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Identification of the Factors on the Effective Establishment of Community-oriented Crisis Management

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Original Article

Abstract

INTRODUCTION: In recent years, the community-oriented approach has been proposed as one of the approaches used in crisis management. Therefore, this study aimed to identify the factors affecting community-oriented crisis management in Iran.

METHODS: Initially, the subject of the study was defined and initial exploratory and library studies were conducted. Subsequently, the relevant factors and components were identified through the Delphi method and a researcher-made questionnaire and were then provided to the experts to give their opinions. These factors and components underwent analysis by statistical methods after that the qualitative and quantitative corrective opinions of the experts were received. Finally, the experts' consensus was reached regarding the appropriateness of the model, components, and the combination of factors. The study population in this section consisted of 28 academics and professionals familiar with the subject selected using a judgmental sampling method. Subsequently, to test the model, a researcher-made questionnaire was distributed among 353 selected individuals of the local community of South Khorasan Province, Iran, who were selected by random clustering method .The collected data in this section were analyzed in Smart PLS software (version 3) using confirmatory factor analysis.

FINDINGS: The research findings included the validation of the model through the Delphi method and the test of the final model through confirmatory factor analysis.

CONCLUSION: The results showed that four categories of preventive, preparatory, confronting, and reconstructive factors were effective on community-oriented crisis management, among which, preparatory factors with an impact factor of 33.5 had the greatest impact on community-oriented crisis management.

Keywords: Community-oriented Approach; Confirmatory Factor Analysis; Crisis Management; Delphi Method.

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Introduction

Today, the occurrence of natural disasters as recurring phenomena (1) is considered a serious threat to the inhabitants of the planet (2). It is said that natural disasters and subsequent catastrophes in the last 20 years have affected about 800 million people worldwide and have killed numerous people and damaged the economy for more than $50 billion in the last decade (3). Therefore, to prevent and reduce the human and financial effects of such disasters, a crisis management system has been developed that can be adopted to manage and organize various natural disasters that have already occurred or may occur in the future (4). Iran is one of the 10 most disaster-prone countries in the world, in which, according to statistics, 31 out of 40 types of natural disasters occur in Iran. The existence of such natural disasters in Iran has made this country one of the top 10 countries in the world in terms of disaster (5), which is a factor in minimizing the catastrophic dimensions of such events and establishing a comprehensive crisis

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management system in the country (6).

However, the evidence in the country shows that the crisis management process has fluctuated a lot, and achieving an effective crisis management system and its successful implementation has always been one of the main challenges in this field. Moreover, the investigation of how natural disasters are dealt with in the country has revealed that different governments have focused on reconstruction in the crisis management cycle. For this reason, the determination of preparation mechanisms has been neglected to some extent in development programs to achieve sustainability, and therefore, reduce environmental and human vulnerability to natural disasters (7).

Due to the lack of preventive and controlling approach in crisis management among the officials and managers in this field, the damages and destructive consequences of natural disasters in the country are very high and often higher than the global average. This issue highlights the need to use a comprehensive and coherent crisis management system in which the necessary forecasts and measures to reduce the damages caused by natural disasters has been considered more (8). In this regard, the community-oriented crisis management approach is one of the approaches that is adopted to reduce vulnerability and increase the ability of high-risk communities.

In this approach, local people actively participate in all stages of identifying and analyzing disasters, risk reduction planning, and implementing crisis management programs and are at the center of decision-making (9). This measure can lead to the focus on finding the root causes of vulnerability, which in comparison with the mere attention to the occurrence of disasters, would moderate the mentioned weaknesses in the country's crisis management system (6). Therefore, this study aimed to identify the factors influencing the effective establishment of community-oriented crisis management in the country. In recent years, several studies have been conducted in the field of community-oriented crisis management and the factors affecting it in different societies. However, considering that the review of all studies is beyond the scope of this article, only some of the internal and external pieces of research are summarized in Table 1.

