Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

Integrating sustainability impact into disaster resource management: A structural model for the United Arab Emirates

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ARTICLE INFO

Article history:
Received 12 April 2023
Received in revised form
23 July 2023
Accepted 27 July 2023

Keywords:
Disaster resources management
Sustainability impact
United Arab Emirates
PLS-SEM
Stakeholder engagement

ABSTRACT

This study endeavors to formulate a comprehensive structural model of disaster resources management that incorporates sustainability impact within the context of the United Arab Emirates (UAE). Given the UAE's vulnerability to diverse natural and man-made disasters, there arises a pressing need for effective disaster management strategies that embrace sustainability principles. To address this need, the research employs Partial Least Squares Structural Equation Modeling (PLS-SEM) and involves 152 stakeholders as respondents. The investigation adopts a multi-faceted approach, combining a thorough literature review, insightful case study analysis, and interviews with key stakeholders engaged in disaster management across the UAE. The study successfully identifies crucial factors that contribute to the efficacy of disaster resources management and its sustainability impact, while also recognizing the barriers and challenges that hinder the implementation of such strategies. The resulting structural model serves as a comprehensive framework for the seamless integration of sustainability considerations into disaster resources management within the UAE. Envisioned through a systems thinking approach, the model thoughtfully addresses the interconnectivity of various factors and the potential trade-offs between immediate emergency response and long-term sustainability objectives. The findings of this research contribute significantly to the field of knowledge concerning disaster resources management and sustainability impact, particularly in the unique context of the UAE. Furthermore, the model developed in this study holds practical implications for policymakers and practitioners involved in disaster management in the UAE, offering them a valuable blueprint for formulating effective and sustainable disaster management strategies.

1. Introduction

Natural disasters have a devastating impact on both the economy with its available resources as well as the society at large. In the US, for instance, the Federal Emergency Management Agency (FEMA) ensures an equal distribution of resources and budgeting to enhance the process of preparedness during national emergencies. The national government has mandated that the institution perform mainly three roles: Risk awareness, communication, and resource support (Tasri et al., 2022). Risk awareness entails ensuring the education of people regarding different types of disasters so that they are well-prepared before such occurrences. The second role involves alerting the public before, during, and after the event of disasters on such aspects as management, safety, and resource allocation (Hansson et al., 2020). It must be noted that most countries have faced disasters due to a lack of quality preparation, which inhibits the quality of preparedness among individuals. The last role includes quality allocation and management of resources before, during, and after disasters. For instance, during the 2019 national budget distribution, the FEMA allocated more than 28.7 billion dollars to enhance the easy management of disasters. The process of budgeting and preparation of resources is crucial in ensuring prevention, preparedness, and recovery. Therefore, all the responsible institutions are supposed to ensure that allocating resources is done effectively, thus

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https://doi.org/10.21833/ijaas.2023.09.002
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facilitating quick recovery both economically and socially.

Since the United Arab Emirates (UAE) has faced different disasters, it is of great significance to introduce and implement different guidelines and standards to allow effective resource allocation (Abbas et al., 2021). Thus, the UAE, under the National Emergency Crisis and Disasters Management Authority (NCEMA), has established the UAE Disaster Management Approach (DMA) to enable the whole country to be well prepared for different disasters to occur in advance. The quality of preparation for the country is more concentrated on the increase of awareness and resource distribution. The framework allows the UAE to ensure the quality allocation of resources, which in turn prepares it and its citizens in case any disaster takes place. Despite an increase in budgeting and cost, the UAE has been facing different disaster management situations. The process of allocating resources has been quite an issue with the government enhancing other policies to sustain emergency preparedness. Such approaches, however, have failed to address the structural analysis of the national emergency management towards sustainability development for the UAE.

The following study delves into exploring how NCEMA can effectively handle disasters in the UAE. Most disasters occur without visible warning. Usually, a lack of preparedness is also associated with high economic and social losses Therefore, it is reasonable to assume that a solution is needed to help disaster management agencies make informative resolutions that are evidence-based (Botzen et al., 2019). Nevertheless, statistical tools can be incorporated into the design of a strategic framework to manage effectively the UAE's resources, including capital and human assets to reduce economic losses. Furthermore, the framework would help the state attain its disaster management milestones (Alhmoudi and Aziz, 2016). The main variables or issues deemed instrumental in the design include recovery, preparedness, social influence, economic effect, response, prevention, and resource management. However, the variables are not observable. To quantify the data, strategic tools, namely questionnaires, are incorporated into the research methodology framework to ensure that the data provided are quantitative for the purpose of statistical analysis.

The conventional methodologies used in statistical analysis are not effective in the formulation of a multivariate framework. In such a manner, dependent variables can only be connected with one independent variable. Therefore, it limits research that involves a set of independent and dependent variables. Therefore, the partial least square-structural equation modelling approach is recommended for the development of a framework that combines multiple constructs of interest. In this context, the interconnection of multiple variables is determined courtesy of the path coefficient parameter in the PLS-SEM model. The framework precisely examined all subjects regardless of whether they are quantifiable or not. Therefore, national resources can be managed effectively by utilizing one framework that covers all variables connected with Resource Management (RM) and DMA (Alzaghal and Momani, 2017). The state can prepare resources earlier as a strategy for mitigating crises or national emergencies (Alhmoudi and Aziz, 2016). Nevertheless, it involves allocating resources equitably and effectively to reduce economic losses. Overall, the research is based on incorporating all variables associated with RM and DMA in a framework developed with the PLS-SEM model to ensure that crisis and national emergencies are mitigated and managed with the help of appropriate methodologies.

