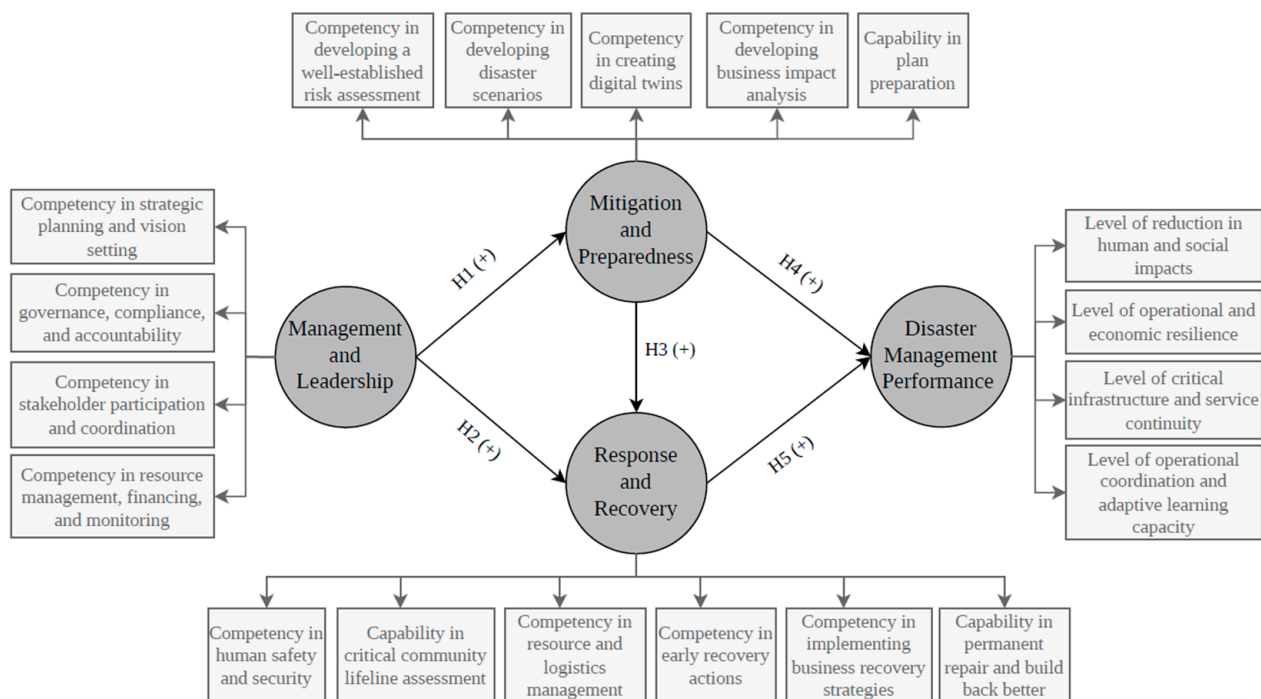


Figure 1. Conceptual framework.

3.1. Mitigation and Preparedness (Pre-Disaster)

The mitigation phase encompasses all actions designed to reduce, minimize, or eliminate the likelihood, impact, and consequences of future hazards in a manner that provides long-term benefits [24–26,87,88]. Preparedness is a stage that comes into play when an emergency or disaster is anticipated, and measures are taken to mitigate its effects [24–26,87,88]. The components of mitigation and preparedness are determined as ‘developing a well-established risk assessment’, ‘developing disaster scenarios’, ‘creating digital twins’, ‘developing a business impact analysis’, and ‘plan preparation’.

- **Competency in developing a well-established risk assessment:** The process of determining the level of risk by systematically, iteratively, and collaboratively assessing the potential hazards that may occur at a specific time and in a specific area, the conditions of exposure and vulnerability to these hazards, using the best available data [1,26,27,31,79,80,87–99].
- **Competency in developing disaster scenarios:** A scenario based on the assumption that a hazard occurs, describing the development process of this event, the affected elements, conditions, and possible outcomes within a narrative sequence of events [1,5,92,100,101].
- **Competency in creating digital twins:** A dynamic digital and virtual copy or representation of a real-world object, product, or process that reflects its state, fed by real-time and historical data [102–111].
- **Competency in developing business impact analysis:** The process of systematically determining the effects of disruptions in critical activities that provide the organization’s products and services over time, the limits of acceptability of these effects, and the priorities, timeframes, and resources required to sustain these activities at a minimum level [5,8,79,80,112–116].
- **Capability in plan preparation:** The ability to develop and implement procedural guides and written plans for business continuity [4,5,8,55,117–121] and emergency action [1,4,5,25,51,122–126]. These include not only written plans but also the identification of emergency response teams and members, roles, chains of command, and com-

munication channels; the establishment of a coordinated response structure [127–131], the testing of performance through training and drills, and the implementation of continuous improvement activities based on the findings [8,80,132–134].

3.2. Response and Recovery (Post-Disaster)

The response phase involves preserving lives, maintaining the stability of community lifelines, protecting property and the environment, and meeting basic human needs after an event [81,87,88]. The recovery stage involves helping affected communities and organizations restore and revitalize themselves [8,81,87,88]. The components of response and recovery are specified as ‘human safety and security’, ‘critical community lifeline assessment’, ‘resource and logistics management’, ‘developing early recovery actions’, ‘implementing business recovery strategies’, and ‘permanent repair and build back better’.