Table 1. Effective factors identified in relation to community-oriented crisis management in previous studies

Researchers	Research title	Identified factors	Source
Motahari and Rafeian (2016)	Explanation of a model for improving crisis risk management with a community-oriented approach, a case study: one of the local communities in Tehran, Iran	Social capital	(10)
Mahdavieh and Soleimanzadeh (2017)	Develop a community-oriented action plan to reduce accident risk, A Case study: sustainability plan of Fahadan neighborhood of Yazd, Iran	The level of local people's participation, the state of social and kinship relations among the people in the neighborhood, the residents' trust in the groups in the neighborhood	(11)
Azmi et al. (2016)	Role of indigenous people in understanding natural disasters and preparing for them in Zalouab rural district of the central part of Ravansar city, Kermanshah Province, Iran	Individual readiness to deal with natural hazards, knowledge and awareness of the people, education of the indigenous people	(12)
Heydari Sarban (2015)	Effects of social cohesion in earthquake crisis management from the perspective of residents, a case study: Northern Azoumodel, Varzeqan County, East Azerbaijan Province, Iran	Social coexistence, economic vitality, strengthening social relationships, knowledge sharing, strengthening self-worth, social intervention, strengthening interactions, social happiness	(13)

Table 1. Continued

Sarabia et al. (2020)	Challenges of impact assessment: An attempt to measure the effectiveness of community-oriented crisis management	Knowledge and readiness, social cohesion, natural asset management	(14)
Islam et al. (2020)	Structural, operational, and participatory factors in disaster sustainability programs: A case study of Bangladesh	Decentralization of leadership, capacity building of communities, application of people's experiences in relation to disasters	(15)
Nareth (2016)	Disaster management in Cambodia: Community-oriented crisis management	Capacity building, developing knowledge among local people, local people's participation in decision-making, using local resources, creating an atmosphere of participation among stakeholders	(16)
Liu et al. (2016)	Risk reduction of the community-oriented disasters in Evansu, China	Education, information analysis, rapid alert systems, emergency response	(17)
Linnell (2013)	Community-oriented approaches to crisis management	Capacity building, volunteering	(18)

Methods

The present applied study was conducted based on a descriptive-survey method. In this study, at first, the subject was defined, initial exploratory and library studies were performed, and the relevant factors and components determined through the Delphi method by a researcher-made questionnaire, which included 5-Likert scale options and an open-ended question to add possible new components, were provided to academic and professional experts familiar with the subject to be reviewed. Afterward, their opinions were obtained regarding the qualitative and quantitative correction (prioritization) of factors based on statistical methods of analysis, and finally, through model fit across three rounds, the components and factors reached the consensus of the experts.

The study population of this part of the study included 28 academic experts and professionals familiar with the subject selected using a judgmental sampling method. Subsequently, to examine the final research model, a researcher-made questionnaire was distributed among 353 individuals from local communities in South Khorasan Province, Iran, chosen by random clustering sampling method. Finally, the collected data were analyzed in SmartPLS software (version 3) using confirmatory factor analysis.

Findings

The research findings included validating the model through the Delphi method and testing the final model using confirmatory factor analysis.

Model validation

In this study, the Delphi method was used to confirm the obtained model. The first step in the Delphi method is to form a panel of experts and select its members. In this case, members are selected to apply their knowledge in a specific issue and based on criteria that are derived from the nature of the research problem (19). Accordingly, 28 academic and professional experts were chosen according to their level of education, familiarity with research methods, research background, and experience in the field of talent management and human resource sustainability (teaching, professional work, or both) using judgmental and snowball sampling methods. The demographic information of the selected panel members is presented in Table 2.

After determining the panel members, based on the available studies and the proposed model, a questionnaire was developed and was provided to the selected sample in order to determine the importance of each dimension, component, and indicator. To this end, in the first round, panel members commented on 4 variables, 17 components, and 71 codes extracted from successful research, and recognized various factors as having a high and very high effect (with a mean effect score of ≥ 4) in designing the model.

Kendall's coefficient of concordance (W) is

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Table 2. Demographic information of Delphi panel members

Academic experts				Non-academic (professional) experts					
Education level	**Academic Rank**	**n**	**%**	**Years of service**	**n**	**%**	**Education level**	**n**	**%**
PhD	Professor	1	3.57	Less than 10 years	5	33.33	PhD	3	10.71
	Associate Professor	4	14.28	۱۰ to 20 years	8	53.33	Masters	9	32.14
	Assistant Professor	10	35.71	More than 20 years	2	13.33	Bachelors	1	3.57
	Sum	15	53.56	Sum	15	۱۰۰	Sum	13	46.44
	Total				28				

used to determine the degree of consensus among the panel members in the Delphi method and ranges from zero (no agreement) to one (complete agreement) (20). In this round, the score of Kendall's W was obtained at 0.247 for members' replies about the order of the 71 factors that had a high and very high impact.

