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Validating the identification and control model of effective factors in strategic crisis management in road accidents

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Abstract

Nowadays, the number of road accidents in Iran is on the increase. Therefore, the financial loss by such accidents which are imposed on households and the government is very high. Since the financial, psychological, and social harms are sometimes irreparable, it is required to think of effective solutions. This study was applied and quantitative in terms of objective with a survey approach to validate the identification and control model of factors affecting strategic crisis management in road accidents. Data collection was conducted using a 50-item questionnaire based on the model developed by the researchers and a survey of 100 employees of the General Directorate of Roads in Kerman province. The results indicated that causal factors affect the main category at 0.705, the main category affects strategies at 0.379, intervening factors affect strategies at 0.129, underlying factors affect strategies at 0.457 and finally, strategies affect consequences at 0.849 all with a 95% confidence level.

Keywords: strategic crisis management, road safety, road accidents
2020 MSC: 68V30, 90B06 , 90B50

1 Introduction

Based on the vision document of the Islamic Republic of Iran in the horizon (2025) considering the Iranian society as a developed society in line with cultural requirements, social justice, preserved dignity and human rights, social security, health, prosperity, and security, it should be noted that development has to be regarded with a human-centered nature so that humans are seen as the focus and audience of the development plan [7]. Thus, it is necessary to study the solutions to this problem since the management of development in Iran is one of the major tasks and is among the required infrastructures for sustainable development, security, safety, and among the most significant issues of safety, reduced number of dead and injured, as well as human casualties [26].

The head of Iran's Crisis Management Organization has stated that the number of people killed in road accidents is still high despite broad culture building in recent years so that about 17000 people are killed and 250000 people are injured in road accidents annually, of whom at least 10% are disabled. Kerman province is one of the big and central provinces of Iran and is considered the main road from the north to the south, having significant roads such as Jiroft, Raver, Kahnuj, etc. Significant statistics of road accidents and injuries are always reported from these roads weekly or monthly. As a result, the factors leading to the management of road crises should be identified in a research-oriented

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and scientific way. Specific purposes such as describing the road safety status on all roads, determining the distance of road safety on different roads, and monitoring the progress in the road administration to implement codified and operational parameters for enhancing safety and managing road accident crises. providing fundamental information which allows the monitoring of international policy processes and the achievement of road safety goals are of paramount importance [14].

The crisis management system involves three phases as follows: Actions before the occurrence (prevention), actions during the occurrence (counteraction), and actions after the occurrence (recovery). The appropriate implementation of this system reduces the effects and consequences related to life, as well as financial and environmental results such as preventing harm to employees as the main assets of companies, reducing lags in production, reducing loss to properties, preserving the properties continuously, reducing environmental damages, preventing the spread of emergency states to the society and harms to people and public properties, reinforcing the confidence in public credit of National Oil Company subsidiaries, and recovering after emergencies quickly [6].

In addition, the World Health Organization (WHO) has mentioned that road accidents are the most critical cause of premature death, especially in developing countries. Iran's share in accidents is 20 times that of industrialized countries which has made road accidents considered a social phenomenon in this country. This issue needs the understanding of infrastructure dimensions such as cultural, psychological, social, medical, road safety, causes of road accidents, and so on. The management and control of roads and a decrease in accidents are among the main safety issues of suburban roads. Furthermore, three factors vehicle, road, and climatic conditions play a key role in causing accidents [21]. The role of crisis management is highly essential in the decrease and management of road accidents [29]. One of the basic principles of crisis management is forecasting future events by using past experiences so that crisis managers prepare for upcoming events. This cannot be achieved unless the crisis managers analyze the sequence of events appropriately and design a documented justifiable plan.

In this regard, the occurrence of road accidents is one of the consequences of the road transport network, causing abundant problems such as loss of life, congestion, waste of time, and conflicts among citizens. A disciplined and efficient transportation system must be organized in a way that the problems and negative effects caused by accidents are solved in the simplest and most efficient possible way. For this purpose, an accident management model should be considered in understanding all factors affecting road crises and accidents [2]. Different factors can be effective in the management of road accident crises. Researchers consider the role of human factors such as increasing attention to rules, reducing haste, reducing fatigue and sleepiness, wearing seatbelts, and not doing additional work while driving, or the factors related to the road such as improving road subsidence, standard road protection, standard transverse and longitudinal slope, asphalt surface, and improved street lighting as important [29]. Further, vehicles should be considered free of steering system defects, brake system defects, lighting system defects, engine defects, as well as environmental factors such as preparation for floods, earthquakes, bad weather, etc. [32]. However, these factors have been studied in a scattered way or related to specific features such as specific and short-term periods, specific weather conditions, and merely economic or specific political surveys. Nevertheless, there should be a comprehensive look at all the factors causing road accidents internally and externally. In addition, the role of crisis management and its dimensions in the control and management of these factors should be identified and strengthened with a survey of experts in Iran's road industry and managers of the road sector to extract a comprehensive view.