- Competency in human safety and security (communication, search and rescue, evacuation, firefighting, access control): The process of coordinating activities such as communication, search and rescue, evacuation, firefighting, and access control, carried out under a common structure by law enforcement agencies and other public safety units, to ensure the safety of employees, the public, and response teams during an incident [81,135–137].
- Capability in critical community lifeline assessment (food, water, shelter, medical, energy, communication, transportation, hazardous material management): The assessment of the status and functionality of critical community lifelines—such as energy (electricity, natural gas), transportation, water–wastewater, communications, and healthcare services—that must sustain functions and be rapidly stabilized and restored after an incident [81,82,138–140].
- Competency in resource and logistics management (requirements, allocation, deployment): The process of identifying and planning the resources required—such as personnel, equipment, facilities, materials, information technology, and financial resources—following an incident [5,81,141–151]. It ensures that these resources are allocated and distributed to affected areas in a timely, cost-effective, and equitable manner by coordinating the procurement, transportation, storage, and distribution processes, in line with the organization’s strategies, critical processes, and operational priorities.
- Competency in developing early recovery actions: A multidimensional early recovery process that begins while humanitarian response efforts continue after an incident, aiming to rapidly meet the basic needs of people and communities—such as shelter, livelihoods, basic services, and security—while also laying the groundwork for long-term, sustainable recovery and development [83,152–154].
- Competency in implementing business recovery strategies: Ensuring that the business and its related ecosystem maintain critical operations and return to normal activity levels by implementing predefined plans and procedures following an incident, quickly restoring disrupted activities to a functional state, and swiftly resolving technology and system disruptions [5,8,41,155–160].
- Capability in permanent repair and build back better: Following an incident, restoring damaged structures and infrastructure not only to their previous state but also improving and rebuilding them to be safer, more sustainable, and more resilient, thereby reducing risks [78,88,161–164] and swiftly and safely returning basic living and working conditions, livelihoods, work/production activities, infrastructure, and services to their pre-event normal functioning [84,165,166].

3.3. Management and Leadership

Effective governance largely relies on leadership taking a central role as a phenomenon related to management [86,167]. Leadership and management can be defined as establishing policies and implementing programs aimed at reducing vulnerability, minimizing loss of life and property, protecting the environment, and strengthening coordination among various organizations, encompassing strategic responsibilities that include all actions related to the stages of disaster management [85,86]. The components of management and leadership are identified as competency in ‘strategic planning and vision setting’, ‘governance, compliance, and accountability’, ‘stakeholder participation and coordination’, and ‘resource management, financing, and monitoring’.

- Competency in strategic planning and vision setting: The ability to define the desired future state and corporate vision and mission, translate this into strategies, policies, and plans aligned with risk mitigation and business continuity objectives, and steer the achievement of these objectives [8,78,80,168–172].
- Competency in governance, compliance, and accountability: The capacity for governance where decision-making authorities are clearly defined, compliance with legal and institutional requirements is ensured, and all stakeholders are accountable in terms of their duties, responsibilities, and outcomes [8,78,80,172–176].
- Competency in stakeholder participation and coordination: The ability to ensure the effective participation of all relevant stakeholders in the process, clarify roles and responsibilities, institutionalize communication and information sharing, and sustain inter-institutional cooperation and coordination through networks and mechanisms—such as platforms and coordination structures [8,73,78,80,81,172,177–180].
- Competency in resource management, financing, and monitoring: The capacity to ensure the continuous review of processes by planning, allocating, and effectively utilizing the necessary resources; planning and managing financial processes; and monitoring, measuring, and assessing operations and performance [8,78,80,172,181,182].

3.4. Disaster Management Performance

Disaster management is a collective struggle process that should be carried out by society to prevent disasters and reduce their damages, to respond to the events resulting in disasters in a timely, rapid, and effective manner, and to create a safer and improved new living environment for the communities affected by disasters [1]. The components of disaster management performance are identified as the level of ‘reduction in human and social impacts’, ‘operational and economic resilience’, ‘critical infrastructure and service continuity’, and ‘operational coordination and adaptive learning capacity’.

- Level of reduction in human and social impacts: The level of reduction in human impacts—such as death, injury, and illness, displacement, and loss of shelter—among the population directly or indirectly affected by the event, as well as the social impacts on the health and well-being, psychosocial status, and continuity of daily life of individuals and communities [78,92,183–186].
- Level of operational and economic resilience: The organization’s capacity to absorb the disruption and continue operations at an acceptable level, recover within the framework of recovery time objective and maximum tolerable period of disruption targets, return to normal capacity, and limit both direct (physical asset damage or destruction of facilities) and indirect (changes in normal production, sales, and service flow) economic losses incurred during this process [5,8,78,81,92,187–190].
- Level of critical infrastructure and service continuity: The level at which critical infrastructure and essential services—such as electricity, water, transportation, communications/information systems, and healthcare—that are vital to the social and economic

functioning of society can continue to operate or be rapidly restored during and after an incident, along with the capacity to minimize the duration, severity, cascading effects, and socioeconomic impacts of service disruptions [5,8,78,81,88,92,191–196].

- Level of operational coordination and adaptive learning capacity: The ability to manage the tasks and responsibilities of multiple response actors in an integrated manner within a common hierarchy and coordination structure during an incident, and to continuously improve processes to prevent similar incidents and enhance security by producing lessons learned through post-event analysis after the incident [5,8,78,80,81,192,197,198].

3.5. Hypotheses

The following hypotheses were developed based on the strong evidence provided by the literature, considering the structural relationships among key variables affecting disaster management and business continuity performance.

Previous studies provide empirical support for the relationship between management and leadership and mitigation and preparedness. Studies indicate that management and strategic leadership contribute to the mitigation phase by anticipating crises and mitigating their impacts [199,200], and encouraging stakeholders to analyze and manage risk factors [201]. Leaders with disaster management knowledge are found to positively influence awareness, behavior, and preparedness planning [202]; leadership attitudes, a strategic management approach, and management commitment are also determined to be strongly and significantly associated with emergency preparedness [201,203,204]. These considerations lead to the first hypothesis.

H1 (+). *“Management and leadership” has a positive effect on “mitigation and preparedness”.*

Empirical studies also support the role of management and leadership in response and recovery processes. Research shows that management and leadership play a critical role in the disaster response process [201] in terms of coordinating and executing tasks [205,206], protecting individuals from harm, and ensuring that response activities continue without interruption [207]. Furthermore, the importance of leaders performing at the highest level for successful, integrated, and effective management—particularly during the post-disaster rescue, recovery, and reconstruction process—is emphasized [201,208]. These considerations lead to the second hypothesis.