After that questionnaire the collected, the results were analyzed, and the panel experts' opinions were evaluated, in the second round, all the factors along with the average of the members' opinions in the first round and the previous opinion of the same member were provided to all panel experts. In this round, the panel members identified 47 out of the 71 factors presented in the second round as having a very high impact (with a mean of more than 4) on community-oriented crisis management with an emphasis on the retention of knowledge workers.

The Kendall's W was estimated at 0.482 for the members' responses to the order of the 71 factors having a high and very high impact in this round. In the third round, the same process was repeated considering the results of the second round. In this round, no factor was removed since according to the average of members' opinions, there was no factor of medium and lower importance (with a mean of less than or equal to 3). The list of 71 factors identified the panel members as having a high and very high impact in the second round of Delphi (with a mean of greater than 4) in designing the model, along with the average opinion of members in the second round and their previous opinions were provided to all panel members. In this round, members expressed their views on the impact of each of the 71 factors in designing the model. In addition, they had to determine the order of importance of the factors according to their opinion.

The Kendall's W was obtained at 0.682 for the members' responses about the order of the 71 factors with a high and very high impact in this round. Therefore, based on the theoretical logic and the usual Delphi procedure, since the quantitative statistical values and the number of specific consensus indicators increased in the three Delphi rounds, there was no need to continue the Delphi process in the fourth round, and according to the agreement, Delphi rounds were considered over. Moreover, the values of Kendall's W were obtained at higher than 0.7 for all factors in the third round, which indicated a strong consensus among experts regarding the presented concepts and factors. The findings of the Delphi method in all three rounds are presented in Table 3. Based on the results of the Delphi rounds, a consensus was reached among the panel members for the following reasons, and the Delphi method was terminated in the third round:

1. In the second round, more than 50% of the members chose 47 influential factors with a mean of > 4 as their first factor in designing the model of factors affecting community-oriented crisis management.

2. The standard deviation of members' responses regarding the importance of factors was significantly reduced in the third round, compared to previous rounds.

3. In the third round, Kendall's W was obtained at 0.682 for members' answers about the order of factors, which considering that there were more than 10 members in the panel, this Kendall's W was quite significant. Figure 1 shows a comparison of the results of the combined indices of the Delphi three rounds.

To determine the fitting of the conceptual model of research, the analysis algorithm model in the Smart- partial least squares (PLS)-Structural Equation Modeling (SEM) method was used in fitting of the overall model (measurement and structural). To this end, first, the accuracy of the relationships in the measurement models was confirmed using reliability and validity criteria; subsequently, the relationships in the structural part were examined and interpreted; and finally, the overall fit of the research model was

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examined.

Table 3. Comparison of the results of the consensus indicators of the Delphi three rounds

Factors	Components	Kendall's coordination coefficient		
		First round	Second round	Third round
Preventive	Optimal localization	0.250	0.536	0.841
	Physical resilience	0.219	0.503	0.806
	Institutional and managerial resilience	0.259	0.561	0.799
	Urban planning and design	0.264	0.572	0.816
Preparatory	Informing	0.469	0.669	0.962
	Support management	0.435	0.627	0.901
	Communication system	0.418	0.619	0.915
	Education	0.227	0.534	0.821
	Strategic integration	0.336	0.561	0.869
	Social capital	0.276	0.549	0.858
	Capacity building	0.384	0.682	0.981
Confrontive	Information system	0.352	0.571	0.866
	Rescue and relief operations	0.445	0.672	0.968
	Leading the Crisis Staff	0.361	0.594	0.892
	Using the media	0.397	0.602	0.927
Reconstructive	Economic resilience	0.315	0.548	0.706
	Normalization measures	0.281	0.568	0.746

