

Pathology of Organizational Crisis Management Based on Hazard and Operability Analysis: The Case Study of an Iranian Oil Company

Elham Rabani^{1*}, Ali Reza Mooghali², Arash Shahin³, Narges Abbasi⁴

1. PhD Student, Department of Public Management, Payame Noor University (PNU), Tehran, Iran

2. Professor, Department of Public Management, Payame Noor University (PNU), Tehran, Iran

3. Professor, Department of Management, University of Isfahan, Isfahan, Iran

4. Associate Professor, Department of Mathematical Sciences, Payame Noor University (PNU), Tehran, Iran

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Abstract

The crisis is a devastating event that is difficult to predict. If not managed, it can cause significant problems for the organization. Therefore, organizations need a comprehensive framework to manage crises well. This article aims to present a new crisis management model with an overlapping attitude and prioritize the most critical components based on the Hazard and Operability Analysis (HAZOP) using a mixed-methods research design. In the qualitative phase, reviewing the academic resources was conducted from 2009 to 2020. Then, three rounds of the Delphi technique was carried out to obtain the consensus of 19 experts over 125 components. Analyzing the data was performed by structural equation modelling in the quantitative phase. The sample consisted of 228 respondents who were employees in an Iranian oil company. The findings indicated that crisis management is a nonlinear overlapping process with 47 elements in seven factors: pre-crisis, in-crisis, post-crisis, pre-crisis and in-crisis, in-crisis and post-crisis, post-crisis and pre-crisis, pre-crisis and in-crisis and post-crisis. In addition, the results of HAZOP showed that “strategic thinking at all levels of the organization” and “standardization of the education system” had higher priority. Overall, the current situation of the company in managing organizational crises was considered favorable.

Keywords: crisis, organizational crisis management, overlapping approach, hazard and operability analysis approach.

1. Introduction

Crises are realities in today’s fast-paced world. Quick changes, economic fluctuations, workforce problems, unexpected technological changes, and political situations have caused instability in the present business world. This instability results in a crisis in organizations (Fener & Cevik, 2015).

Organizations must be prepared for unexpected events, equipped for facing new conditions, and be ready for returning quickly to a normal situation (Frykmer et al., 2018). Achieving this purpose requires a comprehensive model that shows both the process and the crucial components in each stage. Despite enormous scientific articles on the subject, a lack of an all-inclusive model is visible.

On the other hand, an in-depth review of studies from 2009 to 2020 indicated three stages

* Corresponding Author, Email: elham.rabani78@gmail.com

for crisis management: pre-crisis, in-crisis, and post-crisis (e.g., Coombs & Laufer, 2018; Paraskevas & Quek, 2019; Pearson & Mitroff, 1993; Traore et al., 2018). Regarding this, we have considered three stages in this research.

Naturally, crises are not linear; however, we manage them as if they are so. Some components of the crisis management process are specific to one stage or common to two or three. Accordingly, crisis management involves a set of interdependent stages that may overlap. In a nutshell, crisis management is an overlapping process. We cannot discuss it as separate stages. It is time to adopt a less linear approach. In other words, it is not correct to determine the stages of the process in the form of pre-crisis, in-crisis, and post-crisis separately. Therefore, a new crisis management model should be designed at this point. Despite the suggestion of this issue in some articles (e.g., Pennington-Gray, 2018), none of the studies has focused on it, and the article at hand is the first to address this issue.

Up to now, most researchers have investigated one or more affected components in the crisis management process. However, it is worthwhile to collect all the components and present them under a comprehensive model. One of our purposes in this research was to gather all the fundamental elements in the organizational crisis management process by reviewing articles from 2009 to 2020. By introducing a comprehensive framework, organizations will have a better understanding of the crisis management process and its core components.

Another significance of the present research lies in determining the amount of risk of each component. The organization should prioritize its improvement programs. The probability and severity of events play a critical role in prioritization. To this end, the researchers have used the Hazard and Operability Analysis (HAZOP) for the pathology of the organizational crisis management process in an Iranian Oil Company (IOC).

Due to the type of activity, the IOCs are particularly more sensitive than other industries in crisis management. Therefore, crisis management infrastructures are carefully evaluated and monitored by their trained and specialized staff. By considering this issue, calculating the risk level of the components based on their comments could guide us to achieve the best results.

Using the research findings, organizations can recognize and prioritize problems in their crisis management system based on the risk level. Moreover, they can review and correct their infrastructures as soon as possible before the crisis causes irreparable damages. In other means, if the infrastructure is proper, organizations will be more agile in the three stages of crisis prevention, coping, and return to normality. Overall, this new study is valuable and aids organizational crisis management.

In summary, five questions are answered in this research:

1. What are the stages (factors) of the organizational crisis management process with an overlapping attitude?
2. What are the main components at each stage (factor)?
3. What is the risk level of each component in the IOC?
4. Which components have priority in the IOC?
5. What are the suggestions for the improvement of crisis management in the IOC?