Since Kerman province is one of the big and central provinces of Iran and is considered the main road from the north to the south, having significant roads such as Jiroft, Raver, Kahnuj, etc. and significant statistics of road accidents and injuries are always reported from these roads weekly or monthly, the main question of this study is "What is the validity of the identification and control model of factors affecting strategic crisis management in road accidents?"

2 Literature review

2.1 Crisis management

Crisis management is often used for describing the solutions of an organization or a system to control the crisis [25]. Crisis management has a process with four steps. Numerous management models are available in the private and public sectors for crisis management. However, the definition of crisis management shows that crisis management is a process that is possible through integrated capabilities. Crisis management focuses not only on preparation activities and the tasks which should be fulfilled during a crisis but also on identifying and forecasting why crises occur and how they should be distinguished from accidents [21].

2.2 Road crisis management

Road transport is the most common method among the different modes of transportation (road, rail, air, and sea) because of its distinctive features. If the road transport network is damaged due to severe crises and accidents, there will be huge casualties and financial losses, and sometimes impossible compensations. More than 1.2 million people die in road accidents around the world every year and millions of people suffer serious injuries, the result of which affects their healthy life in the long term. Road crises leave huge damage in the cities in this regard the amount of damage caused by the crisis in its first hours should be decreased. The main objective to use crisis management in the transport network is to reach a transport network with optimal performance. The favorable performance involves the possibility of moving cargo and passengers to the required points in the required amount with acceptable time, cost, safety, quality, and reliability. Natural disasters are among the significant problems which endanger the roads and cause crises problems caused by the crisis. The dangers caused by natural disasters and accidents are increasing in the world every day. As a result, governments should provide appropriate programs and use appropriate management and preventive methods to reduce human casualties and financial losses at the time of such incidents. Earthquakes, floods, rock falls, avalanches, tsunamis, landslides, storms, etc. are among the natural disasters endangering transportation and road infrastructure. The problems caused by road crises include the destruction of structures and residential buildings, road networks, accesses such as bridges and communication roads, and basic facilities such as water tanks, power plants, telephone communication lines, electricity, water piping, gas, etc. Thus, it is significant to consider road transportation infrastructure [11].

Forecasting is mainly the best issue in the management of road and traffic crises. In addition, forecasting is scientific and methodical thinking in the light of which future studies are conducted. Forecasting is considered a scientific and methodical system and future studies mean its implementation technology and traffic crisis management. In other words, it means taking advantage of the factors which are used for optimizing and reducing the damages caused by the traffic crisis using a specific model. Studies indicated that the traffic crisis management process involves the forecast, assistance, organization of forces, and reconstruction. Taking these steps appropriately leads to the continuation of life, economic savings, as well as the preservation of economic and social centers. At first, precautionary measures must be determined. The required precautions depend on the factors below:

- Making a list of preventive measures for the management of emergencies;
- Evaluating the structure and geographical dispersion and the cognitive population column and the connected network;
- Identifying different tasks of security, assistance, and services;
- Identifying the existing and related rules and processes;
- Conducting analytical studies and explaining feasible scenarios.
- To provide a comprehensive model for pre-crisis management in road crises, three components should be considered as follows:
  - Components of forecasting road crises;
  - Components of preventing road crises;
  - The preparedness of road-related organizations in crisis management

2.3 Road safety

Road safety is considered the pre-accident safety issue which reduces accident damages and casualties. In other words, road design should provide the possibility of safe traffic and prevent accidents as much as possible. Safety is one of the inseparable factors of life which becomes highlighted in activities such as driving. Road safety is normally defined by the absence of accidents and fatalities. The significance of this issue is typically measured reversely. Road safety is a complicated issue that involves different components. To achieve the desired level of road safety, a deep understanding of road safety and all the effective components should be made to estimate the effect of each component and achieve road safety by allocating the limited budget optimally. According to researchers, comparing the safety performance will not help understand the fundamentals of road safety and solve it merely by including the number of fatalities and road accidents [19].