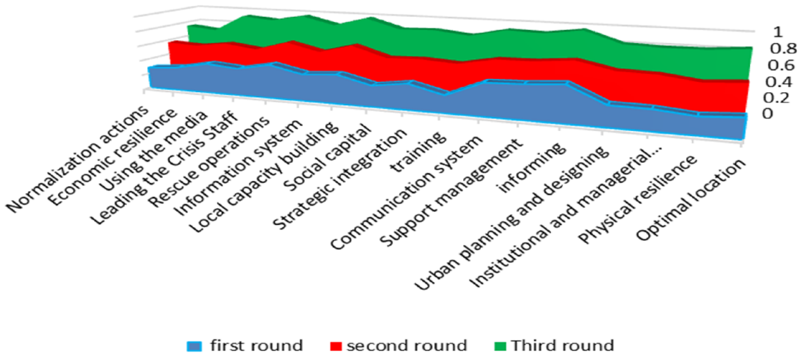

Figure 1. Comparison of the results of the consensus indicators of the Delphi three rounds

Model test

A) Measurement model fit

The reliability and validity criteria of the research components were used to evaluate the fitting of the measurement model. For this purpose, three criteria of factor loadings, composite reliability, and Cronbach's alpha coefficient were used to measure the reliability of the model. Moreover, two criteria of convergent validity and divergent validity were employed to assess the validity of the model.

Reliability assessment of the model

Factor loadings assessment: The reliability of each item refers to the number of factor loadings of each observed variable and is used to determine the extent to which the measurement indices (observed variables) are acceptable for measuring hidden variables (21). If the factor load is less than 0.3, the relationship is considered weak and ignored. However, the factor loadings between 0.3 and 0.6 are acceptable showing that the explanatory questions are suitable for the desired variable, and if it is more than 0.6, it is very desirable.

Composite reliability assessment

Composite reliability calculates the reliability of structures, not absolutely, rather according to the correlation of structures with each other (22), which should be greater than 0.7.

Cronbach's alpha assessment

Cronbach's alpha is a suitable criterion for assessing internal consistency (internal compatibility) (23), the value of which should be greater than 0.7. Table 4 presents the factor loading

Table 4. Results of factor loading, composite reliability, and Cronbach's alpha coefficients of model structures

Second-order structures	First-order structures	Question	Factor loading >0.4	Composite reliability >0.7		Cronbach's alpha >0.7	
Preventive factors	Optimal localization	Q1	0.481	0.807	0.889	0.776	0.832
		Q2	0.800				
		Q3	0.834				
		Q4	0.759				
	Physical resilience	Q5	0.787	0.910		0.877	
		Q6	0.741				
		Q7	0.735				
		Q8	0.879				
		Q9	0.851				
	Institutional and managerial resilience	Q10	0.790	0.900		0.861	
		Q11	0.788				
		Q12	0.820				
		Q13	0.820				
		Q14	0.789				
	Urban planning and design	Q15	0.678	0.824		0.715	
		Q16	0.867				
		Q17	0.564				
		Q18	0.728				
Preparatory factors	Informing	Q19	0.714	0.860	0.942	0.800	0.928
		Q20	0.708				
		Q21	0.823				
		Q22	0.862				
	Support management	Q23	0.947	0.939		0.871	
		Q24	0.934				
	Communication system	Q25	0.689	0.846		۰.۷۷٦	
		Q26	0.691				
		Q27	0.678				
		Q28	0.824				
	Education	Q29	0.729	0.913		0.873	
		Q30	0.819				
		Q31	0.836				
		Q32	0.883				
		Q33	0.864				
	Strategic integration	Q34	0.851	0.917		0.880	
		Q35	0.874				
		Q36	0.846				
		Q37	0.859				
	Social capital	Q38	0.858	0.885		0.829	
		Q39	0.793				
		Q40	0.820				
		Q41	0.775				
	Capacity building	Q42	0.776	0.870		0.810	
		Q43	0.879				
		Q44	0.831				
		Q45	0.741				
		Q46	0.528				
	Information system	Q47	0.884	0.925		0.891	
		Q48	0.813				
		Q49	0.904				
		Q50	0.871				
Confronting factors	Rescue and relief operations	Q51	0.771	0.915	0.959	0.874	0.944
		Q52	0.887				
		Q53	0.839				
		Q54	0.911				
	Leading the Crisis Staff	Q55	0.725	0.922		0.894	
		Q56	0.853				
		Q57	0.907				
		Q58	0.855				
		Q59	0.846				
	Using the media	Q60	0.908	0.928		0.896	
		Q61	0.60				
		Q62	0.932				