H2 (+). *“Management and leadership” has a positive effect on “response and recovery”.*

The mitigation and preparedness phases occur before the event, while the response and recovery phases occur after the event [25,27]. Earlier studies emphasize that mitigation and preparedness phases are closely linked [209,210] and play a critical role in preventing disasters when implemented together [211]. Similarly, response and recovery phases are described as sequential, but often overlapping processes; activities initiated during the response phase shape the long-term recovery process [212–214]. Developing the preparedness phase supports effective response and recovery processes [42]. Post-disaster recovery plans, developed as part of the pre-disaster process, make recovery efforts more effective, organized, and feasible [215]. Decisions made during the risk reduction and preparedness phases significantly influence the duration and effectiveness of the response and recovery phases [216]. These considerations lead to the third hypothesis.

H3 (+). *“Mitigation and preparedness” has a positive effect on “response and recovery”.*

There is an emphasis that each stage of emergency management—mitigation, preparedness, response, and recovery—has its own objectives and outcomes, and that the level of success and effectiveness achieved in each stage reflects the overall performance of emergency management activities [37].

Mitigation reduces disaster-related losses by reducing vulnerability or decreasing the magnitude and frequency of the hazard [36]. It also increases the adaptability of businesses, reduces losses, and facilitates post-disaster recovery [39,41]. Being prepared and equipped is critical for strengthening resilience against multiple disasters [19]. The level of preparedness is associated with more effective response, fewer injuries, casualties, and economic impacts, efficient resource use, rapid resumption of operations, and strengthened recovery processes [42,44,45]. These considerations lead to the fourth hypothesis.

H4 (+). *“Mitigation and preparedness” has a positive effect on “disaster management performance”.*

Delayed response can lead to performance losses after a disaster [38], while rapid response is critical in terms of maintaining operational capacity, reducing loss of life, and enabling effective crisis communication [43,46]. Companies with post-disaster recovery plans are more effective in restarting operations and maintaining production [40]. Effective recovery strategies should be prioritized to strengthen resilience and ensure business continuity [41]. These considerations lead to the fifth hypothesis.

H5 (+). *“Response and recovery” has a positive effect on “disaster management performance”.*

4. Research Methodology

4.1. Questionnaire Design

An online questionnaire was designed and implemented to collect standardized expert evaluations suitable for quantitatively testing the relationships among the proposed variables (See Appendix A). The questionnaire targeted professionals working in the fields of disaster management and business continuity. The questionnaire consists of three main parts: (i) general information about the respondent; (ii) general information about the company; (iii) variables related to disaster management and business continuity performance. The respondents were asked to evaluate their disaster management and business continuity practices based on the listed variables using a 1–5 point Likert scale (1: very low, 2: low, 3: medium, 4: high, 5: very high). To improve content validity and clarity, the draft questionnaire was reviewed by an expert panel comprising three academics specializing in disaster management and construction management and three practitioners with professional experience in disaster management and business continuity within Organized Industrial Zones (OIZs). Based on their feedback, some revisions were made to improve wording, eliminate ambiguities, and ensure that the items accurately reflected the intended constructs before the questionnaire was administered.

4.2. Data Collection

The data collection process was carried out by distributing the prepared online questionnaire to the target participants via digital channels. The questionnaire was sent to professionals engaged in disaster management and business continuity to collect data from experts with relevant knowledge and experience. For this reason, since the study was based on expert assessments rather than random opinions gathered from the general population, a purposive sampling method was employed, and 81 valid responses were obtained for the SEM analysis. The final structural model included 56 freely estimated parameters, corresponding to a sample-to-parameter ratio of approximately 1.45:1. Sample size in SEM should not be evaluated solely according to fixed general rules, as the required sample

size may vary significantly depending on the model, ranging from 30 to 460 cases [217]. While the sample size is relatively limited, it was considered reasonable within the scope of this exploratory SEM study because data were obtained through purposive sampling from experienced professionals, the model was theory-based, and the analyses produced acceptable reliability, validity, and model fit results.

The general characteristics of the respondents and the companies they represent are presented in Table 1.

Table 1. Demographic characteristics of respondents and companies.

Category	Sub-Category	Percentage
Level of Education	Bachelor's Degree	50.62%
	Master's Degree	34.57%
	Doctorate	12.35%
Field of Operation	Engineering	43.21%
	Construction	32.10%
	Architecture	12.35%
Experience in the Field of Operation	10–15 years	28.40%
	15–20 years	39.51%
	20+ years	20.99%
Position at Current Company	Engineer	32.10%
	Manager	20.99%
	Director	13.58%
Years at Current Company	10–15 years	25.93%
	15–20 years	35.80%
	20+ years	18.52%
Company Type	Public Institution	46.91%
	Private Company	37.04%
	Multinational Corporation	16.05%
Expertise Areas of Company *	Building	28.57%
	Industrial	20.30%
	Transportation-Logistics	17.29%
Company Years in Operation	20–30 years	24.69%
	30–40 years	30.86%
	40–50 years	16.05%
	50+ years	12.35%
Company Annual Turnover	50–250 million TL	37.04%
	250 million–1 billion TL	20.99%
	More than 1 billion TL	14.81%
Company Employees	150–200	16.05%
	200–250	16.05%
	250+	41.98%
Disaster Experience	Earthquake	80.25%
	Fire	34.57%
	Frost and Icing	16.05%
	Flood	7.41%
	Chemical Leak	2.47%

Table 1. *Cont.*

Category	Sub-Category	Percentage
Trainings	Disaster Management	39.51%
	Business Continuity	2.47%
	Both	41.98%
	Neither	16.05%
Existence of Plans	EAP	71.60%
	BCP	43.21%
Role in Plans	Main Responsible	12.35%
	Member of a Related Team	27.16%
	Contributing Staff	43.21%
	No Specific Role	17.28%

* Multiple responses were allowed; percentages were calculated based on the total number of responses to this item.