2. Research framework

The framework under consideration incorporates critical factors that are involved in crisis management in the UAE. The concept is based on multivariate statistical concepts and hypotheses. The PLS-SEM is strategically significant in examining dynamic variables. In such a manner, these variables are bound to change with time. The PLS-SEM is usefully used when principal components can be analyzed with statistical methods, for example, the least square. Furthermore, the essence of the PLS-SEM method is to model a framework that can be represented with graphical features to assess the cause-and-effect relationships associated with data in psychology, sociology, and environmental science in a wide range of disciplines. Therefore, there is no limitation to its use as multiple disciplines can be modeled effectively with observed and latent variables. Usually, latent variables signify factors that cannot be observed, for example, emotions, intentions attitudes, and perceptions. Nevertheless, statistical tools, including secondary data or questionnaires are used to model the latent variables statistically. With the use of the PLS-SEM, the relationship among multivariate factors can be determined in relation to how they connect with the constructs of interest (Schubring et al., 2016). The model is preferred over independent statistical solutions due to its complexity in estimating correct data variables. Nevertheless, it is effective in the analysis as compared to other frameworks, for example, CB-SEM (Hair et al., 2017). Nevertheless, the study uses the concept in the analysis of factors associated with crisis management in the UAE. Crisis management involves latent variables that need to be integrated into the modeling design. Specifically, the variables include recovery, preparedness, prevention, and response. The four attributes can be neither quantified nor observed. However, incorporating statistical data collection tools, for example, administering questionnaires specifically targeting the constructs of interest. The number of pages for the manuscript must be no more than ten, including all the sections. Please make sure that the whole text ends on an even page. Please do not insert

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Many challenges arise in the course of crisis or emergency management. Therefore, Abbas et al. (2021) recommended that a different strategic approach should be incorporated into crisis management for early response to disasters. Specifically, the level of preparedness is considered in the management design while focusing on resources that can be used to mitigate the consequences associated with the crisis (Hede, 2017). With the adoption of the PLS-SEM framework, the UAE disaster management team can identify risks before their occurrence and thus integrate solutions for mitigating the menace. According to Muths and Fisher (2017), emergencies are usually difficult to contain due to the incapacity of management agencies to identify the risks. The aspect is termed risk identification and preparedness. Disasters impose negative effects on society, including economic slowdowns. For instance, the case of the COVID-19 pandemic is regarded as a major disaster that led to the closure of many businesses. The GDP growth rate has been steadily declining with a significant number of people rendered unemployed. Other possible disasters include terror attacks that can be contained if the information is leaked and collected earlier. Nevertheless, incorporating the new framework enhances the ability of the team to make better predictions associated with the probability of disaster occurrence. In addition, disasters are reported to affect the social mobility of many families or individuals in society. Thus, it is essential to recognize crisis administration phases to facilitate effective management through preparedness and recouping from the catastrophe. As shown in Fig. 1, the four elements or variables required for better data management include preparedness, responsiveness, prevention, and recovery.

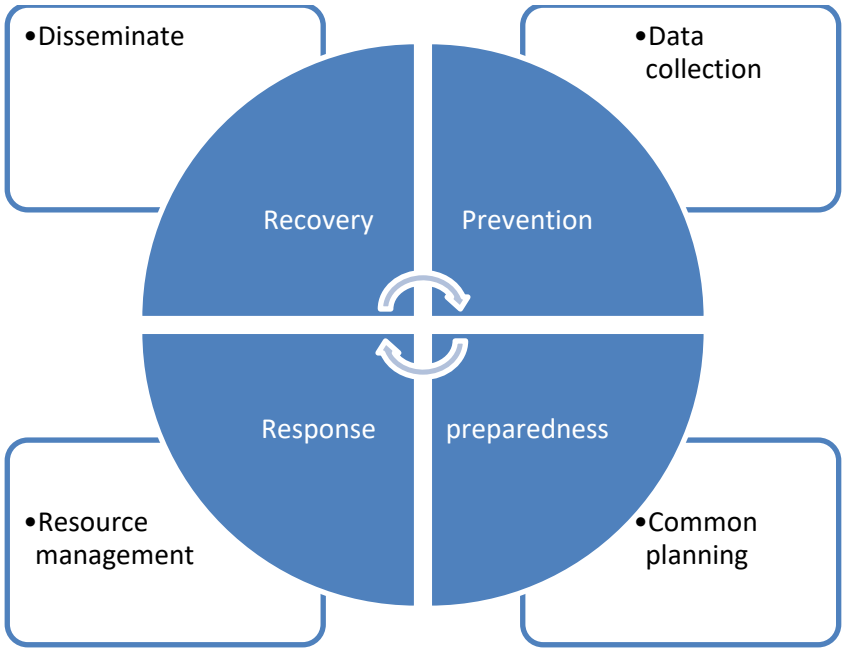

Fig. 1: The emergency management cycle (EMC)

The constructs of interest are based on data collection, dissemination, resource management, and common planning (CRIP). The factors constitute the EMC cycle that was recommended by Ghareb (2018). With the new system, the correlation between the variables would be significant in determining significant approaches and standards that can be implemented in the UAE for better disaster management. The functionalities of NCEMA can be revised in the framework as it would adopt a new mechanism of disaster management and preparedness (Kuipers et al., 2015). Disaster Management incorporates resource optimization techniques, for example, resource management, information and technology, production properties, human assets, portfolios, and financial funds. Therefore, it is noted that multiple variables are involved in the identification and development of the required SEM framework for managing disasters in the UAE.