Numerous methods have been presented for evaluating road safety such as the economic-social evaluation methods of road safety programs including multi-criteria analysis methods, cost-benefit methods, and structural methods of road safety evaluation such as data mining and statistical methods. Among the above-mentioned methods, the appropriate methods for evaluating road safety can analyze the maximum road safety parameters and their interactions simultaneously such as the methods based on composite performance index, and data envelopment analysis. and data mining. Other types of methods such as benefit-cost can be regarded as a supplement to these methods. The simplest and the most complete definition of the word "safety" may be the degree of being away from danger, accident, and harm. In the scientific definition of safety, it refers to a condition where the potential for any harm to humans and equipment is at a minimum and controlled. The issue that many people neglect is that safety is a relative and comparative factor and cannot be regarded as absolute. Safety attempts to prevent the actualization of potential risks and it is natural that the level of safety and protection can never be 100%. The level of safety cannot be defined without regarding the current factors and restrictions or comparing different conditions and it is impossible to completely prevent the occurrence of risk and harm. For this reason, we believe that safety is not absolute and can be obtained by comparing risk in different conditions and is practically a relative protection from risk and harm. In the case of driving and accidents, three factors the road, human, and vehicle play a key role in the probability of an accident [8].

2.4 Road accidents

Road accidents are currently regarded as a social problem in the world, killing many people annually and causing huge economic costs to society. so more than 3000 people die because of road accidents around the world every day and if it continues, road accidents are predicted to be the fifth cause of death in 2030 [13]. To deal with such a public health and socio-economic problem, the United Nations in Global Goals (2017) proposed Goal No. 3 to halve the number of casualties and caused injuries in the world. Road accidents are considered the second cause of death in Iran in terms of the number of victims. It should be noted that more than a third of hospital beds in Iran are allocated to road accident victims. However, road accidents are the ninth cause of death on average throughout the world. Harms caused by trauma, especially vehicle accidents are the seventh cause of death in developed countries including the United States [10].

Several 235 thousand people were killed and 2 million and 221 thousand people were injured due to driving accidents in Iran during the last 10 years. More than 30000 people die annually due to road accidents. In addition, precious efforts have been made in Iran in recent years to establish a modern city, develop highways and roads, and use advanced technical methods of traffic guidance and control. Unfortunately, the number of traffic anomalies and road accidents has not reduced in line with such developments. Furthermore, the statistics of road accidents that manifests the anomalies in Iran are still 12 times the world standard. The one-year consequence of traffic in the cities and roads of Iran is over seven hundred billion Tomans in financial loss and 27000 deaths and around 280000 injuries [9]. Multiple studies have been carried out to propose road accident forecast and analysis models in the context of the social, economic, cultural, and development conditions of Iran, revealing the difficulty of proposing a single forecast or analysis and such a model works in all fields.

2.5 Factors affecting road accidents

Haddon [15] classified the factors affecting road accidents into the main category of behavioral factors or driver's performance, the factors related to vehicle performance, and the factors related to the environment and road infrastructure [12]. Due to the effect of roads, humans, and vehicles in forming the image of road safety in a society, it is required to search for appropriate measures as a puzzle forming this image of safety. Awareness about the safety conditions on the roads (accident rate and technical specifications), domination of classifying the budgets, identification of needs and defects in the road safety condition, and ultimately the selection of the correct and optimal solutions in response to such needs can put the safety management system in the framework of asset management [17]. Intelligent transportation systems apply a set of technologies and equipment such as advanced sensors, processors, and information and communication technology in the transportation system enabling the different sectors of transportation management to interact with each other automatically so that the transportation network is managed in a coordinated way [36]. Accordingly, the hypotheses below have been proposed and tested to achieve the research objectives:

1. Causal factors have a significant relationship with road safety management (axial category).
2. Road safety management (axial category) has a significant relationship with strategies.
3. Intervening factors have a significant relationship with strategies.
4. Underlying factors have a significant relationship with strategies.

5. Strategies have a significant relationship with consequences.

Previous studies and official reports have investigated a variety of factors in the occurrence of road accidents and reduction of road safety. Factors such as driving without considering the climatic conditions and not having a snow chain and winter equipment or lack of trust in the vehicle conditions, not observing the safe speed, not observing the longitudinal distance, not paying attention to rules and signs, not revealing the signs, increasing the number of signs, using night signs in low-speed vehicles, not fastening the seat belt by all vehicle passengers, not using the capabilities of rural governors to spread the appropriate culture of driving on rural roads, not training people about rescue (since the lack of training leads to more harms to the injured), not having coordination among the aid forces of the Red Crescent, emergency services, firemen, and police about rescue and relief, not having equipment for rescue centers and construction of trauma units in the hospitals across the country, not having coordination among the responsible bodies in the field of acculturalization, especially the increase of tolerance in driving based on speed control signs, not observing the right of way and using flyovers, etc., which should begin from a young age, not having coordination in relevant organizations to place special signs and markings in high-risk areas, not having development in the roads to conform to the number of vehicles, not correcting the U-turns, dangerous turns, etc. [1, 5, 6, 10, 16, 20]. Fig. 1 displays the paradigmatic model of factors affecting road safety crisis management:

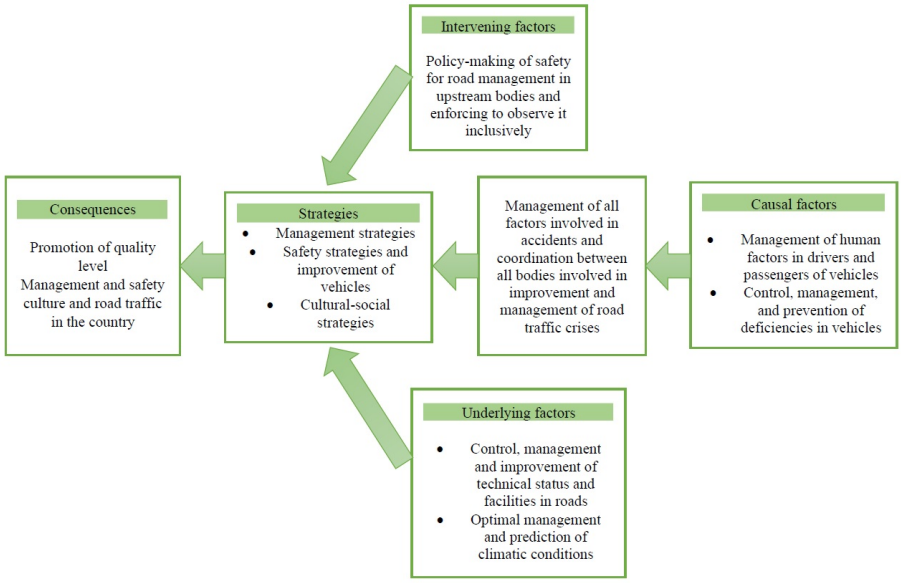

Figure 1: Paradigmatic model of "Factors affecting road safety crisis management"

Here are some similar researches conducted in the field of the present study. Samadian and Jafari [29] in a study entitled "Identification and prioritization of factors affecting road accidents" indicated that out of 55 identified and prioritized sub-themes, 17 sub-themes were related to human factors, 16 sub-themes were related to road factors, 13 sub-themes were related to vehicles, and 9 sub-themes were related to environmental factors. Alavi and Esfandiari [3] in a study entitled "Evaluating the performance of provinces in road transport safety" revealed that the first 31 provinces were compared to each other without any classification to the safety performance indicators introduced in the statistical yearbook so that East Azarbaijan, Alborz, Khuzestan, Sistan Baluchistan, Qazvin, Golestan, Gilan, Lorestan, Markazi and Hamedan provinces were recognized as ineffective. Then, the provinces were classified into three categories according to the number of freight and passenger trips made and then each province was compared at its traffic level in terms of efficiency status. At this step, Golestan, Sistan and Baluchistan, Markazi, Hamedan, Gilan, Alborz, and Lorestan provinces were recognized as ineffective. The results of implementing the Anderson-Peterson method reported Tehran, Isfahan, and Khorasan Razavi provinces as the top three provinces, respectively. Mousavi et al. [21] in a study entitled "Strategies to organize and decrease the vulnerability of vital arteries with a crisis management approach (Case study: Yazd-Shiraz communication axis)" realized that not considering the principle of location in access to inter-road services and equipment or not regarding the principle of optimal dispersion in creating roadside parking lots have often been studied as the main cause for the increased road accidents along the evaluated axes. The strategy of overcoming with the use of appropriate approaches such as safety signs, lighting, and equipment, identification, prioritization, reduced high-accident points, and roadside parking lots in line with the standard distance, particularly on steep routes can enhance road transportation and reduce weaknesses and threats.

Vakilaroaya and Zargar [34] in a study entitled "Analysis on the priority of factors affecting road accidents (Case study: Semnan province roads)", found that the human factor had the maximum effect on road accidents and then vehicles, road, and environment were ranked. Gholami et al. [11] in a study entitled "The vulnerability of road transport infrastructure and implementation solutions from the perspective of crisis management in Iran" concluded that providing the correct government program and applying appropriate management and preventive methods are required to reduce human casualties and financial loss in such accidents. Earthquakes, floods, rockfalls, avalanches, tsunamis, landslides, storms, etc. are considered natural disasters which endanger transportation and road infrastructure. Destroying residential structures and buildings, road networks and accesses such as bridges and communication roads, and fundamental facilities such as water tanks, power plants, telephone communication lines, electricity, water piping, gas, etc. are considered the problems caused by road crises.