4.3. Data Analysis

Analysis of Moment Structures (AMOS), a SEM tool, was used as a software package in the analysis of data collected from 81 questionnaires. SEM is a statistical method that utilizes a multivariate approach, employing a confirmatory technique to evaluate a structural theory related to a specific phenomenon [218]. Hypotheses among observed and latent variables are also tested by SEM [219–222].

The main reason SEM was preferred in this study is that it provides strong results in terms of validity and reliability while also allowing the analysis of complex relationships. SEM enables more robust assessments at the construct level by allowing the simultaneous measurement of each construct with multiple indicator variables and produces more unbiased estimates by including measurement error in the model. Moreover, SEM allows for the testing of numerous hypotheses and relational constructs together within the same model [218].

5. Results

The questionnaire collected data on perceived levels of competency and performance for each component. The responses were examined for missing data, inconsistent responses, and potential outliers; since none were found, all the responses were included in the final dataset and used in statistical analysis. Univariate normality tests revealed that the data are normally distributed [223–225]. Correlation matrices were calculated for all the constructs. The fact that the inter-item correlation values are in the range of 0.30–0.90 and the item-total correlation values are in the range of 0.50–0.90 shows that the items are compatible with the scale and sufficient in terms of internal consistency [226]. Finally, correlations between variables remaining below 0.90 indicate the absence of multicollinearity [227–229]. Since the data were collected from the same respondents using a single questionnaire at one point in time, the potential influence of common method variance (CMV) was assessed. Harman’s single-factor test was performed through an unrotated exploratory factor analysis (EFA) using SPSS Statistics 29.0. The results showed that the first unrotated factor explained 59.477% of the total variance. As this value exceeds the commonly accepted threshold of 50%, Harman’s single-factor test suggests that the possibility of common method variance cannot be completely ruled out. Nevertheless, Harman’s test is regarded as a preliminary diagnostic rather than a definitive assessment of CMV. Therefore, the findings of this study shall be interpreted with appropriate caution, and future research is encouraged to utilize further robust techniques, such as marker variables, unmeasured latent method factor approaches, or multi-source and longitudinal data collection designs, to further mitigate potential method bias.

Figure 2 presents the ratings for each component. According to Figure 2, it can be seen that all the components are rated around 3.0–3.5, except MIT3, and Cronbach's alpha value is calculated as 0.96.

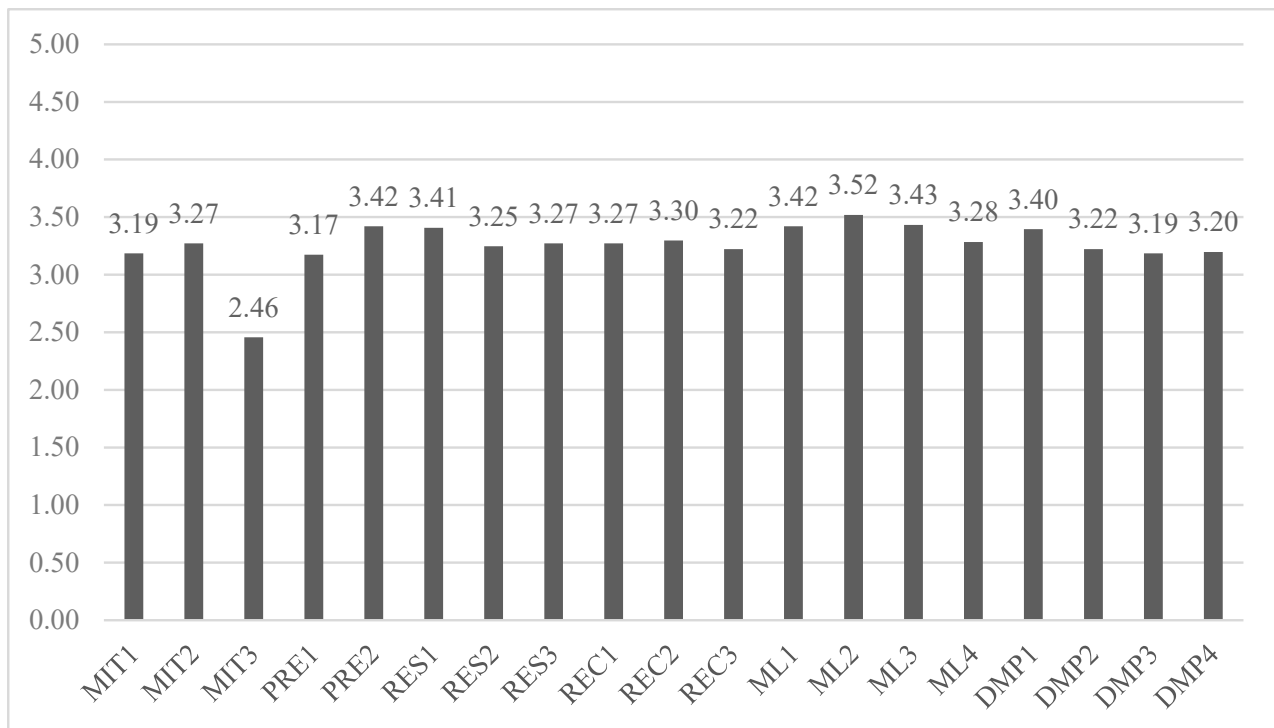


Figure 2. Ratings for components.

Since there is no formal statistical test for content validity, this study relied on the researcher's judgment and insight [230]. A comprehensive literature review was conducted to obtain the indicators of each construct.