Human assets mean the employed staff with the ability to identify possible problems earlier. Information technology is considered a part of the management framework since robust software, including ERPs, has to be integrated to facilitate real-time data collection and preparedness. Technology has a wide range of applications in disaster management. Nevertheless, the main use is the collection of data. Financial assets incorporate funds required in the management or mitigation of the identified risks. Generally, the team needs to determine what funds should be allocated depending on the type of crisis identified in the management plan. In addition, allocation of the resources is another prudential attribute required for the effective identification of data requirements.

The main objective is to develop a framework that would be used for National Emergencies in the UAE with the PLS-SEM model to align disaster resources management with sustainability impact. Furthermore, the intensity mediator should be identified in the process since it is a part of the requirements in the PLS-SEM model. The main independent concepts in the model include disaster management and resource management (RM) in the UAE.

3. Hypothesis formulation

The research is guided by three main hypotheses, which can be covered in two broad phases. The first phase involves making a connection between the two attributes of RM and DMA and constructs; production resource, information technology, human resource, inventory, and financial resource. The second phase of the model involves the incorporation of social and financial effects as dependent model constructs. Based on the key attributes identified, the main hypothesis of the study is divided into three elements. The first hypothesis relates to the connection between Resource Management and Disaster Management. The second hypothesis emphasizes the connection between variables of resource management and disaster management (in relation to economic growth. The third hypothesis connects the two variables to social impact in the UAE. In such a manner,

H1: There is no significant difference between DMA and RM.
H2: There is a significant economic influence of integrating DMA and RM.
H3: There is a positive social influence of integrating disaster management and resource management in the UAE.

A framework that interconnects all three hypothetical views was developed for the ease of assessing the existing relationships between the constructs. Fig. 2 overviews the conceptual framework that connects all the variables.

4. Procedure

The methodology entails the approach used in the collection of data, either qualitative or quantitative for later analysis. In this context, the research involved the identification of constructs associated with crisis management. The constructs were basically variables that had an impact on the effective management of disasters. They include preparedness, recovery, social impact, economic impact, inventory systems, financial capital resources, resource management, disaster management, and human assets. Most of the variables are unobservable and hence, it is difficult to quantify them. Hence, the solution was to utilize a questionnaire with a set of queries that are directly related to the topic under consideration.

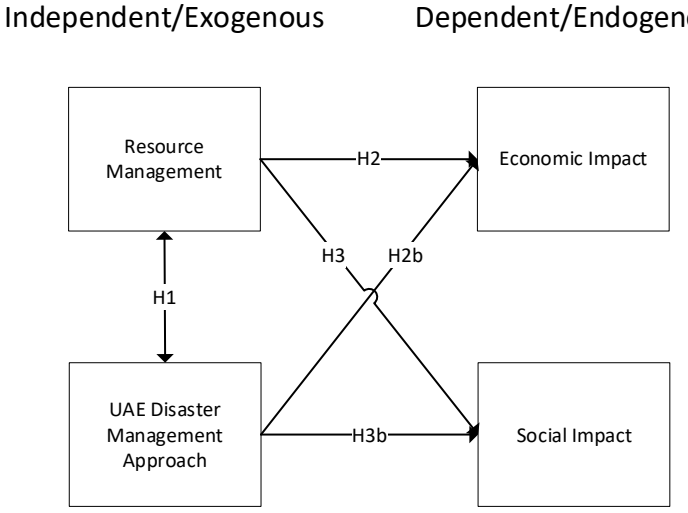

Fig. 2: Concept mapping

4.1. Sample identification

The next step involved the identification of the participants or population to whom the questionnaires were distributed. The population was presented by the staff mandated to oversee operations of disaster management in the UAE. Additionally, randomly selected participants with adept knowledge of disaster operations were identified. The participants involved scholars in the disaster management field with the knowledge and capacity to advise on optimal solutions required in the analysis. At least 150 participants were required in the research to collect meaningful data that would support the research. Fewer participants mean that the data collected would not be reliable (Fugard and Potts, 2015). Thus, 150 was considered the optimal number for maximizing the output. More participants means a lot of time would be required to perform the analysis. Nevertheless, the number of respondents was 139 (an efficiency rate of 91%). The method entailed quantification of the data in a

quantitative format to facilitate better statistical analysis. Advanced analytical strategies including bootstrapping, Path coefficient determination, and cross-validity redundancy Q2. Nevertheless, research ethical considerations were incorporated into the study. That is, ensuring that no bias in the information collected.

4.2. Ethical considerations

Ethical considerations must be incorporated in any empirical research that involves collecting data from participants. Permission from the governing authority was obtained in the form of a license. The license was used to convince participants to take part in the study. Yet, the participants were randomly selected as a strategy for managing bias. All participants were barred from providing their personal details which are in line with ethical research practices. Moreover, respondents have a right to informed consent (Engel and Schutt, 2014). Hence, they were educated on the essence of the research and its contribution to disaster management operations. Participation was not forcefully conducted as respondents willingly accepted to take part in the research. Most importantly, the results were collected in their raw form without altering the content. Altering the data would compromise the quality of the research due to untrustworthy information and results (Igwenagu, 2016). Overall, the ethical considerations include informing the participants about the research objective, seeking a license of study, and deterring participants from providing their personal information.