2. Definition

2.1. Crisis

A review of the early literature on crisis management reveals that much of interpretation is based on the context (Paraskevas & Quek, 2019). It ordinarily describes an event or a series of unique, unexpected, and unusual occurrences that create a high level of uncertainty and threat or lead to a threat to the organization's high-level goals (Ulmer et al., 2007).

A crisis is difficult to predict, but quick and informed action can drastically reduce its effect. If mismanaged or otherwise left unchecked, it will have a cascading effect, leading to a loss of life or resources (Hetu et al., 2018).

2.2. Organizational Crisis Management (OCM)

The organizational crisis is a disorder that affects the entire system, causes vital problems for the organization, and endangers its life. Thus, the crisis is known as a threat to the organization's survival (Dubrin, 2017).

Based on the existing definitions, several points are recognized. First, crises have substantive implications for organizations and stakeholders (Tokakis et al., 2019). Second, they can occur in any organization, whether international, public, or private. Third, it may damage the credibility of the organization. Despite these destructive effects, a crisis can be both a danger and an opportunity (Iftikhar, 2017).

2.3. Crisis Management Stages

Crisis management is a set of interdependent activities, often presented across four phases. Traditionally, crisis management models have had multiple stages, and scholars and practitioners have not had agreement on the numbers. Models have four, three, or six parts (Pennington-Gray, 2018). The three-stage approach is more common. It describes crisis management as involving three phases: the pre-crisis phase (prevention and preparation), the crisis phase (response), and the post-crisis phase (learning and revision). In pre-crisis, the risk assessment is the foundation of crisis management and crisis management plans are the primary tool for crisis managers. In the crisis phase, reputation, apologies, and compensation are the three response options for a crisis. Organizational learning and examining the role of grieving and memorials are in the post-crisis phase (Coombs & Laufer, 2018). To elaborate more, we might describe the three stages of OCM process as below:

1. Pre-crisis: The pre-crisis stage has an enormous impact on the other parts. If the organization's performance is well in the pre-crisis phase, it will have the necessary security. They must receive signals about impending crises, be prepared to face them, and identify and prevent them (Coombs & Laufer, 2018). It is the fundamental stage in the process of OCM (Tokakis et al., 2019).
2. In-crisis: At this stage, a response is given to the crisis. The actual CM occurs at this phase. Speed of action and initial rapid reaction during the early hours, accuracy, and control of all items are essential at this stage (Coombs & Laufer, 2018).
3. Post-crisis: The post-crisis phase occurs when the crisis is over. Although the crisis subsides, its consequences appear in the body of the organization (Coombs, 2010). The process of returning to the normal state of the organization should be considered and accelerated at this stage (Bakos, 2018).

2.4. Overlapping Approach

If we want to design the OCM model according to what is happening in practice, we will have to change the existing theoretical models. In reality, some components of crisis management are specific to a particular stage, but some others will be important in two or more. Despite the evolution of the proposed models in crisis management from a linear to nonlinear approach, overlapping the stages is not considered in the existing studies. This point is a research gap that is addressed in the present study.

2.5. Organizational Pathology and HAZOP

Organizational pathology is the process of gathering appropriate information about the fundamental problems of the organization and its reasons, analyzing the collected data, concluding and prioritizing the troubled components, and offering suggestions to solve them (Fuqua & Kurpius, 2011). HAZOP is an effective and systematic method for identifying system operational hazards and problems and determining their effects (Cagno et al., 2002).

3. Literature Review

3.1. Non-Linear vs Linear Process

Primary studies express the main stages of the crisis management process in the linear form. Littlejohn (1983) presented a six-step crisis model. According to Littlejohn, the first step for any organization is to design the crisis management organizational structure. The two next steps are selecting the crisis team and training them. Then, conducting the situation audit should be done as well. The two last steps are preparing a suitable plan and managing the crisis. Fink (1986) suggested a comprehensive situation audit consisting of a preparedness audit, developing the scenarios, and preparing action plans.

The linear approach in crisis management studies was improved in the last decade and was changed with non-linear models. Jaques (2007) raised an integrated, non-linear construct for the first time. He illustrated that crisis management consists of interdependent activities and clusters of tasks that need to be managed in both the pre-crisis and post-crisis phases. The model addressed some of the limitations of linear approaches and helped analyze the outcomes and overlaps between activity clusters to optimize strategic relationships and enhance bottom-line effectiveness. Bakos (2018) suggested a centralized distributed crises management, a non-linear approach in which the human factor's intuition, skills, and expertise were vital elements. Pennington-Gray (2018) discussed that destination crisis management research has a long way to go. He explained that the extension of the traditional management model beyond sequential steps requires greater attention. It causes clustering of the related and integrated activities that may overlap simultaneously. He illustrated it as a gap in recent studies and suggested it as future research. Paraskevas and Quek (2019) aimed to design a resilience management framework. They proposed this non-linear five-stage model for organizations to distinguish risk from crisis management and identified specific activities within each stage. This framework consisted of sensing the risk landscape, risk assessment, risk treatment, crisis response, and crisis recovery. It emphasized the role of risk intelligence and the sense of the risk landscape. Ideally, the loop should be closed at these five stages.