Casado-Sanz et al. [5] in a study entitled "Analysis of the risk factors affecting the severity of road accidents in cross-town roads in Spain, the driver's point of view" realized that factors such as side crossing roads, low traffic, higher percentage of heavy cars, wider lanes, lack of marking, and violations increase the severity of injuries to drivers. Yakupova et al. [35] in a study entitled "Factors affecting the rate of road traffic injuries" indicated that the factors such as climatic conditions, road and infrastructure parameters, driver's condition, type of accident, and type of violation leave a significant effect on the target variable of determining the severity of accident - the number of road traffic injuries. Eboli et al. [8] in a study entitled "Factors affecting the severity of the accident: Analysis based on the type of road accident" concluded that the relevant factors in their study were categorized into various groups of road, external environment, and driver. [22] in a study entitled "Crisis management in organizations with high reliability: Some lessons from air and road disasters in Brazil" indicated that management and operational activities aimed to preserve the required conditions which prioritize a high level of reliability. High reliability generally includes concerns about failure, unwillingness to accept simple interpretations, sensitivity to operations, commitment to flexibility, and precise structural specifications. Salmon et al. [28] in a study entitled "Bad behavior or social failure? Perception of factors affecting drivers' involvement in five fatal driving behaviors" showed that there are factors in the system to show where based on an ergonomic system model of the road transport system in Queensland, Australia. In addition to the factors related to drivers' knowledge, experience, and personality, some additional factors have been identified at higher levels of the road transportation system in line with a road safety policy, transportation system design, road rules, and social issues.

3 Methodology

This study was applied in terms of objective and survey in terms of nature and aimed to validate the identification and control model of factors affecting strategic crisis management in road accidents. Data collection was conducted using a 50-item questionnaire based on the model developed by the researchers of this study and a survey of 100 employees at the General Directorate of Roads in Kerman province. The model used in this study was obtained from the grounded method in the previous studies using interviews as shown in Fig. 1. Confirmatory factor analysis was used for measuring the questionnaire validity and Cronbach's alpha coefficient was used for measuring the reliability. Structural equation modeling was used with the help of Smart PLS software for testing the hypotheses.

4 Findings

4.1 The Kaiser-Meyer-Olkin (KMO) Test

This test is conducted for measuring the adequacy of the sample size. The adequacy index must be more than 0.7. In this study, the KMO index was equal to 0.701, indicating that the number of samples was adequate for factor analysis and the significance value of Bartlett's test was lower than 0.05. In the Bartlett test, which we will use in the rest of the text, the null hypothesis (H0) is formed based on the constancy of the variance k of the society, while the opposite hypothesis (Ha) indicates that at least two communities do not have the same variance. As we can see, the null hypothesis implies the homogeneity and homogeneity of all societies in terms of variance, while the opposite hypothesis rejects this hypothesis. In this way, if out of K population samples of size n_i and S_i^2 indicates the variance of the i^{th} community, then Bartlett's statistic is written as follows:

$$\chi^2 = \frac{(N-k)\ln(S_p^2) - \sum_{i=1}^{k}(n_i-1)\ln(S_i^2)}{1+\frac{1}{3(k-1)}\left(\sum_{i=1}^{k}\left(\frac{1}{n_i-1}\right)-\frac{1}{N-k}\right)}. \tag{4.1}$$

Note that the following limitation should be considered in this regard:

$$N = \sum_{i=1}^{k} n_i. \tag{4.2}$$

It is clear that the mixed variance is also calculated as follows:

$$S_p^2 = \frac{1}{N-k} \sum_i (n_i - 1) S_i^2. \tag{4.3}$$

According to this form of Bartlett's test statistic, which is defined as the square ratio of two standard normal distributions, asymptotically, the distribution of χ^2 or χ^2 with $k-1$ degrees of freedom will be zero. In this way, if the value of the statistic is greater than the α^{th} percentile of such a distribution, we assume zero:

$$\chi^2 > \chi^2_{k-1,\alpha}. \tag{4.4}$$

Table 1: Measurement of sample adequacy

Statistics		**Test**
0.701	Measurement of sample adequacy	The Kaiser-Meyer-Olkin (KMO)
457.086	Chi-square approximation	Bartlett's sphericity test
3	Degree of freedom	
0.000	Significance	

4.2 Normality test

In this study, the Kolmogorov-Smirnov test was used to check the normality of data. If the significance level (sig) for variables is higher than the test level (0.05), the data distribution will be normal. The result of this test is presented in Table 2. Based on Table 2, the significance level for all variables is lower than 0.05 which means the data is not distributed normally. According to the mentioned definition for the empirical distribution function, the Kolmogorov-Smirnov statistic is defined as follows:

$$D_n = sup_x |\widehat{F}_n(x) - F(x)|, \tag{4.5}$$

$\sup_x$ means to find the smallest upper bound for the distance between two empirical distributions and the true distribution over all values. It can be shown that if the observations are from the $F(x)$ distribution, the value of D_n tends to zero as the value of n increases.