Construct validity involves convergent, discriminant, and nomological validity; reliability is also a necessary condition for validity [231,232]. Accordingly, the concepts of convergent validity, discriminant validity, and reliability are explained as follows [231,232]: Convergent validity indicates how closely two measures of the same construct are related. Discriminant validity shows how different two constructs are. Reliability refers to the consistency with which a variable or a set of variables measures the intended construct. Convergent validity is assessed by examining factor loadings, average variance extracted, and construct reliability [232]. Discriminant validity is assessed by estimating the true correlation between two constructs using the heterotrait–monotrait ratio [232].

Evaluating factor loadings in confirmatory factor analysis enables the removal of statistically insignificant indicators from the model, thereby improving internal reliability and model fit indices [218]. Table 2 presents the factor loadings for the model's indicator variables.

Since the sample size was 81, the evaluation of factor loadings was based on a sample-size-dependent threshold. The minimum acceptable factor loading was calculated as 0.613 based on the recommended criteria [232]. The standardized factor loadings of all the indicator variables exceed this value; therefore, all the factor loadings are considered acceptable.

Table 2. Model variables.

Latent Variables	Indicator Code	Indicator Name	Factor Loadings
MIT-PRE (Mitigation and Preparedness)	MIT1	Developing risk assessment	0.719
	MIT2	Developing disaster scenarios	0.755
	MIT3	Creating digital twins	0.669
	PRE1	Developing business impact analysis	0.661
	PRE2	Preparing plan	0.873
RES-REC (Response and Recovery)	RES1	Human safety and security	0.792
	RES2	Critical community lifeline assessment	0.856
	RES3	Resource and logistics management	0.910
	REC1	Early recovery actions	0.800
	REC2	Implementing business recovery strategies	0.843
	REC3	Permanent repair and build back better	0.715
ML (Management and Leadership)	ML1	Strategic planning and vision setting	0.808
	ML2	Governance, compliance, and accountability	0.845
	ML3	Stakeholder participation and coordination	0.892
	ML4	Resource management, financing, and monitoring	0.842
DMP (Disaster Management Performance)	DMP1	Reduction in human and social impacts	0.741
	DMP2	Operational and economic resilience	0.927
	DMP3	Critical infrastructure and service continuity	0.959
	DMP4	Operational coordination and adaptive learning capacity	0.903

Table 3 represents the reliability values and fit indices for the model. Reliability expresses the extent to which a measurement variable represents the relevant construct when error terms are excluded, and reliability was assessed by Cronbach's ' α ' coefficient in this study. The reliability is satisfied when Cronbach's ' α ' coefficient exceeds 0.7 [233–236]. Given the results of the reliability analysis, it is concluded that the model is consistent.

Table 3. Reliability and fit indices.

Index	Recommended Value	Model Value
Cronbach's Alpha	>0.70	0.960
χ^2/df	<5.00	1.331
IFI	>0.90	0.970
TLI	>0.90	0.961
CFI	>0.90	0.970
RMSEA	<0.10	0.064

The Chi-square test was applied to evaluate model fit. This test is used to determine the significant difference between actual and predicted matrices in SEM; a lower χ^2 value indicates a better fit [237]. In AMOS, the χ^2/df ratio is used for model fit [218]. A χ^2/df ratio below 5.00 is acceptable [238].

Incremental fit index (IFI) [239], Tucker–Lewis index (TLI) [240], and Comparative fit index (CFI) [241] evaluate the fit of the proposed model by comparing it to the null or independent model [242]. The values of these indices range from 0 to 1.0, with values closer to 1.0 indicating a good fit. The Root Mean Square Error of Approximation (RMSEA) [243] is an absolute fit index that evaluates the extent to which the default model approaches the perfect model [244]. For RMSEA, a cut-off value less than 0.10 indicates acceptable fit [221].

Although Mardia's multivariate kurtosis statistic [245] showed deviation from multivariate normality, overall model fit was further evaluated using the Bollen-Stine bootstrap procedure [246], and the result provided additional support for the adequacy of model fit.

In the convergent validity assessment, the following criteria [232] were used: a Composite or Construct Reliability (CR) value of 0.70 or higher and an Average Variance Extracted (AVE) value of 0.50 or higher. All the latent variables meet the threshold values, thus satisfying the convergent validity criteria, as shown in Table 4.

Table 4. Convergent validity.

Indicator Variables	Latent Variables	CR	AVE
MIT1 MIT2 MIT3 PRE1 PRE2	MIT-PRE	0.856	0.547
RES1 RES2 RES3 REC1 REC2 REC3	RES-REC	0.925	0.675
ML1 ML2 ML3 ML4	ML	0.910	0.718
DMP1 DMP2 DMP3 DMP4	DMP	0.936	0.786

Table 5 shows that all the Heterotrait–Monotrait (HTMT) ratio values are equal to or less than 0.85, satisfying the suggested threshold [232]; therefore, discriminant validity is confirmed.

Table 5. HTMT ratio values.

Latent Variables	MIT-PRE	RES-REC	ML	DMP
MIT-PRE				
RES-REC	0.599			
ML	0.697	0.651		
DMP	0.586	0.779	0.726	

SEM analysis was used to test hypotheses among the validated constructs. In this context, the relationships between management and leadership, mitigation and preparedness, response and recovery, and disaster management performance were examined. The arrows indicate the direction of influence between the constructs, as shown in Figure 1, and H1–H5 represent the hypotheses being tested. The model assumes that management and leadership affect mitigation and preparedness, and response and recovery; and that these constructs, in turn, affect disaster management performance.

Figure 3 presents the hypothesized relationships with path coefficients. In interpreting the path coefficients, the suggested criteria [247] were taken into consideration; 0.10–0.30 was considered a weak association, 0.30–0.50 a moderate association, and 0.50–1.00 a strong

association. According to the findings, management and leadership have a strong impact on mitigation and preparedness (0.846), but a moderate impact on response and recovery (0.382). The impact of mitigation and preparedness on response and recovery is moderate (0.409). On disaster management performance, the impact of mitigation and preparedness is weak (0.217), while the impact of response and recovery is strong (0.701).