3.2. The Components of Organizational Crisis Management

The field of crisis management studies is very extensive. Many researchers have studied the important components in each stage of the process. In this context, there is no comprehensive model that includes all components. Drury et al. (2010) focused on crisis response in their study. Findings illustrated that prior training and collaborative relationships helped with decision-making. Israeli (2011) provided an opportunity to evaluate what managers do during and immediately after a crisis. The finding suggested that industry managers and their government must develop an action plan with their respective governments for effective dealing with future crises. In the absence of a comprehensive crisis management plan, managers can only try to be more efficient, and they may neglect practices of improving their

organizational effectiveness. Bea (2011) illustrated the pervasive importance of organizational influences on safety and reliability. The other recommendation is real-time prevention of failures and the importance of selecting, training, and organizing the right staff for the right job. Moreover, the physical systems must provide adequate support and security for crisis management teams to accomplish their tasks. Claeys et al. (2013) studied the impact of expressing emotions in organizational crisis communication. They found that in the case of organizational self-disclosure, expressing sadness as a discrete negative emotion results in a post-crisis reputation. Sommer et al. (2015) explained the role of affect and team leadership in developing resilience during an organizational crisis. They collected multilevel data from 426 team members and 52 leaders. As a result, transformational leadership was found to have a higher effect on team members' resilience. Haddon et al. (2015) showed that employees' expectation of leaders is to take action quickly while simultaneously engaging in continuous communication with employees during a crisis. Grappi and Romani (2015) developed another theoretical framework to show the effectiveness of matching post-crisis communication strategies to the crisis types. Findings demonstrated the moderating role of corporate reputation in the relationship between post-crisis communication strategy and sympathy and their effects on consumers' attitudinal and behavioral responses. Vardarlier (2016) mainly focused on the human resources strategies at managing crises. He admitted that the success of an organization mostly depends on the employee skills and expertise and their continuous professional training. Time management, health, morale, and motivation of employees were important factors when an organization tackled crises. Kiambi and Shafer (2016) examined the interplay of reputation and crisis response strategies. Results indicated that organizations with a prior good reputation have better post-crisis reviews than those with a prior bad reputation. Ponis and Ntalla (2016) tried to identify specific processes and practices that help enterprises successfully confront supply chain crises. The process of decision making before, during, and after a crisis; collaboration management; flexibility in capacity; keeping underutilized equipment and facilities; brand building and keeping customers and employees satisfied; strong leadership; crisis management plans; and preparing the technological facilities were vital factors in OCM. Herrero (2017) presented an integrated symmetrical model for crisis communications management. The model had four phases: issues management, planning-prevention, crisis and post-crisis. Snoeijers and Poels (2018) indicated that an academic communication degree, a high hierarchical position in the organization, and crisis experience are positively related to an augmented perception of an impending organizational crisis. Andrew et al. (2018) focused on the 2014 Ebola crisis response. Primary data were collected and analyzed from 24 face-to-face interviews and 12 online surveys. The results showed that prior training and collaborative relationships helped with improvised decision-making. Ong and Tan (2018) developed a taxonomy of skills comprised of six categories and 18 underlying observable behaviors. The developing categories were task and resource management, situational awareness, teamwork, communication, control of emotions, and leadership. Telang et al. (2018) focused on crisis communication. The findings showed that a company should respond to the crisis as quickly as possible to avoid loss. By following the communication strategies, organizations can achieve damage control and turn the crisis events into an opportunity to grow. Crisis leadership is also an appealing subject in crisis management, so Lacerda (2018) focused on leadership characters in a crisis. He discussed that leaders must act as blocking agents against the negative social impacts of economic crisis, including the fragility of trust in organizational life, the uncertainty of the future, and toxic emotions to achieve maximum effectiveness. Tokakis et al. (2019) aimed to investigate the factors that affect crisis management in public administration for safety during the pre-crisis, crisis, and post-crisis phase. Results indicated that the ability of crisis management team

leaders and members to make the right decisions, internal and external communication, and crises type are predictors of the crisis management process in public administration. Al Thani and Obeidat (2020) identified the reality of strategic leadership and crisis management at a company in Qatar. They suggested focusing more on studying and analyzing its internal environment to identify its strengths and weaknesses. In addition, they maintained that organizations should identify possible indicators of the occurrence of the crisis and take the necessary measures to prevent crises from occurring and reduce their impacts and negative repercussions. Hazaa et al. (2021) provided a comprehensive systematic literature review of factors influencing crisis management. The results showed that the most important factors are communication, social media, and leadership. Lee and Kwon (2021) did a study on the public crisis management efficacy, focusing on COVID19. They emphasized central government support and response, protection of vulnerable populations, publication of policies, and crisis management communication for preventing crisis spread.