5. Results and discussions

The aim of the research was to formulate a multivariate framework that covers all the constructs associated with disaster recovery and disaster management. In this section, the relationships between the constructs and their connection to the hypothesis are reviewed. The data is verified using reliability assessment, data normality, and discriminant validity. For data reliability assessment, Cronbach alpha was utilized in evaluating and confirming the component's data. According to Hair et al. (2014), 0.7 is set as the threshold for confirming the internal consistency of the components. Table 1 shows the reliability assessment evaluated alongside the Cronbach scale. The number of items is also indicated to showcase the relationship of the constructs.

Abbreviated codes are used to represent the constructs where FIR, NIV, and HUR denote financial resources, inventory, and human resources respectively. PRR, ICT, RSM, and PPD denote production resources, information technology resource management, and preparedness. Further, PRV, RES, REC, ECI, and SOI denote response recovery, economic impact, and social impact respectively. According to the analysis, all the variables exceed the Cronbach value threshold of 0.7. Therefore, their reliability is confirmed and useful for research purposes.

Table 1: Reliability test

Constructs		Reliability as per scale and items	
		Scale	Items
FIR	Financial resources	0.918	9
INV	Inventory	0.911	12
HUR	Human resources	0.912	11
PRR	Production resources	0.950	7
ICT	Information technology	0.947	6
RSM	Resource management	0.955	8
PPD	Preparedness	0.929	5
PRV	Prevention	0.821	5
RES	Response	0.707	4
REC	Recovery	0.890	4
ECI	Economic impact	0.954	5
SOI	Social impact	0.865	5

Regarding the normality of the data, statistical descriptive tools namely kurtosis and skewness, were considered effective parameters for the assessment of the data distribution. That is how the data spreads based on pre-defined values. The optimal range for defining symmetrical data is depicted by values in the range of -2 and +2. In such a manner, if the kurtosis and skewness values fall within the range, the data are regarded as symmetrical, which is required for perfectly distributed statistics. Table 2 shows the distribution of kurtosis and skewness for framework constructs identified in simulating the resource management tool for national emergencies. According to the data, it is noted that the value lies within the range of -2 and +2. Therefore, the normalcy is confirmed as the data comply with the rules of kurtosis and skewness.

5.1. Discriminant validity

With discriminant validity, the Heterotrait-Monotrait method is applied in assessing how the factors or constructs interrelate with each other. The variable measures the variation of indexes. The discriminant validity is approved when the Heterotarit Monotrait value does not exceed 0.9. Table 3 shows how the constructs are related to each other based on the Heterotrait-Monotrait index value.

Table 2: Normality test

Constructs	Statistical-skewness		Statistical-kurtosis	
	Statistic	Std. Error	Statistic	Std. error
FIR	-0.223	0.206	-0.658	0.408
INV	-0.237	0.206	-0.049	0.408
HUR	-0.211	0.206	-0.526	0.408
PRR	-0.079	0.206	-0.394	0.408
ICT	-0.003	0.206	-1.077	0.408
RSM	-0.428	0.206	-0.821	0.408
PPD	-0.214	0.206	-0.685	0.408
PRV	-0.388	0.206	-0.509	0.408
RES	-0.200	0.206	-0.254	0.408
REC	-0.460	0.206	-0.735	0.408
ECI	-0.153	0.206	-0.709	0.408
SOI	-0.155	0.206	-0.579	0.408

All the data presented in Table 3 are less than 0.9. The highest value is based on the correlation between DM and PPD with an estimated Heterotrait-Monotrait value of 0.937. Nevertheless, all other values are less than 0.9 indicating that the inter-correlations validity is upheld. The fact that only one inter-correlation is higher than 0.9 means that the record is insignificant. Framework Development with Partial Least Squares-Structural Equation Modelling. There are two components associated with PLS modeling including the measurement and structural features. Measurement is conducted in the first round whereas the structural is applied subsequently after the first phase. There is a need to confirm the trustworthiness of the measurement. Thus, composite reliability is incorporated in assessing the data's value. To analyze the predictive relevance of the estimated model, two methods are considered namely Average Variance Extracted (AVE) and component loadings. Further, Wong (2013) reported that discriminating validity is analyzed using three techniques namely the Heterotrait-Monotrait attribute, cross-standard loading, and the Fornell and Larcker (1981) principle. Rigorous testing and confirmation are conducted to ensure that the data collected is valid and that it is a reflection of the framework.

Table 3: Discriminant validity test

	DM	ECI	FIR	HUR	ICT	INV	PPD	PRR	PRV	REC	RES	RM	RSM
ECI	0.813												
FIR	0.615	0.570											
HUR	0.730	0.742	0.705										
ICT	0.592	0.648	0.695	0.771									
INV	0.349	0.465	0.342	0.450	0.428								
PPD	0.937	0.820	0.546	0.704	0.547	0.279							
PRR	0.561	0.489	0.469	0.620	0.556	0.351	0.524						
PRV	0.738	0.321	0.233	0.283	0.165	0.180	0.424	0.321					
REC	0.848	0.751	0.706	0.687	0.659	0.391	0.620	0.448	0.199				
RES	1.000	0.586	0.384	0.591	0.474	0.213	0.713	0.439	0.386	0.821			
RM	0.730	0.764	0.824	0.932	0.867	0.689	0.681	0.726	0.310	0.724	0.527		
RSM	0.650	0.717	0.664	0.788	0.722	0.447	0.664	0.489	0.284	0.576	0.438	0.872	
SOI	0.880	0.879	0.807	0.851	0.821	0.447	0.818	0.550	0.326	0.895	0.695	0.890	0.792

The interconnectedness of the constructs is conducted with the structural model as reported by Lowry and Gaskin (2014). The main variables in the path weights include the Goodness of Fit (GOF) of the constructs incorporated in the framework, the Cohen F2 factor for estimating the exogenous measurements, the coefficient of determination that is evaluated by the cross-validated redundancy, and the R2 threshold. Generally, the assessment involves the examination of coefficients related to different constructs.