Table 2: Kolmogorov-Smirnov test

Indicators	**Significance level**	**Test result**
Causal factors	0.000	Abnormal
Intervening factors	0.000	Abnormal
Underlying factors	0.000	Abnormal
Strategies	0.000	Abnormal
Consequences	0.000	Abnormal
Main Category	0.000	Abnormal

4.3 Measurement model test

Average Variance Extracted (AVE), composite reliability (cp), and alpha indicators were used to test the measurement model as presented in Table 3. The results indicate that all the variables have the criterion limit:

$$AVE = \frac{\sum \lambda_i^2}{n}. \tag{4.6}$$

Average Variance Extracted or AVE stands for Average Variance Extracted. This index was introduced by Fornell and Larcker in 1981. Convergent validity is checked based on the external model and by calculating the average variance extracted (AVE). The AVE measure represents the average variance shared between each construct with its indicators. In simpler terms, AVE shows the degree of correlation of a structure with its indicators, the higher the correlation, the better the fit. Fornell and Larcker believe that convergent validity exists when AVE is greater than 0.5.

Table 3: Composite reliability and Cronbach's alpha as reliability tests and average variance extracted (Ave) as a convergent validity test

Variable/indicator	**cr**	**AVE**	α
Causal factors	0.758	0.566	0.732
Intervening factors	0.790	0.519	0.719
Underlying factors	0.900	0.750	0.835
Strategies	0.849	0.553	0.865
Consequences	0.860	0.584	0.828
Main Category	0.911	0.515	0.898

4.4 Confirmatory factor analysis

Table 4 shows the factor loading of the items on the research constructs. The results indicate that all the observable variables are confirmed at this step due to the criterion limit of 0.7 and are not eliminated at the hypothesis testing step.

Table 4: Factor analysis for observable variables

Question	**Factor loading**	**Result**	**Question**	**Factor loading**	**Result**
1	0.744	Confirmed	26	0.873	Confirmed
2	0.783	Confirmed	27	0.884	Confirmed
3	0.799	Confirmed	28	0.875	Confirmed
4	0.754	Confirmed	29	0.838	Confirmed
5	0.713	Confirmed	30	0.725	Confirmed
6	0.741	Confirmed	31	0.794	Confirmed
7	0.729	Confirmed	32	0.741	Confirmed
8	0.752	Confirmed	33	0.759	Confirmed
9	0.806	Confirmed	34	0.704	Confirmed
10	0.831	Confirmed	35	0.758	Confirmed
11	0.792	Confirmed	36	0.796	Confirmed
12	0.755	Confirmed	37	0.732	Confirmed
13	0.796	Confirmed	38	0.796	Confirmed
14	0.745	Confirmed	39	0.800	Confirmed
15	0.751	Confirmed	40	0.764	Confirmed
16	0.721	Confirmed	41	0.788	Confirmed
17	0.788	Confirmed	42	0.700	Confirmed
18	0.710	Confirmed	43	0.754	Confirmed
19	0.773	Confirmed	44	0.818	Confirmed
20	0.727	Confirmed	45	0.820	Confirmed
21	0.746	Confirmed	46	0.816	Confirmed
22	0.796	Confirmed	47	0.799	Confirmed
23	0.757	Confirmed	48	0.794	Confirmed
24	0.866	Confirmed	49	0.706	Confirmed
25	0.783	Confirmed	50	0.767	Confirmed

Table 5 presents the results of the divergent validity criteria.

Table 5: Fornell Larcker test

Variable	**1**	**2**	**3**	**4**	**5**	**6**
Causal factors	0.605					
Intervening factors	0.719	0.565				
Underlying factors	0.664	0.780	0.866			
Strategies	0.710	0.846	0.822	0.673		
Consequences	0.709	0.752	0.705	0.752	0.522	
Main Category	0.626	0.753	0.781	0.849	0.766	0.718

4.5 Structural model test

Figs. 2 and 3 display T-coefficients (significance coefficient) for the research paths and tested model in the significant and standard modes. T coefficients lower than 1.96 are not significant.