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Table 4. Continued

		Q63	0.790				
Reconstruction factors	Economic resilience	Q64	0.880	0.890	0.923	0.834	0.833
		Q65	0.855				
		Q66	0.787				
		Q67	0.745				
	Normalization measures	Q68	0.935	0.919		0.880	
		Q69	0.856				
		Q70	0.877				
		Q71	0.763				

coefficients, composite reliability values, and Cronbach's alpha coefficients of the model structures.

According to Table 4, the value of factor loading coefficients for all questions was more than 0.4, which indicated a high level of correlation with the observed variables. Furthermore, Cronbach's alpha and composite reliability for all structures were higher than 0.7; therefore, it can be said that all structures had high reliability in the model.

Model validity assessment

Convergent validity assessment: Convergent validity examines the degree of correlation between each structure and its questions (indicators). In order to measure the convergent validity, the average variance extracted (AVE) is used (23), the value of which should be greater than 0.5. The value of AVE for model structures is summarized in Table 5. According to the results of Table 5, the AVE of all structures was higher than 0.5; regarding this, it can be said that the degree of correlation of each structure with its indicators was at a desirable level.

Divergent validity

Divergent validity compares the degree of correlation between the indices of a structure with that structure and the degree of correlation between the indices of a structure with other structures. If it is determined that the degree of correlation of an index with another structure other than its structure is greater than the degree of correlation of that index with its structure, the validity is questioned. The validity of the structure is investigated using two methods of cross-loadings and the Fornell-Larcker methods (21); in this study, the Fornell-Larcker method was used.

In this method, the relationship between a structure and its indicators was compared with the relationship between that structure and other structures through a matrix whose cells contained the values of the correlation coefficient between the structures and the square root of the AVE values for each structure. Table 6 summarizes the divergent validity matrix using the Fornell-Larcker

Table 5. Average variance extracted of model structures

Second-rank structure	First-rank structure	Average variance extracted ≥0.5	
Preventive factors	Optimal localization	0.528	0.668
	Physical resilience	0.671	
	Institutional and managerial resilience	0.642	
	Urban planning and design	0.543	
Preparatory factors	Informing	0.608	0.701
	Support management	0.885	
	Communication system	0.525	
	Education	0.724	
	Strategic integration	0.735	
	Social capital	0.659	
	Capacity building	0.579	
Confronting factors	Information system	0.755	0.855
	Rescue and relief operations	0.729	
	Leading the Crisis Staff	0.705	
	Using the media	0.764	
Reconstruction factors	Economic resilience	0.671	0.857

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	Normalization measures	0.739	

Table 6. Divergent validity matrix by Fornell-Larcker method

Second-order structures	Preparatory factors	Reconstructive factors	Confronting factors	Preventive factors
Preparatory factors	0.907	-	-	-
Reconstructive factors	0.838	0.926	-	-
Confronting factors	0.818	0.874	0.925	-
Preventive factors	0.814	0.664	0.761	0.818

B) Structural model fit

method. According to Table 6, the square roots of AVE of each structure (latent variables), located in the main diameter cells of the matrix, were greater than the correlation value between them in the lower and left cells of the main diameter. Therefore, it can be said that model structures had more interaction with their indicators than with other structures.

To evaluate the fit of the structural model by the PLS method, the criteria of t-values, coefficient of determination (R Squares or R^2), and Stone-Geisser (Q^2) were used.

Significance t-value: The significance of the relationship between the questions and the specified structure is examined based on the t-value, the absolute value of which needs to be greater than 1.96 to indicate the significant relationship between each question and the specified structure. Figure 2 depicts the significant t-values.

According to Figure 2, the absolute value of t for all questions was obtained at greater than 1.96; therefore, it can be said that the relationship between each question and the specified structure was significant.

Determination coefficient (R Squares or R^2)

This criterion is used to connect the measurement part and the structural part of the SEM and expresses the effect of an exogenous variable on an endogenous variable (24). Accordingly, the three values of 0.19, 0.33, and 0.67 indicate weak, medium, and strong values of R^2, respectively; regarding, higher values show the goodness-of-fit of the model. Figure 3 shows the factor loading coefficients of each model structure and the values of the coefficient of determination.