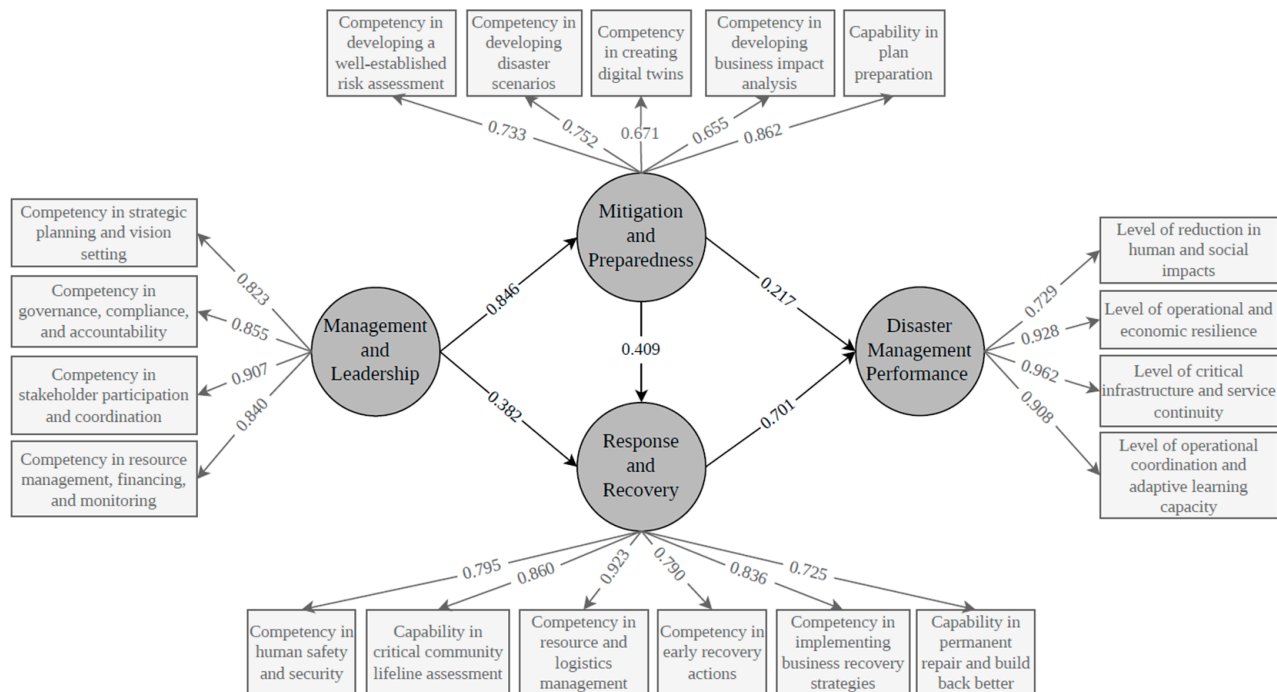


Figure 3. Conceptual framework with path coefficients.

The statistical significance of the hypothesized structural relationships was evaluated using critical ratios and p -values. Parameter estimates with absolute critical ratios greater than 1.96 and p -values less than 0.05 were considered statistically different from zero [231,232]. A hypothesis was considered supported when the corresponding structural path was statistically significant, and the sign of the coefficient was consistent with the hypothesized direction. As shown in Table 6, the critical ratios for all the structural paths are above 1.96, and the p -values are below 0.05. Furthermore, all the path coefficients were positive and consistent with the hypothesized directions, and none of the 95% confidence intervals included zero. Therefore, all the hypotheses are supported.

Table 6. Hypothesis testing results.

Hypothesis	Path	Standard Error	Critical Ratio	p -Value	Result
H1 (+)	ML → MIT-PRE	0.119	6.518	<0.001	Supported
H2 (+)	ML → RES-REC	0.187	1.981	0.048	Supported
H3 (+)	MIT-PRE → RES-REC	0.209	2.070	0.038	Supported
H4 (+)	MIT-PRE → DMP	0.135	1.971	0.049	Supported
H5 (+)	RES-REC → DMP	0.151	5.397	<0.001	Supported

The squared multiple correlations (R^2) were examined to assess the explanatory power of the structural model. The model explained 71.5% of the variance in mitigation and preparedness ($R^2 = 0.715$), 57.8% of the variance in response and recovery ($R^2 = 0.578$), and 76.1% of the variance in disaster management performance ($R^2 = 0.761$). These re-

sults demonstrate that the proposed structural model explains a significant portion of the variance in all three endogenous constructs [232].

6. Discussion

The findings indicate that disaster management performance is strongly influenced, particularly by the response and recovery construct. This situation reveals that human safety, lifeline assessment, resource and logistics management, early recovery, business recovery, and permanent repair capacity are decisive factors in performance. The importance of response in reducing casualties and preserving operational capacity [43,46], and the emphasis on the role of recovery in restarting operations and maintaining production [40], promote this finding. The strong impact of management and leadership on mitigation and preparedness can be emphasized. This result shows that strategic planning, governance, stakeholder engagement, and monitoring play an important role in strengthening pre-disaster capacity. The emphasis on leadership's role in supporting risk mitigation [201] and on its consideration as a fundamental part of emergency management during the preparedness phase [203] supports this result.

The moderate impact of mitigation and preparedness dimensions on response and recovery indicates that pre-disaster activities support post-disaster processes [248]; however, these processes cannot be explained solely by pre-disaster activities. The moderate impact of management and leadership on response and recovery, compared to their stronger impact on mitigation and preparedness, suggests that management and leadership are more closely linked to pre-disaster processes. Although mitigation and preparedness have a significant direct impact on disaster management performance, the relatively stronger impact of response and recovery suggests that overall performance is shaped more by post-disaster capacity. This finding suggests that the contribution of mitigation and preparedness to performance may become more effective when pre-disaster processes are converted into post-disaster capabilities. This is also consistent with emphasis [78] on the need to strengthen preparedness for effective response and recovery.