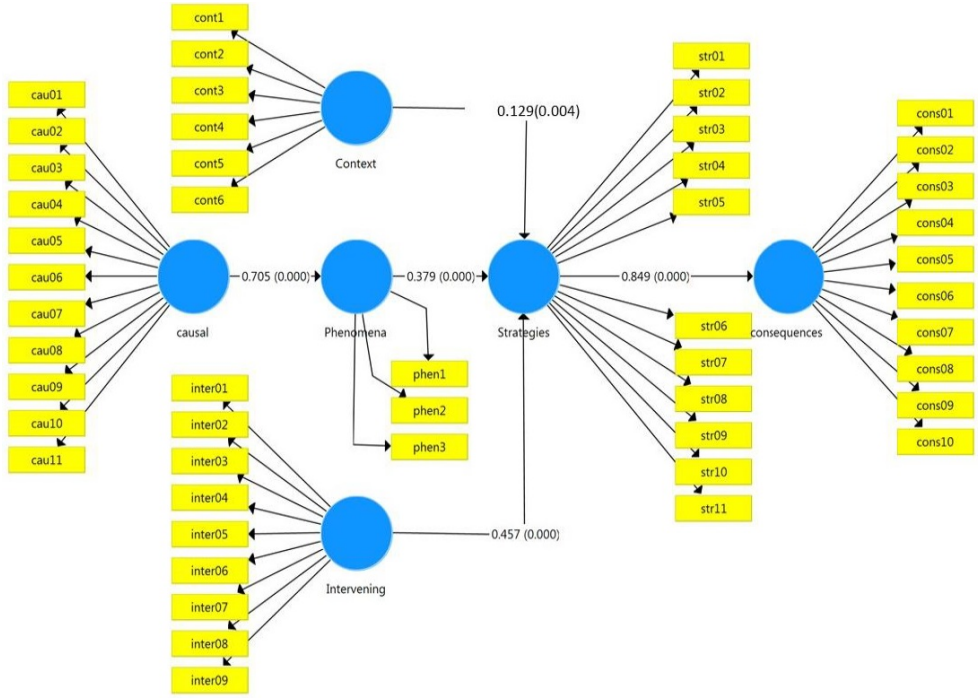

Figure 2: Model in standard mode

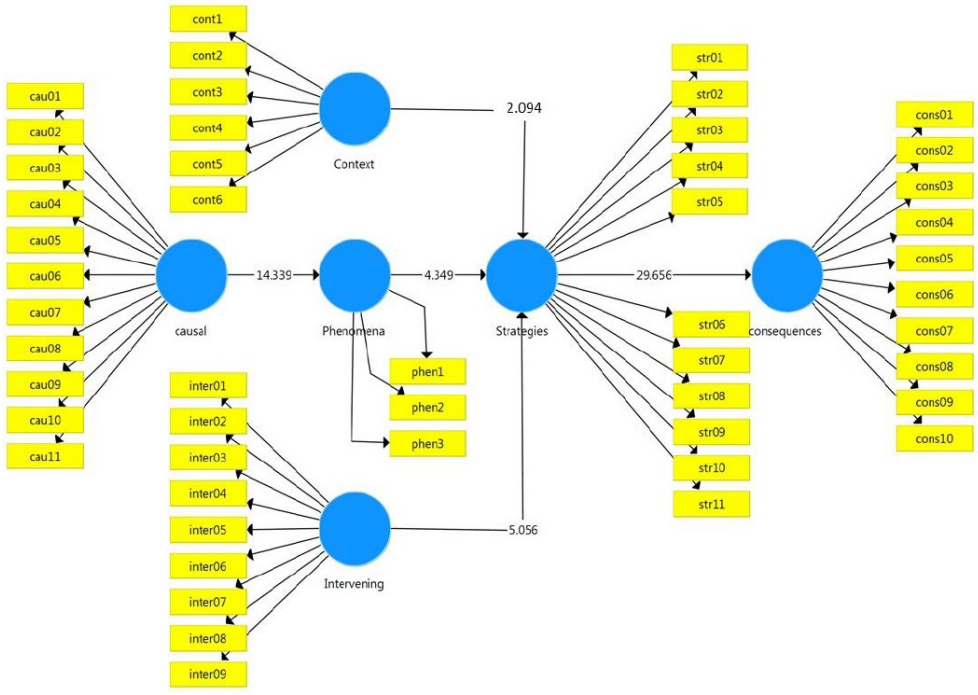

Figure 3: Model in significance mode (T-value)

Table 6 shows the estimation of the path coefficients, the explained variance variables, and the results of hypothesis testing.