Stone-Geisser criterion (Q^2): This criterion determines the predictive power of the model, and the models that have an acceptable structural fit should be able to predict the indices of the endogenous structures of the model (23). The three values of 0.02, 3.15, and 0.35 indicate weak, medium, and strong predictive powers, respectively. The values of R^2 and Q^2 are shown in Table 7.

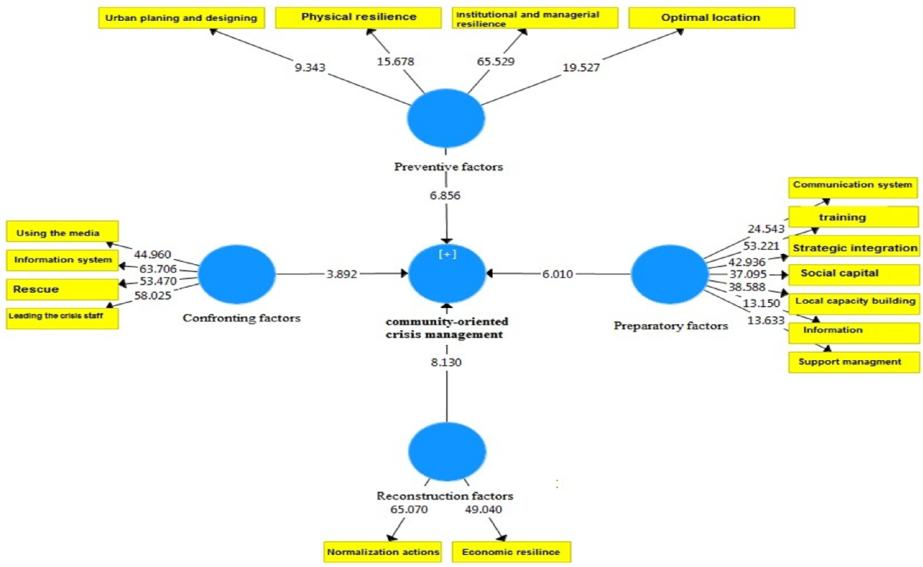

Figure 2. Significant t-values

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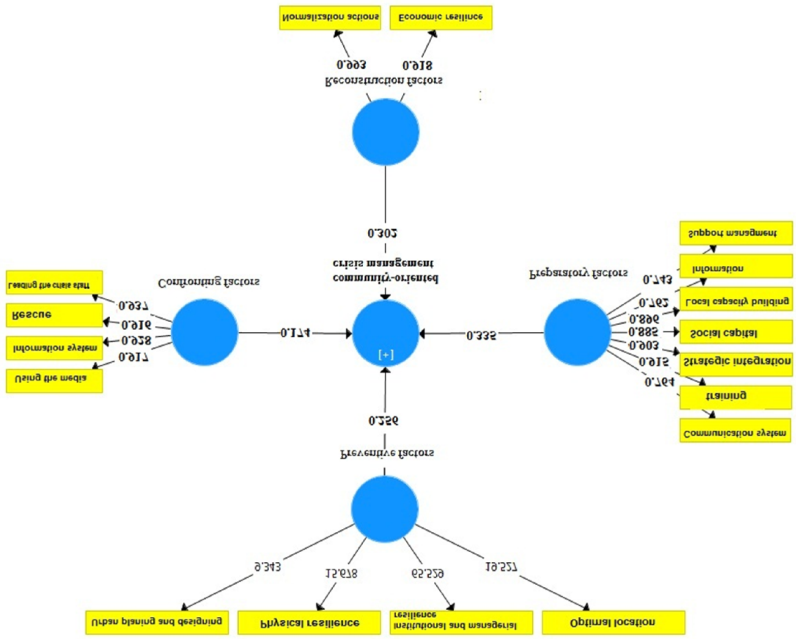

Figure 3. Factor loading and determination coefficients of in the standard estimation model

Table 7. Determination coefficient and Stone-Geisser criterion values of model structures

Structure	Determination coefficient ≥0.19, 0.33, and 0.67	Stone-Geisser criterion ≥0.02, 0.35, and 3.15
Community-oriented crisis management	0.723	0.659

According to Table 7, the values of R^2 for all model structures were greater than 0.67. Furthermore, the value of Q^2 for all model structures was obtained at more than 0.35, which indicated the strong predictive power of the model for these structures and confirmed the goodness-of-fit of the structural model.