4. Conceptual Model

In the research model, each stage is deemed as a factor. The number of factors that make up the initial model is seven, including pre-crisis, in-crisis, post-crisis, and overlapping stages. Therefore, the conceptual model consists of seven factors, namely 1) pre-crisis, 2) in-crisis, 3) post-crisis, 4) pre-crisis and in-crisis, 5) in-crisis and post-crisis, 6) post-crisis and pre-crisis, and 7) pre-crisis, in-crisis, and post-crisis. Figure 1 shows the conceptual model. A brief explanation of the overlapping factors is presented below:

- *Pre-crisis and in-crisis*: Some components have a key role in both the “pre-crisis” and the “in-crisis” stages. These are in the “pre-crisis and in-crisis” factor.
- *In-crisis and post-crisis*: Some components have a key role in both the “in-crisis” and “post-crisis” stages. These are in the “in-crisis and post-crisis” factor.
- *Post-crisis and pre-crisis*: Some components have a key role in both the “post-crisis” and “pre-crisis” stages. These are in the “post-crisis and pre-crisis” factor.
- *Pre-crisis, in-crisis, and post-crisis*: Some components have a key role in the “pre-crisis,” “in-crisis,” and “post-crisis” stages. These are part of the “pre-crisis, in-crisis, and post-crisis” factor.

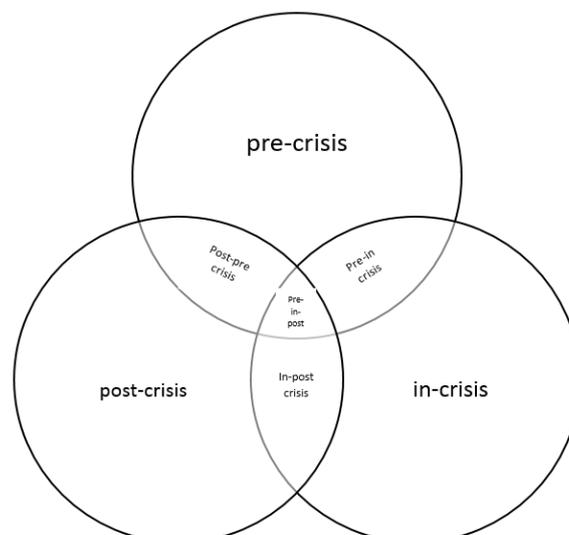


Figure 1. Conceptual Model

5. Research Methodology

The study was a developmental and practical project in terms of purpose, and descriptive-correlational in terms of the nature of the problem. To fulfill its purpose, it adopted the mixed-method approach. Moreover, it was cross-sectional regarding the data collection span, and quantitative in terms of the data nature. As Table 1 illustrates, this article was performed in five steps.

Table 1. Research Steps

Approach	Steps	Data collection		Respondents		
		Tools	Number	Statistic society	No.	Method
Qualitative	Primary data collection	Authentic journals indexed in databases such as Elsevier, Emerald, and Scopus.	114 articles	----	----	Searching the keywords "crisis," "crisis management," "organizational crisis"
	Use of Delphi method		125 questions at the first round 77 questions at the second round 64 questions at the third round	Experts from university and industry	19	Snowball sampling
Quantitative	Confirmatory factor analysis	Questionnaire	64 questions	Managers, supervisors, and senior experts of the IOC	228	Random stratified sampling
	Model fitting		64 questions		228	
	Pathology by HAZOP		47 questions		22	

5.1. Primary Data Collection

We tried to identify all the main components in the OCM process by reviewing articles from 2009 to 2020. The sources of data were international journals such as Elsevier, Emerald, Scopus, etc. The keywords searched were "crisis," "crisis management," and "organizational crisis." We selected 114 out of 285 articles that presented the crisis management elements and extracted 125 components from them.

5.2. Use of Delphi Method

The Delphi method is considered a qualitative method. It is a research approach for extracting the opinions of a group of experts on a topic. The number of experts in this study was 19. Those who had academic or executive experience in crisis management were selected based on snowball sampling. Snowball sampling is a method for situations where the units under study are not easily identifiable. The researcher, through personal communication with those interested in completing the questionnaire, asks them to introduce other people who have research characteristics and are willing to cooperate. (Burns and Grove, 2001)

At first, 125 components were presented in a questionnaire to experts for calculating the content validity by the CVR index. Questionnaires were mostly sent by email, though some were delivered in person. The respondents answered the question: “Do you agree with the component or not?” All the components were accepted.