4.6 Model fitting

In this section, the structural model is discussed and the general research model is fitted. The numerical coefficient is regarded to be between zero and one. R^2 values close to 0.67 are favorable, values close to 0.33 are average, and

Table 6: Path coefficients and t-test for the effects of variables on the structural model paths

Path No.	Path description	T statistics	Path coefficient	Significance statistics	Result
1	Causal factors to the main category	24.335	0.705	0.000	Confirmed
2	Main category of strategies	4.349	0.379	0.000	Confirmed
3	Intervening factors to strategies	2.094	0.129	0.004	Confirmed
4	Underlying factors to strategies	3.056	0.457	0.000	Confirmed
5	Strategies to consequences	29.656	0.849	0.000	Confirmed

values close to 0.19 are considered weak [23].

Table 7: Coefficients of determination

Constructs	Coefficient of determinations (R^2)
Creating consumer value in content marketing	0.409%
Strategies	0.551%
Consequences	0.403%

As shown in Table 7, the coefficients of determination for the latent variables of the model show the affectivity of the dependent variables from the independent variable. The table above shows that 0.409% of the changes in the main category, 0.551% of changes in strategies, and 0.403% of changes in consequences can be explained by causal, underlying, and intervening factors. The general fitting of the model with the GOF index that should be more than 0.3 indicates that the index is appropriate:

$$GOF = \sqrt{\text{Communalities} \times R^2} = 0.441 \tag{4.7}$$

5 Discussion and conclusion

This study aimed to validate the identification and control model of factors affecting strategic crisis management in road accidents. For this purpose, a model based on the quantitative method which was created in the previous studies was validated in this study. The results indicated that causal factors affect the main category at 0.705, the main category affects strategies at 0.379, intervening factors affect strategies at 0.129, underlying factors affect strategies at 0.457 and finally, strategies affect consequences at 0.849 all with a 95% confidence level. The results of this study on human factors are consistent with the studies by [4, 5, 31]. Regarding the road factors, this study is consistent with the results of [1, 5, 6, 10, 16, 18, 20, 24]. In terms of transportation factors, this study is consistent with the results of [5, 6, 18, 20, 24, 33]. Regarding the environmental and climatic factors, the results of this study are consistent with the results of [16, 32]. Finally, in terms of managerial factors, the results of this study are consistent with the studies by [16, 18, 19, 30, 33].

In line with the results of this study, it is suggested that the senior managers and decision-makers of the Kerman Province Road Organization establish regulatory institutions for non-standard vehicles. participate and conduct annual joint exercises with partner institutions, transfer experiences from the axes of prevention, consider the comprehensive map of road safety measures and its five principles, apply the experiences of other countries in the field of road transport crisis management, regard the proportion between the growth of industrial activities in cities and the investment rate in increasing the traffic capacity of the communication networks between the cities, the proportion between the national investment policies in the equipment of the vital arteries with the timely payment of the required funds, consider punitive measures for violators precisely, apply all advertising potential, mass media, and radio to establish a culture of correct driving and safe driving, create a comprehensive accident database, have more careful supervision by regulatory institutions and effective enforcement of law on violating drivers, concentrate on performance parameters, have more precise monitoring of regulatory institutions and effective enforcement of law on violating drivers, confirm the technical conditions of some devices despite the lack of required standards, particularly during Nowruz and holidays, the number of technical mechanic inspection centers for heavy vehicles across the country, produce the vehicles which have successfully passed the CRASH TEST, observe the standards such as the durability of columns, overturning and impact tests from various directions, and how to withstand the impacts to passengers and conduct periodical inspections, as well as the technical inspection of vehicles according to modern standards, especially in the parts of brakes, suspension system, operation light. It is also suggested that a global approach [27] is taken in which both global standards and local cultural norms and behaviors are taken into consideration in the creation of a safer transportation system.

A comprehensive review of the theoretical literature from domestic and foreign studies was conducted in this study. In addition, future studies are suggested that develop and test the dimensions and aspects of effective factors in road safety crisis management using the meta-synthesis method. Since this study was cross-sectional, future studies can be developed longitudinally based on the findings of several continuous periods to evaluate all aspects and management functions of the factors affecting road safety crisis management and the process of changing their models. Due to the cultural-social diversity and geography of Iran, future studies are suggested that control the model of the functions and strategies of control and management for "Factors affecting the management of road safety crisis" under the cultural needs of different provinces to determine the probable cultural-social effect on the control model. Future studies can evaluate the possibility of implementing the developed model at other time points. The spatial scope of this study was limited to one province. The cultural characteristics of other regions may affect the model as an intervening variable which is not considered in this study and the results can be generalized in the research scope. The temporal scope of the present study was single-section and the variables were studied only in one period of time. The management strategies for the factors affecting the management of road safety crises can be effective in different periods and upstream policies and can be considered a field for future studies.

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