C) Overall model fit

After examining the measurement and structural parts of the model, the overall model fit was performed through the goodness of fit (GOF) criterion. This criterion was calculated using Equation 1:

$$GOF=\sqrt{\overline{(communality)} \times \overline{(R^2)}}$$

Equation 1. GOF value formula

where communality represents the mean of the common values of each structure and R^2 is the mean value of $\bar{R}^2$ of the endogenous structures of the model.

The GOF value in the model is:

$$GOF=\sqrt{\overline{(communality)} \times \overline{(R^2)}} = 0.861$$

The standard value of GOF for the research model was obtained at 0.861, which according to the three values of 0.01, 0.25, and 0.36 representing weak, medium, and strong values for GOF, respectively, indicated a strong overall model fit.

Discussion and Conclusion

Natural disasters are among the potential threats that have always targeted the health and property of people in society. This issue highlights the need for special attention of various government structures to the designing and implementing of crisis management systems. The crisis management process in Iran has fluctuated widely and the evidence suggests that different governments have focused more on curing the consequences of disasters and addressed their efforts on confronting and reconstruction stages in the crisis management cycle (6). Therefore, to solve this problem, the country's officials and policymakers are required to turn to new approaches to crisis management, including a community-oriented approach, in order to reduce the vulnerability of regions to the crisis.

Accordingly, the present study was conducted

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to present a comprehensive model of factors affecting community-oriented crisis management, as a result, through its better understand, it would be possible to adopt policies and programs of the country in line with establishing the most effective community-oriented crisis management process. Therefore, according to the studies conducted in this domain, open system of analytical logic, and experts' opinions, finally, the effective factors on community-oriented crisis management were categorized in 4 dimensions (preventive factors, preparatory factors, confronting factors, and reconstruction factors), 17 components, and 71 indicators.

In terms of prioritizing the components of the four factors, the most important factors affecting the community-oriented crisis management in the country were selected as optimal localization in the preventive factors, capacity building in the preparatory factors, rescue and relief operations in confronting factors, and normalization measures in reconstruction factors. In other words, in the crisis prevention phase, more attention should be paid to the distance of vulnerable buildings and places from high-risk areas, such as faults, rivers, river estuaries, and high-risk equipment. On the other hand, the proximity of susceptible buildings and places to roads and communication networks, medical centers and fire stations, and open spaces should also be considered. In addition, in the crisis preparedness phase, more emphasis should be placed on strengthening the ability of local communities; developing self-sufficiency in individuals; strengthening existing local capabilities and facilities; developing individuals' skills, knowledge, and self-confidence, and paying attention to women and vulnerable groups. In the crisis confronting phase, the authorities should consider the establishment of rescue and relief units, timely delivery of relief forces to the affected areas, the provision of emergency services and facilities, and the provision of psychological assistance.

Finally, in the post-crisis reconstruction phase, more emphasis should be given to the distribution of materials and facilities among the survivors, the psychological support of the survivors, the renovation of the infrastructures, and the return of the normal life in the affected areas. Subsequently, in order to test the obtained model, the confirmatory factor analysis method is used. The results of this part of the research showed that the model of the present study has a good fit. Moreover, the values related to path coefficients in the final model of the study showed that preventive, preparatory, confronting, and reconstruction factors could directly explain 6.25%, 33.5%, 17.4%, and 33.2% of the changes related to the community-oriented crisis management variable, respectively. Therefore, it can be said that the preparatory factors had the greatest impact on the process of community-oriented crisis management in the country, which in comparison with previous research in this field, the results of this part of the study was in agreement with those reported by Mahdavieh and Soleimanzadeh (2017), Motahari and Rafeian (2016), Azmi et al. (2015), Heidari Sarban (2015), Sarabia et al. (2020), Islam et al. (2020), Nareth (2016), Liu et al. (2016), Linnell (2013).

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Conflict of Interests

Authors declared no conflict of interests regarding the publication of the present study.

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