Then, we asked them about the importance of each component by Delphi method questionnaires in three rounds. Acceptance criteria in each part were average >3 and standard deviation <1. Finally, the number of accepted components at the end of three rounds was 64.

Evaluating the reliability of the questionnaire was conducted by Cronbach’s alpha, and the agreement coefficient of expert members was achieved in each Delphi round via Kendall coefficient. According to Table 2, Cronbach’s alpha in all three Delphi parts was higher than 0.7, and the final agreement coefficient was 0.612. In conclusion, the results were evaluated as acceptable.

Table 2. Results of Kendall and Cronbach’s Coefficients

Delphi round	Number of components before the Delphi round	Number of components after each Delphi round	Cronbach’s Alpha	Kendall
First round	125	77	0.968	0.562
Second round	77	64	0.941	0.571
Third round	64	64	0.947	0.612

5.3. Confirmatory Factor Analysis

A Likert-type questionnaire was used in this part. The statistical population consisted of 228 managers, supervisors, and senior experts of an IOC. They were selected based on stratified sampling and the Cochran formula. The stratified random sampling was used to minimize the changes within groups and achieve more homogeneity of groups. Sampling details are presented in Table 3. The questionnaires were mailed to the respondents through Isfahan Oil Refining Company network. In addition, the briefings were held with the managers at each step. They answered the question “How important are the components in OCM?”

The KMO index was 0.911, indicating the adequacy of the sample for factor analysis. In addition, the results of the Bartlett test showed that the significance level was 0. It is less than 5% and was desirable for identifying the structure.

Finally, the components were classified into seven steps according to a conceptual model using a confirmatory factor analysis approach.

Table 3. Number of Stratified Sampling of the Statistical Population in the IOC

Statistical society	Number of statistical society	Calculated number by Cochran’s) (formula	Number of questionnaires distributed	Number of approved questionnaires collected
Managers	3	3	3	3
Supervisors	70	62	70	62
Senior experts	223	163	180	163
Total	296	228	253	228

5.4. Model Fitting

At this stage, fitting the model with the actual model was evaluated using AMOS software. The criteria for non-acceptance of the components were the significance coefficient higher than 1.96 and loading factor less than 0.3. Figure 2 shows the results.

Finally, 47 components in the final model were accepted, as described in Table 5. Moreover, the results showed that the normalized chi-square index was equal to 1.414 (less than 2), the RMSEA index was equal to 0.043 (less than 0.05), and the GFI index was 0.98 (greater than 0.9). Eventually, we evaluated the model as being close to the actual model.

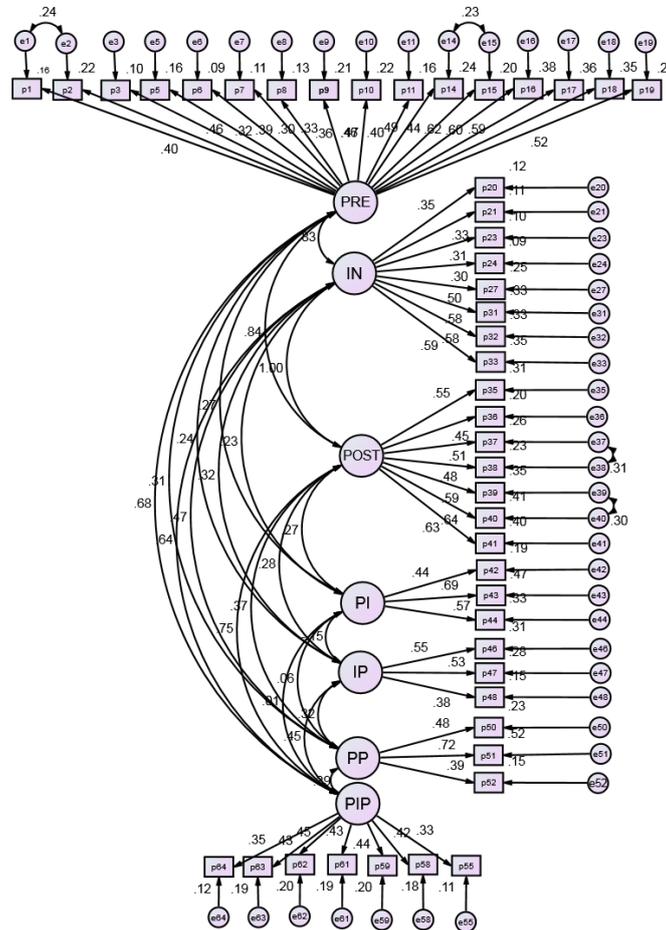


Figure 2. The Result of Model Fitting

5.5. Hazard and Operability Analysis

The HAZOP is a legal method for the identification of process hazards and determining their effects on the system (Nezamodini et al., 2018). The three main steps of the HAZOP technique are calculating the risk probability, risk severity, and risk matrix. To collect data, 22 respondents in IOC who had enough knowledge or experiments in crisis were selected based on snowball sampling. Based on descriptive statistics, the “mode” was our criteria in calculating the likelihood and severity of each component. The HAZOP steps are as follows:

Step 1: Calculating the Probability of Occurrence

It indicates the possibility that a hazard may occur over some time. The likelihood escalation falls into five cases: very likely, likely, possible, unlikely, and remote (Table 4). We asked the respondents to answer the question: “How does your organization perform in each component of crisis management?” The designed questionnaire had a five-point Likert scale with 47 components. The results are shown in Table 5 (column 5).