Among the indicators of mitigation and preparedness, plan preparation had the highest factor loading, indicating that it is the indicator that most strongly represents this construct. This result is consistent with studies emphasizing planning-related capacities as key components of the pre-disaster phase [249,250]. On the other hand, 'creating digital twins', which received a relatively lower score compared to others, suggests that the adoption of digital twin applications in OIZs may still be in an early stage relative to other applications. This situation may be related to implementation barriers, such as system integration and interoperability issues, real-time communication and data processing requirements, and cost-related factors [109]. Therefore, digital twin applications can be considered a promising but still developing area for strengthening mitigation and preparedness capabilities in OIZs.

Resource and logistics management had the highest factor loading within the response and recovery construct, indicating that it is particularly representative of this construct. This result is consistent with previous studies emphasizing effective resource allocation and logistics coordination as essential elements of the post-disaster phase [144,248,251]. The highest factor loading of the 'stakeholder participation and coordination' indicator demonstrates that this variable strongly represents the management and leadership construct. The studies supported the idea that stakeholder coordination is an essential component of management and leadership [252,253]. The highest factor loading of the 'critical infrastructure and service continuity' indicator indicates that this variable strongly represents the disaster management performance construct. The papers reinforced the notion that

critical infrastructure and service continuity are vital aspects of disaster management performance [254,255].

The findings offer important implications for academia, businesses, and public administrations. For academia, the study contributes to the literature on disaster management and business continuity by demonstrating that performance in OIZs should be understood as a multidimensional and interconnected construct. For businesses, the results show that disaster management and business continuity should go beyond written plans and facility-level preparedness by strengthening risk assessment, scenario development, business impact analysis, logistics coordination, and business recovery strategies. For public administrations, the findings highlight the need for region-level policies that support coordinated planning, stakeholder engagement, resource allocation, critical infrastructure continuity, and recovery-focused disaster management in OIZs.

Overall, the results show that implementations aimed at improving disaster management and business continuity performance should be addressed holistically. Therefore, pre-disaster and post-disaster processes should be considered not as independent elements, but as a complementary system.

7. Conclusions

This study investigated the relationships among management and leadership, mitigation and preparedness, response and recovery, and disaster management and business continuity performance in OIZs. Data were collected from 81 professionals through a questionnaire, and SEM was used to validate the proposed framework and test the hypothesized relationships among the constructs.

The study's findings reveal that management and leadership in OIZs strongly influence mitigation and preparedness processes, and that disaster management performance is strongly influenced by response and recovery capacity. The findings also show that mitigation and preparedness efforts support response and recovery processes, and that pre-disaster activities become more effective when translated into post-disaster operational capabilities. Therefore, disaster management performance in OIZs should be evaluated not only based on preparedness activities but also on the capacity to respond, recover, and maintain critical operations.

Theoretically, this study contributes to the literature on disaster management and business continuity by integrating these two fields into a single structural model within the context of OIZs. Previous studies have generally examined disaster management phases, business continuity, or organizational resilience separately. In contrast, this study quantitatively demonstrates how management and leadership, mitigation and preparedness, response, and recovery interact within a holistic framework of disaster management performance. In this regard, the study provides an empirical foundation for understanding disaster management and business continuity performance as a multidimensional and interconnected structure at the zone level.

From a management perspective, the proposed model can be used by OIZ administrations to evaluate pre-disaster mitigation and preparedness capacity, improve post-disaster response and recovery processes, and monitor overall performance. The results indicate that OIZ managers need to strengthen management and leadership mechanisms because these mechanisms play a significant role in supporting mitigation and preparedness processes. However, strengthening management, leadership, and pre-disaster capacity alone is not sufficient. OIZ management must also invest in response and recovery capabilities. For public authorities, this model can support the development of zone-level disaster management and business continuity policies, particularly in industrial areas with shared infrastructure and interdependent organizations.

This study has several limitations. First, the data were collected from a relatively small sample of 81 participants. Second, the study was conducted in the context of Türkiye's OIZs; therefore, the findings may vary across different countries, industrial structures, management systems, and types of disasters. Third, the indicators used in the model were developed based on the literature and expert assessments; this may limit the inclusion of context-specific operational indicators. The study is based on cross-sectional data; therefore, the relationships between variables were tested at a single point in time. Another limitation of this study is that measurement invariance and multi-group analyses were not conducted. Although the proposed model is intended to provide a general framework for disaster management and business continuity performance in Organized Industrial Zones, the sample size ($n = 81$) was insufficient to support reliable subgroup analyses across organizational characteristics such as public versus private organizations, organizations with and without Business Continuity Plans (BCPs), or organizations with different levels of prior disaster experience.

Future studies could test the proposed model with larger sample groups and more complex path structures across different OIZs, sectors, and countries to enhance its generalizability. Comparative studies could also examine whether the relationships among constructs vary depending on the disaster type, organizational size, sectoral structure, or business continuity maturity level. By using sufficiently large subgroup samples, measurement invariance can be evaluated in greater detail in future studies, and multi-group analyses can be conducted based on organization type, the presence of a BCP, and previous disaster experiences. Furthermore, upcoming research could use longitudinal data to examine how disaster management and business continuity capabilities evolve. Further studies could expand the model by incorporating additional variables such as digital transformation, digital twins, supply chain resilience, inter-organizational dependencies, and public–private sector coordination mechanisms. In addition, the model can be tested using objective performance data, exercises, and post-incident assessments. The integration of resilience indicators—such as business continuity maturity, lifeline dependencies, and recovery time objectives—into OIZ governance processes can also be examined.

Consequently, this paper reinforces the importance of addressing disaster management and business continuity performance in OIZs through an integrated and evidence-based framework. By clarifying the relationships among management and leadership, pre- and post-disaster processes, and disaster management performance, the study provides both theoretical and practical contributions toward building more resilient industrial zones.

