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The Impact of Boundary Spanning on the Stages of Crisis Management: The Mediating Role of Artificial Intelligence – A Field Study at the Diyala Governorate Office

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Abstract: This research aims to demonstrate the impact of Boundary Spanning processes on crisis management phases through the mediating role of artificial intelligence, specifically within the Diyala Governorate Office. The research stems from a central problem: the extent to which Boundary Spanning processes, with their dimensions of surveying, monitoring, prediction, and evaluation, can enhance crisis management phases—namely, early warning and detection, preparedness and prevention, crisis containment, recovery, and organizational learning—when employing artificial intelligence technologies.

The research adopted a descriptive-analytical approach, deemed the most suitable for the nature and objectives of the study. It also utilized a quantitative approach through a questionnaire and a qualitative approach through semi-structured interviews and analysis of official documents. The research population consisted of 293 employees of the Diyala Governorate Office. A questionnaire, designed based on existing literature and previous studies, was used to measure the research variables and test the hypotheses.

The research reached a number of conclusions, most notably the existence of a statistically significant correlation and influence between Boundary Spanning processes and crisis management phases, as well as a correlation and influence between artificial intelligence and crisis management phases. The results also showed that artificial intelligence plays a significant mediating role in enhancing the impact of Boundary Spanning processes during crisis management phases.

The research concluded that the integration of Boundary Spanning processes and artificial intelligence technologies represents a modern strategic approach that can contribute to enhancing the preparedness of the Diyala Governorate Office to face crises and transitioning from reactive to proactive management based on prediction and intelligent data analysis.

Keywords: Boundary Spanning, artificial intelligence, crisis management, Diyala Governorate Office

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1. Introduction

Contemporary organizations operate in a highly complex, rapidly changing, and uncertain environment, driven by successive technological advancements, intensifying competition, and escalating security, economic, social, and environmental challenges. These changes have led to the emergence of frequent and diverse crises, varying in nature and impact. This has made crisis management a vital administrative function, requiring the adoption of modern approaches and methods that enable organizations to anticipate potential risks and address them efficiently and effectively.

In this context, Boundary Spanning has emerged as a crucial strategic tool for organizations to monitor internal and external changes, collect information related to early signals and indicators, and analyze and interpret this data. This contributes to building a proactive vision regarding potential events and threats. The success of

organizations in crisis management is no longer solely dependent on their ability to respond after a crisis occurs, but also on their capacity to sense and predict environmental changes and take appropriate preventative measures before they escalate.

In parallel, the world has witnessed a rapid technological revolution in artificial intelligence (AI), which has become a cornerstone in supporting administrative processes and decision-making. AI's ability to process massive amounts of data, discover complex patterns and relationships, and provide accurate predictions contributes to improving the quality of decisions and enhancing organizational performance. AI applications have created vast opportunities to develop and enhance the effectiveness of Boundary Spanning processes by providing advanced mechanisms for analyzing environmental data and extracting indicators relevant to potential crises.

Given the importance of integrating Boundary Spanning processes with AI technologies, there is a need to study the role of this integration in enhancing the effectiveness of crisis management phases. These phases begin with detection and early warning, continue through preparedness, prevention, containment, and mitigation, and culminate in recovery and organizational learning. The greater an organization's ability to sense its environment and analyze its data using smart technologies, the more proactively and flexibly it can deal with crises and minimize their negative repercussions. Based on the foregoing, this research aims to shed light on the nature of the relationship between Boundary Spanning processes and crisis management phases, by exploring the mediating role of artificial intelligence in strengthening this relationship within the Diyala Governorate Office, as one of the governmental organizations facing a changing and multifaceted work environment. The research also seeks to provide a scientific and applied framework that contributes to employing artificial intelligence technologies to support Boundary Spanning processes and enhance the organization's capabilities in managing crises efficiently and effectively, thereby positively impacting the sustainability of institutional performance and the achievement of its strategic objectives.