Step 2: Calculating the Severity of the Risk

The severity of hazards indicates the extent of the damage and casualties that would occur. Danger can be catastrophic, severe, major, minor, and with no impact on an organization (Table 4). At this stage, respondents were asked to answer this question: “What is the risk severity of each component?” The designed questionnaire had a five-point Likert scale with 47 components. The results are shown in Table 5 (column 6).

Step 3: Risk Matrix

The risk matrix has two elements, namely risk probability and risk severity. It is an effective tool for estimating the risk level of each component. The six levels of risk are critical, high, medium, low, acceptable, and no risk. This category is illustrated in Table 4. The results are shown in Table 5 (column 7).

Table 4. Risk Matrix (R) (Marhavilas et al., 2019, p.8)

severity	catastrophic	4	3	2	1	AC	4: “Critical Risk”	Risk Level
	Severe	3	2	1	AC	AC	3: “High Risk”	
	Major	2	1	AC	AC	NSR	2: “Medium Risk”	
	Minor	1	AC	AC	NSR	NSR	1: “Low Risk”	
	no impact	AC	AC	NSR	NSR	NSR	AC: “Acceptable”	
	Very likely	Likely	Possible	Unlikely	Remote		NSR: “No Special Risk”	
	Likelihood							

Table 5. The Components of the OCM Model

Factor	Components	Model fitting		HAZOP technique		Risk level
		Loading factor (>0.3)	T-value (>1.96)	likelihood	severity	
Pre-crisis (pre)	Risk management					
	Risk intelligence					
	Risk communication					
	Establishing an integrated command system			4	1	1
	Preparation			4	1	1
	Ability to absorb knowledge from other organizations			4	1	1
	Developing the scenarios			3	2	1
	Developing the operational plan			3	1	2
	Developing the psychological rehabilitation program	0.78	12.98	4	1	1
	Developing the tasks of the crisis team			4	1	1
	Establishing an integrated command system			4	1	AC
	Making systems integrated			5	1	AC
	Empowerment			4	2	AC
	Skills taxonomy			4	1	1
	Standardization of the education system			4	2	AC
	Putting the right people in the right places			4	1	1

Table 5.

Factor	Components	Model fitting		HAZOP technique				
		Loading factor (>0.3)	T-value (>1.96)	likelihood	severity	Risk level		
In-crisis (in)	Problem-solving	0.79	13.22	5	1	AC		
	Deciding an emergency			4	2	AC		
	Organizing the team according to the type of crisis			4	1	1		
	Team leadership			4	2	AC		
	Preventing crisis spread			4	2	AC		
	Interpersonal cooperation			4	2	AC		
	Careful assessment of the situation			4	1	1		
	Speed of action in the initial response							
Post-crisis (post)	Modifying and updating plans and scenarios	0.80	13.58	4	1	1		
	Retrieving the work of operational units			4	1	1		
	Delivering the promises			4	2	AC		
	Responding			4	2	AC		
	Time management for returning quickly to the normal situation			4	2	AC		
	Collective constructive review			4	2	AC		
	Learning from change			4	1	1		
Pre-crisis and in-crisis (pi)	Recognizing the types of crisis	0.44	6.4	4	1	1		
	Identifying the crisis life cycle			4	2	AC		
	Understanding the thresholds of turning a small events into a large one			4	1	1		
In-crisis and post-crisis (ip)	Controlling the access to information when needed	0.35	5.0	4	1	1		
	Allocating sufficient authority to decision making with minimal delay			5	1	AC		
	Managing negative and destructive emotions			5	1	AC		
Post-crisis and pre-crisis (pp)	Strategic thinking at all levels of the organization	0.44	6.52	3	1	2		
	Organizational credibility			4	2	AC		
	Identifying the strengths and weaknesses			4	1	1		
Pre-crisis, in-crisis, and post-crisis (pip)	Awareness of crisis activities	0.54	8.25	4	1	1		
	Transparency			4	2	AC		
	Coordination			4	2	AC		
	Commitment to the continuous execution of programs			4	2	AC		
	Honesty			4	2	AC		
	Trust-building			4	2	AC		
	Collective efficiency			4	2	AC		

The risk matrix of the IOC is illustrated in Figure 3. Moreover, the position of medium and low-risk components in the research model can be seen in Figure 4.