Author Contributions: Conceptualization, Y.E.A. and S.D.; methodology, Y.E.A., S.D. and M.K.; software, F.U. and E.T.; validation, Y.E.A., S.D. and M.K.; formal analysis, Y.E.A., F.U. and E.T.; investigation, S.D. and M.K.; resources, Y.E.A. and F.U.; data curation, Y.E.A. and E.T.; writing—original draft preparation, Y.E.A. and S.D.; writing—review and editing, Y.E.A. and M.K.; visualization, Y.E.A. and F.U.; supervision, Y.E.A., S.D. and M.K.; project administration, Y.E.A., S.D., M.K., F.U. and E.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Gebze Technical University (protocol code 43633178-050.99/ and 01.02.2026).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Descriptive Statistics

Part I: Respondent Profile

1. **Level of education:**

- ☐ PhD
- ☐ Master's Degree
- ☐ Bachelor's Degree
- ☐ Other: _____

2. **Field of operation:**

- ☐ Management
- ☐ Engineering
- ☐ Architecture
- ☐ Construction
- ☐ Academic
- ☐ Other: _____

3. **Your experience in your field of operation:**

- ☐ 0–5 years
- ☐ 5–10 years
- ☐ 10–15 years
- ☐ 15–20 years
- ☐ 20+ years

4. **Which of the following trainings have you received?**

- ☐ Disaster Management
- ☐ Business Continuity
- ☐ Both
- ☐ Neither

Part II: Company Profile

1. **Ownership type of your company:**

- ☐ State-Owned Company/Public Institution
- ☐ Multinational/Foreign-Owned Company
- ☐ Privately Held Company
- ☐ Publicly Held Company
- ☐ Family-Owned Company
- ☐ Other: _____

2. **Number of years that your company has been operating:**

- ☐ 0–10 years
- ☐ 10–20 years
- ☐ 20–30 years
- ☐ 30–40 years
- ☐ 40–50 years
- ☐ 50+ years

3. **Areas of expertise of your company:**

(Check all that apply.)

- ☐ Industrial
- ☐ Building
- ☐ Transportation and Logistics
- ☐ Energy and Power Systems
- ☐ Water and Environmental Systems
- ☐ Service and Trade (Purchase-Sale/Distribution)
- ☐ Education and Academic Research
- ☐ Other: _____

4. **Annual turnover of your company:**

- ☐ Less than 10 million TL
- ☐ 10–50 million TL
- ☐ 50–250 million TL
- ☐ 250 million–1 billion TL
- ☐ More than 1 billion TL

5. **Number of total employees in your company:**

- ☐ 1–10
- ☐ 10–50
- ☐ 50–100
- ☐ 100–150
- ☐ 150–200
- ☐ 200–250
- ☐ 250+

6. **Your position at your current company:**

- ☐ Owner
- ☐ Board Chair
- ☐ Board Member
- ☐ Director
- ☐ Manager
- ☐ Engineer
- ☐ Architect
- ☐ Technician
- ☐ Academic Staff
- ☐ Other: _____

7. **Number of years that you have been working at your current company:**

- ☐ 0–5 years
- ☐ 5–10 years
- ☐ 10–15 years
- ☐ 15–20 years
- ☐ 20+ years

8. **Which of the following disasters has your company experienced in the last 10 years?**

	Within the Last 3 Years (2026–2023)	4–6 Years Ago (2022–2020)	7–10 Years Ago (2019–2016)	Not Experienced
Earthquake	☐	☐	☐	☐
Fire	☐	☐	☐	☐
Flood	☐	☐	☐	☐
Chemical Leak	☐	☐	☐	☐
Frost and Icing	☐	☐	☐	☐

9. Which of the following plans does your company currently have?

	Available	Under Development	Not Available
Emergency Action Plan	☐	☐	☐
Business Continuity Plan	☐	☐	☐

10. What is your role in disaster management and business continuity in your company?

- ☐ Main responsible
☐ Member of a related team
☐ Contributing staff
☐ No specific role

Part III: Disaster Management and Business Continuity Performance

1. Please indicate your company's level of competence in the items listed below as part of the "Mitigation" phase.

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Competency in developing a well-established risk assessment	☐	☐	☐	☐	☐
Competency in developing disaster scenarios	☐	☐	☐	☐	☐
Competency in creating digital twins	☐	☐	☐	☐	☐

2. Please indicate your company's level of competence in the items listed below as part of the "Preparedness" phase.

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Competency in developing business impact analysis	☐	☐	☐	☐	☐
Capability in plan preparation	☐	☐	☐	☐	☐

3. Please indicate your company's level of competence in the items listed below as part of the "Response" phase.

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Competency in human safety and security (communication, search and rescue, evacuation, firefighting, access control)	☐	☐	☐	☐	☐
Capability in critical community lifeline assessment (food, water, shelter, medical, energy, communication, transportation, hazardous material management)	☐	☐	☐	☐	☐
Competency in resource and logistics management (requirements, allocation, deployment)	☐	☐	☐	☐	☐

4. Please indicate your company's level of competence in the items listed below as part of the "Recovery" phase.

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Competency in early recovery actions	☐	☐	☐	☐	☐
Competency in implementing business recovery strategies	☐	☐	☐	☐	☐
Capability in permanent repair and build back better	☐	☐	☐	☐	☐

5. Please indicate your company's level of competence in the items listed below as part of the "Management and Leadership".

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Competency in strategic planning and vision setting	☐	☐	☐	☐	☐
Competency in governance, compliance, and accountability	☐	☐	☐	☐	☐
Competency in stakeholder participation and coordination	☐	☐	☐	☐	☐
Competency in resource management, financing, and monitoring	☐	☐	☐	☐	☐

6. Please indicate your company's level in the items listed below as part of the "Disaster Management Performance".

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Level of reduction in human and social impacts	☐	☐	☐	☐	☐
Level of operational and economic resilience	☐	☐	☐	☐	☐
Level of critical infrastructure and service continuity	☐	☐	☐	☐	☐
Level of operational coordination and adaptive learning capacity	☐	☐	☐	☐	☐

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