2. Materials and Method

2.1 First: The Research Problem

The current organizational environment is witnessing rapid fluctuations and an increasing level of complexity and ambiguity due to successive developments in technological factors and transformations in the overall system. This has led to escalating challenges and conflicts for organizations in general, and for the Diyala Governorate Office in particular. This situation has created an urgent need to develop organizational tools and mechanisms to enable them to confront these challenges and deal with them at acceptable levels of impact, through the adoption of appropriate solutions and alternatives that align with the requirements of the current stage. In this context, Boundary Spanning using artificial intelligence technologies represents an important resource in supporting the continuous development process, given its active role in monitoring and analyzing environmental indicators, anticipating crises, and mitigating their potential effects. Therefore, based on the researcher's field experience in the Office, the application of these technologies is essential in enhancing the Office's capabilities for early detection and control of events before they escalate. Hence, the main research question arises: To what extent do Boundary Spanning processes contribute to crisis management using artificial intelligence technologies?

2.2 Second: The Importance of the Research

The importance of this research is highlighted through five main points:

1. The research demonstrates the theoretical importance of Boundary Spanning processes as a modern variable in the academic field, and its pivotal role in enhancing the effectiveness of crisis management by employing artificial intelligence technologies, thus contributing to bridging the research gap surrounding this emerging variable.

2. Its theoretical importance lies in its connection between three pivotal variables in the field of public administration: the independent variable (Boundary Spanning processes), the dependent variable (crisis management), and the mediating variable (artificial intelligence technologies), providing a comprehensive framework for analyzing the interaction between them.
3. The importance of the research is reinforced by the scarcity of previous studies – to the best of the researcher's knowledge – that have examined these three variables together (Boundary Spanning, artificial intelligence, and crisis management) as an integrated system for addressing organizational challenges.
4. The research derives its practical importance from its focus on the Diyala Governorate Office, as the apex of the service sector and the decision-making body in the governorate. This necessitates that the office keep pace with technological advancements to improve the quality of services, anticipate crises, and mitigate their effects.
5. The research designs an operational framework that enables the Diyala Governorate Office to enhance its capabilities in: early crisis detection and warning through proactive Boundary Spanning; preparedness and prevention through threat pattern analysis; crisis containment and mitigation; efficient post-crisis recovery; and organizational learning from failures and successes, to build a flexible system capable of transforming challenges into development opportunities.

2.3 Third: Research Objectives

1. To analyze the Diyala Governorate Office's level of awareness regarding Boundary Spanning processes.
2. To identify the role of artificial intelligence (AI) technologies as an effective means of containing crisis challenges.
3. To assess the Diyala Governorate Office's awareness of AI applications and their potential for implementation.
4. To evaluate the effectiveness of current crisis management practices and methodologies employed by the office.
5. To formulate practical recommendations for the organization (Diyala Governorate Office) that are applicable in similar organizational environments.

2.4 Fourth: Research Hypotheses

First Hypothesis (H1): There is a statistically significant correlation between the independent variable (Boundary Spanning processes) and its dimensions, and the dependent variable (crisis management) and its dimensions, at both the macro and micro levels within the organization under study, at a statistical significance level of ($\alpha \leq 0.05$).

Second Hypothesis (H2): There is a statistically significant effect of Boundary Spanning processes and their dimensions on crisis management and its dimensions, at both the macro and micro levels, within the organization under study, at a statistical significance level of ($\alpha \leq 0.05$).

Third Hypothesis (H3): There is a statistically significant indirect effect of the independent variable (Boundary Spanning processes) on the dependent variable (crisis management) through the mediating variable (artificial intelligence), at a statistical significance level of ($\alpha \leq 0.05$).

2.5 Fifth: The research community and sample

The research community consists of the employees working in the entity of Diyala Governorate, whose number is (293) employees, and the research sample was chosen by random sampling method, in order to suit the nature of the research.

2.6 Theoretical Framework

2.6.1 Boundary Spanning

2.6.1.1 First: The Concept of Boundary Spanning

Before delving into the concept of Boundary Spanning, it is necessary to address the meaning of "sensing" in dictionaries. In the Comprehensive Dictionary of Meanings, "sensing" (noun) and "to sense" (verbal noun) are defined as: "His sense of terror," meaning his feeling of it.