severity	(1)	Strategic thinking at all levels of the organization, and standardization of the education system	Risk management, risk intelligence, risk communication, empowerment, putting the right people in the right places, ability to absorb knowledge from other organizations, developing the operation plan, establishing an integrated command system, preparing the equipment and facilities, deciding on an emergency, interpersonal cooperation, time management for returning quickly to the normal situation, modifying and updating plans and scenarios, learning from change, recognizing the types of crisis, understanding the thresholds of turning a small crisis into a large one, controlling the access to information when needed, organizational credibility, honesty	Developing the tasks of the crisis team, developing the scenarios, team leadership, allocating sufficient authority to make decisions with minimal delay, managing negative and destructive emotions	
	(2)	Skills taxonomy	Preparation, developing the psychological rehabilitation program, making systems integrated, organizing the team according to the type of crisis, problem-solving, speed of action in the initial response, preventing crisis spread, careful assessment of the situation, retrieving the work of operational units, delivering the promises, responding, collective constructive review, identifying the crisis life cycle, identifying the strengths and weaknesses, transparency, coordination, commitment to the continuous execution of programs, awareness of crisis activities, trust-building, collective efficiency		
	(3)				
	(4)				
	(5)				
	(1)	(2)	(3)	(4)	(5)
	likelihood				

Figure 3. Risk Matrix (R) of the Iranian Oil Company

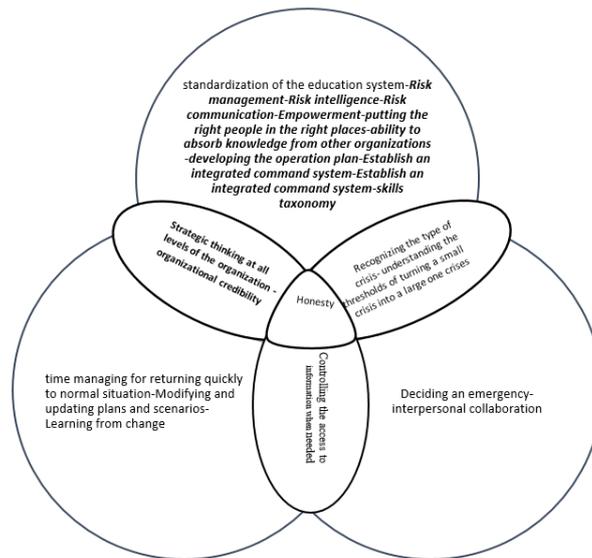


Figure 4. The Position of Risky Components of IOC in the Model

6. Discussion

This research was carried out in two sections. In the first part, the crisis management model was designed and presented. Taking into account studies from 2009 to 2020, some similarities exist between our model and other studies in crisis management. The CM process in our investigation, like most studies (e.g., Coombs & Laufer, 2018; Paraskevas & Quek, 2019; Pearson & Mitroff, 1993; Traore et al., 2018), is based on three main stages: pre-crisis, in-crisis, and post-crisis. Moreover, our approach in designing the model is nonlinear similar to some studies (e.g., Jaques, 2007; Lechat, 1990; Paraskevas & Quek, 2019).

Despite the above similarities, some differences bring about superiority for the present study. Firstly, we classified the available research in crisis management from 2009 to 2020 into several categories based on the purpose of the study. Some researchers had studied the obstacles of the process (e.g., Mitroff et al., 1987), while a fewer number had provided models and introduced several components of each crisis management process (e.g., Jaques, 2007; Paraskevas & Quek, 2019). Most researchers had examined the effect of two or more variables on each other. In conclusion, the depth surveys from 2009 to 2020 showed no review of recent studies that ended with an all-encompassing model. Therefore, we filled this gap and presented a comprehensive framework. This model shows the vital components in each stage. The organizations can have a thorough understanding of the process and the key elements. They form the infrastructure of OCM, and lead the organization to better prevent, prepare, respond, and return to ordinary situations.

By nature, some components can be essential in two or more stages. For example, caring about the crisis life cycle in both the pre-crisis and in-crisis stages is vital. On the other hand, transparency is not only crucial in one part but rather throughout the whole process. Thus, the overlapping of crisis management stages with each other occurs in terms of component sharing. It is the second distinguishing point of our research in comparison with others. It had also been recommended by Pennington-Gray (2018) as a research gap for future studies. Despite proposing such an approach, there are no studies in this area. Regarding that, we designed a new nonlinear overlapping model for crisis management with seven factors.