5.2. Evaluation of the structural model

In this section, the results are assessed to infer the association of the constructs as hypothesized in the research framework stage. The final phase of the SEM technique is the structural assessment of the models and identified constructs. The interconnection of the observed variables is identified in the structural model. The hypotheses formulated in the previous sections can then be confirmed based on the evidence collected. With the interdependencies, the answer can be utilized in making inferences on whether the hypothetical views are justified or null. Overall, the objective of the study is to examine the effectiveness of using the model for making accurate predictions about the constructs identified in the SEM framework. Each construct can be easily estimated based on the interconnection coefficients as indicated in the discriminant validity (Henseler and Sarstedt, 2013). For instance, if the FIR is known then it is possible to determine variable INV by substituting the coefficients of correlation. The following methods are effectively applied in the analysis of the parameters; overall goodness of fit (GOF), cross-validity redundancy (Q2), Cohen's formula F2, and the coefficient of determination R2 along with the bootstrapping method (Hair et al., 2014). The resultant structural model is based on a set of interconnections framed as Fig. 3.

In the model, the relationship between DM and RM is illustrated by hypothesis H1. Yet, DM is associated with SOI, ECI, REC, RES, PPD, and PRV. On the other hand, the RM is connected to the

constructs; RSM, ICT, PRR, HUR, FIR, and INV. The model is sophisticated in design as it incorporates all the constructs as opposed to the conventional statistical models that are usually limited to the relation between one independent and multiple variables (Sarstedt et al., 2014). The PLS-SEM model is multivariate in that there is a set of interconnections on several variables. Yet, it is significant in the estimation of non-observable data such as the PRV and RES. Statistical tools are used to quantify the observations into latent variables that can be analyzed in the framework.