In English, according to the Cambridge Dictionary, it refers to the feeling or experience of something without being able to explain exactly how it happened. For example, we can say, "I felt he had something to tell me," or "Although they didn't say anything, he could sense their disagreement with his suggestion." Synonyms for "sensing" include "sensing," "perception," and "discovery." Leifer and Delbecq (1978) indicated that the concept of Boundary Spanning means surveying, examining, and predicting the features of opportunities and threats within the environment by the Boundary Spanning agent, monitoring and evaluating these features, and taking proactive and preventive measures [1]. (Meanwhile, Tabarsa et al. 2014: 180) stated that Boundary Spanning is a set of processes and procedures that guide the organization toward the conscious discovery of opportunities and threats, followed by taking appropriate actions [2]. (Cyfert & Krzakiewicz, 2016: 281) view Boundary Spanning as the analysis of various trends and phenomena in the environment, generating new ideas, and identifying the requirements for change [3]. (EKKERINK, 2008: 4) defined Boundary Spanning as the process in which members of the organization participate in networks outside the organization [4]. Meerkerk, 2014, 15) defines sensing as a combination of interconnected activities (aimed at linking various actors from the worlds of government, society, and business, building sustainable relationships between these actors, and connecting governance network processes with processes within the organization [5]. (Van de Ven & Zahra (2014, 2) define Boundary Spanning as the process by which regulatory actors sense, recognize, learn from, and gather information about developments outside their area of expertise [6]. (Austin et al., 2012, 113) offer another definition of Boundary Spanning, describing it as a form of "role shift," where managers seek to understand and adapt to their new environment [7].

2.6.1.2 Second: Dimensions of Boundary Spanning

Management literature shows that strategic management theorists have presented multidimensional frameworks for studying Boundary Spanning processes. However, this research will focus on the model proposed by Hitt, [8]. These researchers believe that these processes develop through four successive stages: examination, monitoring, prediction, and evaluation. Each of these stages will be detailed as follows:

First Stage: Environmental Scanning: This is considered the first step in the process of sensing the organization's environment, which it undertakes before formulating its strategy. This involves scanning the internal environment, including its strengths and weaknesses, and the surrounding external environment to identify potential changes. (Narayanan, 1993, p. 24) refers to this stage as a general environmental survey of the organization to discover changes in its environment and identify indicators of potential changes. It is a crucial process for organizations, especially those operating in a rapidly changing environment, but it may be costly and less important for organizations operating in a stable environment [9].

Phase Two: Environmental Monitoring: An organization's ability to succeed increases depending on its understanding of the larger systems surrounding it—whether economic, social, or political at the local level—and its ability to monitor influential environmental changes of a political, social, or cultural nature. As (Lesca et al., 2016, 3) indicate, an organization's sustainability and resilience are linked to its skill in understanding potential fluctuations in its external environment and reducing the ambiguity surrounding its strategic decisions [10]. This requires it to continuously update

its objectives and adapt its tactics to keep pace with changes. The essence of this adaptation lies in the organization's ability to gather relevant information from the external environment, filter it, and transform it into actionable insights. On the other hand.

The third stage: Forecasting: (Ahmed, 2015: 164) defined forecasting as "a step focused on developing an understanding of the expected future of issues and trends revealed by examining the environment and the results derived from it." He added that this process relies on using available technical tools for forecasting, where each issue or trend is tracked to monitor its future trajectory and detect any deviations from predetermined expectations [11].

The fourth stage: Assessment: (Al-Dhahabi & Al-Azzawi ,2005: 273) defined assessment as judging the extent to which work, during its progress and at its completion, conforms to pre-established standards or criteria. In our assessment, we say that the work is progressing correctly with a score of acceptable, good, very good, or excellent. It is necessary to establish standards or numbers, each indicating a specific level, by identifying deviations from their standard level [12].