In the second part, the Prioritization of the components was done by the HAZOP technique in the IOC. Calculating the risk level is the basis of this approach. Results in the IOC highlighted five points: First, no component had a critical and high risk. Second, there was no risk-free component, and all of them had risk, at least a low-level one. Third, 53% of the components had acceptable risk. 43% had low, and 4% had medium. (Table 5) Fourth, most components with medium risk were in the pre-crisis stage. Fifth, there were two components with medium risk: “standardization of the education system” and “strategic thinking at all levels of the organization.” The first is in the pre-crisis. The other is in the pre and post-crisis stages. These two components have more priority than others in the company. Finally, there are some recommendations for the Iranian Oil Company under study to improve its crisis management:

- Improving the prevention culture at all levels of the organization
- Strengthening the strategic thinking in all staff
- Creating a centralized and independent crisis command system
- Reviewing skill taxonomy to avoid wasting talent in crisis management
- Establishing a research-based educational system aiming to attract knowledge from successful organizations for alignment with global developments in crisis management
- Employing people with a systemic approach in integrating the crisis management system

7. Conclusion, Implications, Limitations, and Future Research Direction

This study addressed a literature gap in providing a comprehensive crisis management model with a new overlapping view and prioritizing the components by HAZOP technique based on their risk level. Despite the existence of several studies addressing various crisis management-related issues, this study is the first comprehensive crisis management review, focusing on the overlapping approach neglected so far. The present study helps organizations recognize their strengths and weaknesses in the crisis management process. In addition, they can formulate management procedures, programs, and strategies to improve their infrastructure. It is a new

contribution to the operational field of crisis management. Therefore, the presented model has two significant points: an overlapping attitude to the main stages of the crisis management and a comprehensive presentation of the components affecting the process by reviewing the articles from 2009 to 2020. In conclusion, 47 components were assigned to seven factors, which are 1) pre-crisis, 2) in-crisis, 3) post-crisis, 4) pre-crisis and in-crisis, 5) in-crisis and post-crisis, 6) post-crisis and pre-crisis, and 7) pre-crisis, in-crisis, and post-crisis.

The overlapping attitude helps organizations understand that the components may be common in one or several stages. Paying attention to overlapping components plays an essential role in the crisis management performance of organizations. Based on the presented model, the components of “recognizing the types of crisis,” “identifying the crisis life cycle,” and “understanding the thresholds of turning small events into a large one” are critical in both pre-crisis and in-crisis stages. “Controlling the access to information,” “allocating sufficient authority to decision-making with minimal delay,” and “managing destructive emotions” are crucial in both in-crisis and post-crisis. “Strategic thinking at all levels of the organization,” “organizational credibility,” and “identifying the strengths and weaknesses” are essential in both post-crisis and pre-crisis stages. “Awareness of crisis activities,” “transparency,” “coordination,” “commitment,” “honesty,” “trust-building,” and “collective efficiency” are vital in the whole process of organizational crisis management.

Prioritizing the components in the final step of the research was done based on the HAZOP approach at IOC. Evaluation of the risk level of each element is the basis of this technique. The findings indicated that most components with medium risk were in the pre-crisis stage. This phase has a preventive role in crisis management. Its importance is supported by the notions of many previous researchers. (e.g., Paraskevas & Quek, 2019) Therefore, if the company does not pay attention to this point, it will face many problems in future. Moreover, the results in the mentioned organization showed that “strategic thinking at all levels of the organization” and “standardization of the education system” had a higher risk than others and are in priority. The presence of 2 components with medium and 25 components with acceptable risk level among 47 elements indicates efficient crisis management in IOC. With this interpretation, evaluating the crisis management in IOC was favourable. Despite the presence of two components with higher priority in terms of risk level, all of them need control and evaluation. Therefore, the organization should not neglect continuous improvement in crisis management.

By doing HAZOP, organizations can identify their potential problems in crisis management and set their improvement plan based on priority. Moreover, implementation in an oil company whose crises management is the main issue due to its activities adds to the importance of this research.

Although this research contributed significantly to presenting a new model of OCM, there were a few limitations. Firstly, time limitation to gathering all data prevented us from examining and presenting implementation barriers and solutions. Besides this, the lack of access to all resources and studies was our second limitation. Thirdly, we tried in this research to perform a case study in an organization with a higher level of maturity in crisis management than others. For this reason, we selected an oil refining company. Due to the type of activity and operational sensitivities, the specialized personnel of this group are equipped continuously with practical techniques in crisis management. Despite this, research in other industries with different maturity levels in crisis management may have different results. Moreover, because of the lack of sufficient time, we did not do the human reliability analysis (HRA) based on the existing methods such as CREAM or ATHENA. Instead, we considered the education and experience level of individuals in the subject under study. Based

on the findings of this study, the following recommendations are proposed for further research:

- Using a wider statistical community consisting of multiple private organizations or government agencies and comparing the results,
- Examining executive barriers and presenting strategies to eliminate them in the organizations,
- Analyzing human reliability by a suitable method and presenting the recommendations to decrease human errors,
- Developing the strategic thinking model at different levels of the organization to manage the organizational crises,
- Identifying the standard requirements for the crisis management education system based on strategic thinking, and
- Investigating and comparing the importance of each component of the research model based on the type of crisis (economic, political, social, cultural, etc.).

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