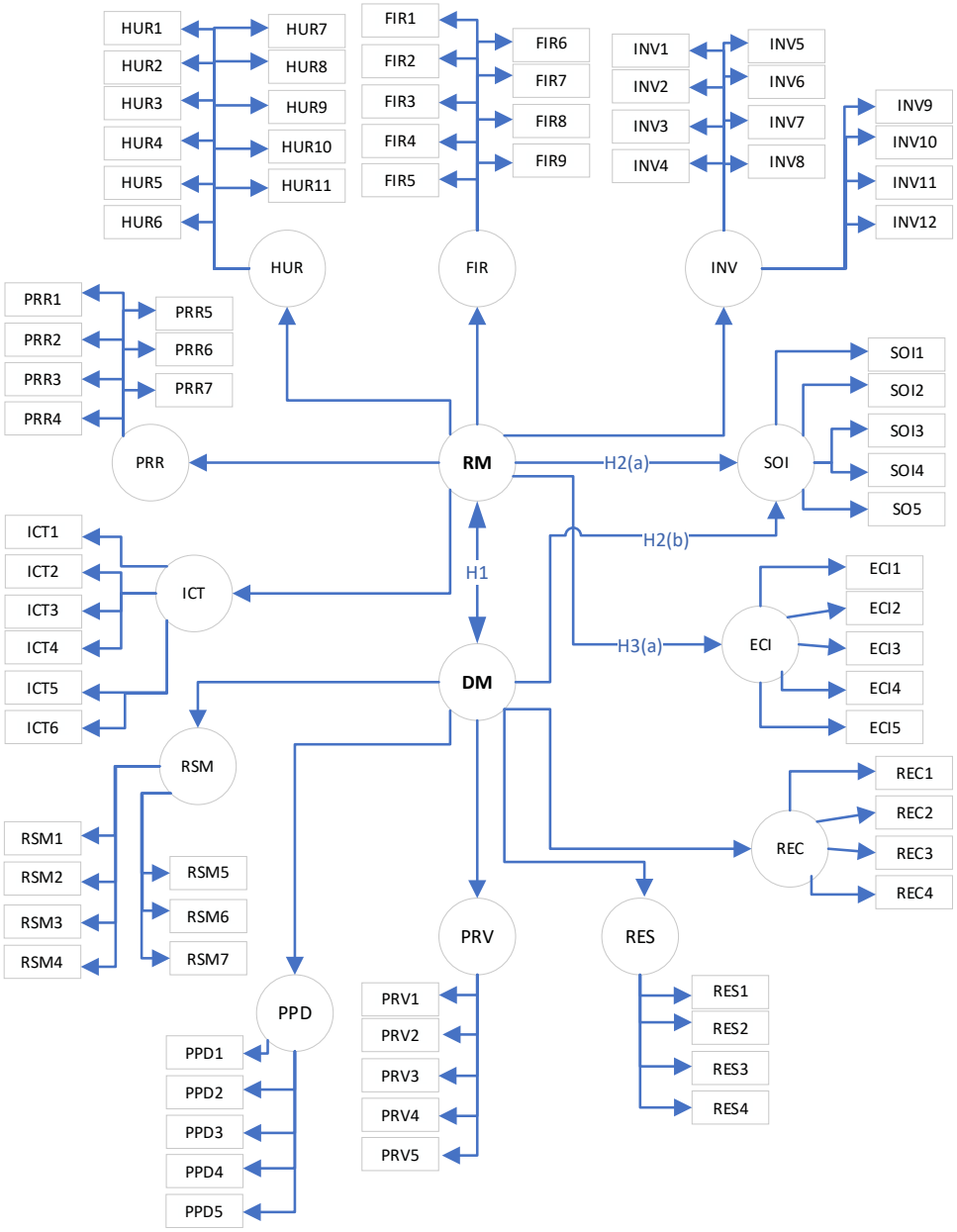

Fig. 3: Structural model

5.3. Testing of research hypotheses

Empirical research is only complete if the hypotheses formulated in the preparation stages are approved or rejected depending on statistical correlations. There are different ways of analyzing hypothetical views including P-values and T-statistics (Greenland et al., 2016). Most importantly, the level of confidence is significantly applied in the estimation model. In this context, the level of confidence is estimated at the 0.001 mark level. Yet, the path coefficient, p values, and T-statistical tests are utilized in making inferences about the correlation between the two constructs and hence, the overall hypothetical views. Table 4 shows the results obtained from the model connections. The parts marked with Ho represent the association between high-order components and their respective lower-order constructs. As noted in Table 4, all the relationships are supported meaning that the hypothetical views are upheld. The path coefficient shows the correlation between the variables such that the closer it is to 1, the higher the value should be supported. For instance, most of the other variables' path coefficients are higher than 0.7. Hence, reflecting a positive correlation between the coefficients.

Table 4: Correlations of the constructs

Correlation	Hypothesis	Path-coefficient	T-statistics	P-values	Inference
RM -> INV	Hº	0.628	10.119	0.000	Supported
RM -> PRR	Hº	0.697	13.569	0.000	Supported
RM -> RSM	Hº	0.862	43.340	0.000	Supported
DM -> PPD	Hº	0.911	63.005	0.000	Supported
DM -> PRV	Hº	0.495	6.454	0.000	Supported
DM -> REC	Hº	0.807	21.825	0.000	Supported
DM -> RES	Hº	0.802	22.041	0.000	Supported
RM -> FIR	Hº	0.802	22.409	0.000	Supported
RM -> HUR	Hº	0.895	64.030	0.000	Supported
RM -> ICT	Hº	0.852	37.804	0.000	Supported
RM<->DM	H1	0.725	*15.231*	0.000	Supported
RM -> ECI	H2(a)	0.328	4.083	0.000	Supported
RM -> SOI	H2(b)	0.471	6.304	0.000	Supported
DM -> ECI	H3(a)	0.573	7.272	0.000	Supported
DM -> SOI	H3(b)	0.494	6.699	0.000	Supported

5.4. Implication

The research results are positive and it reflects a higher connection between the constructs and their association with disaster management and resource management. The research contributes to the management of crises and emergencies in the UAE. Yet, the idea can be borrowed and utilized in managing global emergencies with international agencies such as the World Health Organization and the United Nations. In the UAE, all the disaster management agencies including the NCEMA can use the framework to adequately prepare for any impending disasters that may occur. The organization can structure its resources better by identifying constructs that are directly and indirectly connected to crisis management. Yet, NCEMA can strategically organize its resources to accomplish its objective of mitigating crises before they impose economic and social impacts in the UAE. As Hepner et al. (2017) reported, the framework would facilitate effective time management and utilization of resources with minimal wastage. A lot of resources are lost in the course of management since the staff cannot prioritize factors that need more attention compared to others. The research would significantly enable the crisis management team to develop strategies and interventions for disaster preparedness. Yet, it would help the UAE meet its strategic visions such as Vision 2030 which is based on sustainable production (Almarzouqi, 2017). That is, a theoretical framework can thus be developed and implemented in informational technology software. For instance, the implementation of the ERP incorporates all the constructs. Therefore, helping the management team in making better decisions.

Yet, the research also contributes to scholarly statistical analysis. That is, most researchers rely on conventional statistical analysis such as regression and descriptive methodologies to relate quantitative data. However, conventional methods are usually limited in terms of covering the interrelations of many variables. That is, multiple analyses must be conducted. In most cases, it is not effective due to the redundancy of information that may be difficult to relate well to Kock (2014). Nevertheless, the application of data PLS-SEM incorporates multiple constructs and hence, analyzes data in disciplines including engineering, sociology, medicine, and other subjects easy to work with Memon et al. (2021). Overall, the research findings can be utilized in examining techniques and standards that NCEMA can incorporate into crisis management in the UAE.

6. Conclusions

All in all, the research objective was achieved considering that a positive causal relationship was noted between disaster management and resource management. Most importantly, a framework that solves resource management and disaster management in the UAE was formulated using the PLS-SEM statistical tool while incorporating constructs of interests including financial assets, human resource, inventory management social impact, economic impact, preparedness, response, recovery, prevention, and capital assets. Yet, the two main variables in the research were disaster management and resource management. Three hypotheses were formulated to guide the research in terms of the correlation between disaster management and social or economic impact. The hypothesis tested the significant relationship between resource management and disaster management. In the research, the relationship was confirmed to be positive in that the constructs of resource management must be properly organized to effectively mitigate the crisis. The second hypothesis was based on the significant relationship between RM, DM, and social impact. Whereas the third hypothesis tested the relation of DM, RM, and economic impact.