2.6.2 Artificial Intelligence

2.6.2.1 First: The Concept of Artificial Intelligence

It is closely linked to understanding the nature of human intelligence, which has been the subject of scientific and philosophical debate for a long time. Before delving into the definition of artificial intelligence, it is worth noting that scientists have not agreed on a unified definition of intelligence itself. Guilford explains in his book (Al-Fakhri, 2018: 11) that definitions of intelligence remain vague and depend on the term "ability," which itself requires interpretation [13]. This makes an operational—measurable—definition the most useful for studying the phenomenon. (McCarthy,2007, 2) offers a computational perspective, describing intelligence as "the computational ability to achieve goals in the world," considering it to exist to varying degrees in humans, animals, and even machines [14]. In the context of artificial intelligence, Koklberg (Ghanem, 2017: 55) indicates that its essence lies in algorithms; these are sets of instructions that guide digital systems to make decisions based on inputs, with the aim of solving specific problems [15]. However, the complexity lies in the fact that the abilities associated with intelligence—such as thinking and learning—remain poorly defined, making it difficult to provide a clear definition of artificial intelligence. Wong (2021, p. 15) argues that artificial intelligence is built upon studying how the human brain works in learning and problem-solving, and then simulating these processes digitally [16].

2.6.2.2 Dimensions of Artificial Intelligence

1. Machine Learning: This forms the basis of many modern artificial intelligence applications and gives systems the ability to learn automatically from data and experience without being explicitly programmed for each task. According to a lecture given at the Malla Reddy College of Engineering and Technology (2020–2021), Arthur Samuel, an American pioneer in computer games and artificial intelligence, coined the term "machine learning" in 1959 while working at IBM. A computer program capable of learning from experience is called a machine learning program, or simply a "learning program," and is sometimes referred to as a "learner."

A computer program is described as being able to learn from experience with respect to a specific category of tasks and a specific performance metric if its performance in performing tasks (T) improves based on the metrics defined by (P) as experience accumulates (E).

2. Big Data Analytics: Artificial intelligence is distinguished by its superior ability to process and analyze massive volumes of structured and unstructured data (such as text, images, and video) that exceed human capacity for direct comprehension. It extracts profound insights, patterns, and hidden relationships that would otherwise remain undiscovered. According to the McKinsey Global Institute, big data is defined as datasets that exceed the capacity of traditional database tools to handle, whether in storage or

analysis [17]. While Mills (2019, p. 10) defines big data simply as massive datasets that may be structured, semi-structured, or unstructured, the main focus in most of the literature to date has been on unstructured data [18].

3. Result

3.1 Crisis Management

3.1.1 First: The Concept of Crisis Management

Crisis management is a relatively recent concept in general, and particularly in countries undergoing complex transformations. This is true both theoretically, as a field of knowledge within the academic system and a domain of scientific research, and practically, in private sector institutions, government administration, public companies, and civil society organizations. The adoption of this concept and its gradual spread in both academic and practical management fields are noteworthy, compared to prevailing global standards [19]. Crises are characterized as critical contexts requiring urgent intervention; however, assessing them poses a challenge for decision-makers due to the complexity of the associated scenarios and the lack of clarity regarding causal factors. These situations are characterized by uncertainty regarding the outcomes of responses, as the actual effects of measures are difficult to measure until after implementation. Furthermore, the relationship between actions and crisis mitigation results lacks precision, raising questions about the effectiveness of preventive or remedial measures [20]. From the perspective of (Groh ,2014, p. 51), crisis management is defined as a comprehensive strategic process aimed at identifying early indicators of crises, establishing the necessary preventive conditions to avoid or reduce their severity, and proactively or reactively addressing them in a timely manner to ensure organizational continuity and prevent the collapse of its operations [21].