The research methodology involved drafting a set of questionnaires that were distributed for purposely collecting unobserved data. Where unobserved data comprised constructs associated with preparedness and recovery operations. A research population was identified upon which the primary survey was drafted. Eventually, the PLS-SEM method was incorporated to facilitate the inter-correlation of the constructs. The path coefficients were used to establish the relationships between the variables. Nearly, all the variables had a strong relationship (the ratios were approaching 1). Other methods involved in the research framework include Cohen F2, the goodness of fit (GOF), bootstrapping, and cross-validity redundancy. Overall, the objective

of the research was attained since the Partial Least Squares-Structural Equation Modelling was notably inferred as an efficient tool in developing a strategic framework for the management of disasters and crises in the UAE.

List of abbreviations

HUR	Human resources
HUR1	Total number and rate of employee turnover
HUR2	Benefits provided to full-time employees
HUR3	Percentage of employees covered by collective bargaining agreements
HUR4	Rate of injury, fatalities, and lost days
HUR5	Programs in place to assist workforce members and their families during serious diseases
HUR6	Health and safety topics covered in formal agreements with trade unions
HUR7	Average hours of training per year per employee
HUR8	Programs for emergency skill management
HUR9	Percentage of employees receiving guidelines and procedures during national emergencies
HUR10	Composition of governance bodies and breakdown of employees per category according to gender, age group, minority group membership
HUR11	Ratio of basic salary and remuneration from women to men by employee category
PRV	Prevention
PRV1	Prevention is dominant in the emergency management of your organization
PRV2	For emergency prevention measures, universities are involved in certain activities
PRV3	Reserves for emergency prevention and liquidation are based in various departments and organizations
PRV4	You consider yourself prepared for the management of disasters
PRV5	You are familiar with the local emergency response system for disasters
RES	Response
RES1	Response is dominant in the emergency management of your organization
RES2	Mitigation, response, humanitarian aid for affected people
RES3	There is an emergency plan for the area you stay in
RES4	There policies that deal with disaster management in your organization
PPD	Preparedness
PPD1	UAE disaster preparedness is satisfactory
PPD2	Preparedness is dominant in the emergency management of your organization
PPD3	Occurrence of negative events connected with climate change
PPD4	Probability of occurring disasters during next 3–5 years
PPD5	Fears of occurring disasters in the future
REC	Recovery
REC1	Leading disaster recovery efforts
REC2	Providing technical expertise on hazards management
REC3	Prepositioning, organizing, and coordinating teams specific to disaster response and recovery needs
REC4	Identifying sources of recovery funding, exploring financial needs of recovery, planning for financial needs of recovery
FIR	Financial resources
FIR1	Cost of space provision for storage purposes
FIR2	Cost of tools/equipment related to inventory control
FIR3	Maintenance cost for storage/security/ ventilation
FIR4	Cost of storage facilities (shelves, boxes, packaging)
FIR5	Systematic inventory management is needed
FIR6	Effort to implement inventory management
FIR7	Time taken to implement systematic inventory management
FIR8	Contribution of systematic inventory management to profitability
FIR9	Willingness to expand financial resources and budgets for emergency plans
INV	Inventory
INV1	Every inventory's movement in and out of your organization is properly recorded
INV2	All inventory is physically counted yearly
INV3	Controls over defective or slow inventory flows
INV4	Your organization has distribution plans for inventories
INV5	All inventories are classified by category with specific goals
INV6	Purchase order is properly numbered and controlled
INV7	Your organization has material/equipment/ tool inventories
INV8	Your organization has an energy inventory
INV9	Your organization has a food inventory
INV10	Your organization has a medicine inventory
INV11	Your organization has a water inventory
INV12	All inventories are controlled based on the optimal-quantity level to avoid shortage or excess of inventories
PRR	Production resources
ICT	Information technology
RSM	Resource management
ECI	Economic impact
ECI1	Economic (monetary loss)
ECI2	Social loss (number of fatalities)
ECI3	UAE's management of risks associated with health and safety
ECI4	UAE's management of risks associated with industrial explosions
ECI5	In the UAE's efforts to minimize the impact of natural disasters, the government is able to search for and rescue people and even provide economy relief
SOI	Social impact
SOI1	Social impacts can be reduced by recovery through preparedness practices
SOI2	Social impacts can provide a basis for preempting prediction and the development of contingency plans to prevent adverse consequences
SOI3	Social impacts are less effective than systematic recovery through preparedness practices
SOI4	The physical impacts, in turn, combine with improvised disaster recovery to produce the disaster's social impacts
SOI5	The community participates in identifying or creating policies for disaster management

Acknowledgment

The authors extend their gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for the financial

support. This transdisciplinary research is part of a dissertation that was submitted as partial fulfillment to meet the requirements for the degree of Doctor of Philosophy at Universiti Teknikal Malaysia Melaka (UTeM).