3.1.2 Second: Dimensions of Crisis Management

The Mitroff model was chosen as the theoretical framework adopted in this research, as it is one of the most widely used models by many researchers in the field of crisis management. Furthermore, it aligns with the current research title and is suitable for the nature of the research environment, namely the Diyala Governorate Office. This model combines early detection, effective prevention, response, recovery, and continuous learning. The following is an explanation of these stages:

1. The Detection and Early Warning Stage: This stage is the cornerstone of crisis management, focusing on monitoring and analyzing initial indicators to anticipate potential threats. (Nasr ,2017, p. 41) indicates that the success of this stage depends on the leadership's ability to foresee environmental changes and assess the likelihood of them escalating into crises [22].
2. The Preparedness and Prevention Stage: This stage aims to develop proactive plans to reduce the likelihood of crises occurring or mitigate their effects by periodically testing organizational structures and operating procedures [23].
3. The containment and mitigation phase: This phase focuses on containing the repercussions by understanding the root causes of the crisis and addressing them scientifically. (Abu Far ,2020, p. 283) argues that the containment strategy transforms the destructive energy of the crisis into an opportunity to achieve organizational goals by absorbing pressures and managing challenges with a positive outlook [24].
4. The recovery phase: This phase involves restoring operational balance through short- and long-term plans. (Abdul Aziz ,2020, p. 122) emphasizes the importance of testing recovery plans beforehand to ensure their effectiveness [25].
5. The learning phase: This phase is central to organizational development, where accumulated experience is transformed into preventative policies. (Malhotra ,1996, p. 210) defines organizational learning as the ability to extract insights from

past experiences (both successful and unsuccessful), while (Jamil ,2016, p. 160) considers the lessons learned to be the essential outcome of crises.

3.2 The Practical Aspect of the Research

Questionnaires are used as the primary tool for collecting data related to the current research variables. Statistical analysis is used to prove or disprove relationships and influences between the variables. A variety of statistics are employed, and these tests are measured before and after distribution to the study sample.

3.2.1 First: Description and Diagnosis of Research Variables and Dimensions

a. Analysis of the Research Sample's Responses to the Independent Variable (Boundary Spanning)

The following is a descriptive analysis of the research sample's responses to the independent variable (Boundary Spanning) and its dimensions. The frequency of responses is presented, and the results of this analysis are as follows:

Table (1) presents the analysis of the sample's responses to the Boundary Spanning variable, as follows:

Table 1. Results of the Analysis of the Sample's Responses to the Boundary Spanning Variable

No.	Dimensions	Arithmetic mean	Standard deviation	Relative importance %	Sequence
1	Survey	3.713	0.652	74.252	1
2	Monitoring	3.475	0.648	69.502	2
3	Prediction	3.367	0.581	67.332	4
4	Evaluation	3.386	0.652	67.726	3
Total	Boundary Spanning	3.485	0.548	69.704	

Source: Prepared by the researcher using SPSS-26.

Table No. (1) indicates that the general mean value for the Boundary Spanning variable was (3.485), and the general agreement was at a high level, with a standard deviation of (0.548) and an agreement percentage of (69.704%), indicating that there was little dispersion in the sample's answers, as the highest value of the arithmetic mean was (3.713) for the survey dimension with a standard deviation of (0.652) and an agreement percentage of (74.252%), while the lowest value was The arithmetic mean (3.367) for the prediction dimension has a standard deviation of (0.581) and an agreement percentage of (67.332%).

b. Mediating Variable: Artificial Intelligence

Table (2) includes the analysis of the sample members' responses to the artificial intelligence variable, as follows:

Table 2. Results of the analysis of the sample members' responses to the artificial intelligence variable

No.	Dimensions	Arithmetic mean	Standard deviation	Relative importance %	Sequence
1	Machine learning	3.672	0.648	73.434	1
2	Big data analytics	3.552	0.682	71.030	2
Total	Artificial intelligence	3.612	0.625	72.232	

Source: Prepared by the researcher using SPSS-26 software.