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abbas ZW, Ahamed F, Ganesan S, Warren K, and Koshy A (2021). COVID-19 crisis management: Lessons from the United Arab Emirates leaders. Frontiers in Public Health, 9: 724494. https://doi.org/10.3389/fpubh.2021.724494 **PMid:34778167 PMCid:PMC8585940**

Alhmoudi AA and Aziz Z (2016). Integrated framework for early warning system in UAE. International Journal of Disaster Resilience in the Built Environment, 7(4): 361-373. https://doi.org/10.1108/IJDRBE-08-2015-0040

Almarzouqi IMZ (2017). An analysis of disaster vulnerability in the United Arab Emirates. Ph.D. Dissertation, University of Northumbria, Newcastle, UK.

Alzaghal MH and Momani NM (2017). Emergency volunteering in Kingdom of Saudi Arabia: Current and future trends. International Journal of Emergency Management, 13(2): 160-168. https://doi.org/10.1504/IJEM.2017.10003682

Botzen W, Deschenes O, and Sanders M (2019). The economic impacts of natural disasters: A review of models and empirical studies. Review of Environmental Economics and Policy, 13(2): 167-188. https://doi.org/10.1093/reep/rez004

Engel RJ and Schutt RK (2014). Fundamentals of social work research. Sage Publications, Thousand Oaks, USA.

Fornell C and Larcker DF (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3): 382–388. https://doi.org/10.1177/002224378101800313

Fugard AJ and Potts HW (2015). Supporting thinking on sample sizes for thematic analyses: A quantitative tool. International Journal of Social Research Methodology, 18(6): 669-684. https://doi.org/10.1080/13645579.2015.1005453

Ghareb MI (2018). Information technology roles in crisis management: A case study in Kurdistan region government. International Journal of Computer Engineering and Information Technology, 10(5): 71-78.

Greenland S, Senn SJ, Rothman KJ, Carlin JB, Poole C, Goodman SN, and Altman DG (2016). Statistical tests, P values, confidence intervals, and power: A guide to misinterpretations. European Journal of Epidemiology, 31: 337-350. https://doi.org/10.1007/s10654-016-0149-3 **PMid:27209009 PMCid:PMC4877414**

Hair JF, Hult GTM, Ringle C, and Sarstedt M (2014). A primer on partial least squares structural equation modelling (PLS-SEM). Sage Publications, Thousand Oaks, USA.

Hair JF, Matthews LM, Matthews RL, and Sarstedt M (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. International Journal of Multivariate Data Analysis, 1(2): 107-123. https://doi.org/10.1504/IJMDA.2017.10008574

Hansson S, Orru K, Siibak A, Bäck A, Krüger M, Gabel F, and Morsut C (2020). Communication-related vulnerability to disasters: A heuristic framework. International Journal of Disaster Risk Reduction, 51: 101931. https://doi.org/10.1016/j.ijdrr.2020.101931

Hede S (2017). Perceptions of crisis preparedness and motivation: A study among municipal leaders. Safety Science, 95: 83-91. https://doi.org/10.1016/j.ssci.2017.02.010

Henseler J and Sarstedt M (2013). Goodness-of-fit indices for partial least squares path modeling. Computational Statistics, 28: 565-580. https://doi.org/10.1007/s00180-012-0317-1

Hepner DL, Arriaga AF, Cooper JB, Goldhaber-Fiebert SN, Gaba DM, Berry WR, and Bader AM (2017). Operating room crisis checklists and emergency manuals. Anesthesiology, 127(2): 384-392. https://doi.org/10.1097/ALN.0000000000001731 **PMid:28604405**

Igwenagu C (2016). Fundamentals of research methodology and data collection. LAP Lambert Academic Publishing, Sunnyvale, USA.

Kock N (2014). Advanced mediating effects tests, multi-group analyses, and measurement model assessments in PLS-based SEM. International Journal of e-Collaboration, 10(1): 1-13. https://doi.org/10.4018/ijec.2014010101

Kuipers S, Boin A, Bossong R, and Hegemann H (2015). Building joint crisis management capacity? Comparing civil security systems in 22 European countries. Risk, Hazards and Crisis in Public Policy, 6(1): 1-21. https://doi.org/10.1002/rhc3.12070

Lowry PB and Gaskin J (2014). Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. IEEE Transactions on Professional Communication, 57(2): 123-146. https://doi.org/10.1109/TPC.2014.2312452

Memon MA, Ramayah T, Cheah JH, Ting H, Chuah F, and Cham TH (2021). PLS-SEM statistical programs: A review. Journal of Applied Structural Equation Modeling, 5(1): 1-14. https://doi.org/10.47263/JASEM.5(1)06

Muths E and Fisher RN (2017). An alternative framework for responding to the amphibian crisis. Oryx, 51(2): 210-213. https://doi.org/10.1017/S0030605315001131

Sarstedt M, Ringle CM, and Hair JF (2014). PLS-SEM: Looking back and moving forward. Long Range Planning, 47(3): 132-137. https://doi.org/10.1016/j.lrp.2014.02.008

Schubring S, Lorscheid I, Meyer M, and Ringle CM (2016). The PLS agent: Predictive modeling with PLS-SEM and agent-based simulation. Journal of Business Research, 69(10): 4604-4612. https://doi.org/10.1016/j.jbusres.2016.03.052

Tasri ES, Karimi K, and Muslim I (2022). The effect of economic variables on natural disasters and the impact of disasters on economic variables. Heliyon, 8(1): e08678. https://doi.org/10.1016/j.heliyon.2021.e08678 **PMid:35028461 PMCid:PMC8741454**

Wong KKK (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. Marketing Bulletin, 24(1): 1-32.