Table (2) indicates that the overall mean value for the artificial intelligence variable was (3.612), with a high level of general agreement, a standard deviation of (0.625), and an agreement rate of (72.232%). This suggests some dispersion in the sample responses. The highest mean value (3.672) was for the machine learning dimension, with a standard deviation of (0.648) and an agreement rate of (73.434%), while the lowest mean value (3.552) was for the big data analysis dimension, with a standard deviation of (0.682) and an agreement rate of (71.030%).

c. Dependent Variable: Crisis Management Stages

Table (3) presents the results of the analysis of the sample members' responses to the variable of crisis management stages, as follows:

Table 3. Results of the analysis of the sample members' responses to the variable of crisis management stages

No.	Dimensions	Arithmetic mean	Standard deviation	Relative importance %	Sequence
1	Early detection and warning	3.316	0.756	66.320	5
2	Preparedness and prevention	3.615	0.671	72.300	4
3	Containment and mitigation of the crisis	3.770	0.555	75.400	1
4	Recovery	3.620	0.794	72.396	3
5	Learning	3.690	0.667	73.802	2
Total	Crisis management phases	3.602	0.535	72.044	

Source: Prepared by the researcher using SPSS-26 software.

Table 3 indicates that the overall mean value for the crisis management stages variable was (3.602), with a high level of general agreement, a standard deviation of (0.535), and an agreement rate of (72.044%). This suggests some dispersion in the sample responses. The highest mean value (3.77) was for the crisis containment and mitigation dimension, with a standard deviation of (0.555) and an agreement rate of (75.4%), while the lowest mean value (3.316) was for the early detection and warning dimension, with a standard deviation of (0.756) and an agreement rate of (66.32%).

3.1.2 Second: Testing the Research Hypotheses

a. Testing the Hypotheses of the Correlation Relationship Between the Research Variables

First Hypothesis: There is a statistically significant correlation between the independent variable (Boundary Spanning processes) and its dimensions, and the dependent variable (crisis management) and its dimensions, at both the macro and micro levels within the organization under study, at a statistical significance level of ($\alpha \leq 0.05$).

Table (4) illustrates the correlation relationship between Boundary Spanning and its dimensions, and the stages of crisis management and its dimensions, as follows:

Table 4. Correlation Coefficients Between the Research Variables

Crisis management stages	Learning	Restoring activity	Containing and mitigating the crisis	Preparedness and prevention	Detection and early warning	Dimensions
.599**	.715**	.483**	.511**	.568**	.199**	Correlation survey

Crisis management stages	Learning	Restoring activity	Containing and mitigating the crisis	Preparedness and prevention	Detection and early warning	Dimensions	
						Coefficient	
.000	.000	.000	.000	.000	.001	Sig. (2-tailed)	
293	293	293	293	293	293	N	
						Correlation	
.579**	.470**	.432**	.600**	.672**	.496**	Coefficient	Monitoring
.000	.000	.000	.000	.000	.000	Sig. (2-tailed)	
293	293	293	293	293	293	N	
						Correlation	
.597**	.566**	.395**	.248**	.410**	.553**	Coefficient	Prediction
.000	.000	.000	.000	.000	.000	Sig. (2-tailed)	
293	293	293	293	293	293	N	
						Correlation	
.591**	.564**	.414**	.409**	.565**	.452**	Coefficient	Evaluation
.000	.000	.000	.000	.000	.000	Sig. (2-tailed)	
293	293	293	293	293	293	N	
						Correlation	
.665**	.686**	.501**	.509**	.627**	.419**	Coefficient	Boundary Spanning
.000	.000	.000	.000	.000	.000	Sig. (2-tailed)	
293	293	293	293	293	293	N	

Source: Prepared by the researcher using SPSS-26 software.

Based on the results presented in Table (4), there is a strong positive correlation with high statistical significance between (Boundary Spanning) and the dependent variable (crisis management stages) with a correlation coefficient of (0.655) at a confidence level of (99%). This indicates the validity of the first main hypothesis, which states that (there is a statistically significant correlation between the independent variable (Boundary Spanning processes) and its dimensions, and the dependent variable (crisis management stages) and its dimensions, at both the macro and micro levels in the organization under study, at a statistical significance level of ($\alpha \leq 0.05$)).

The results in the table above indicate a statistically significant positive correlation between the survey and all dimensions of the crisis management stages, both individually and as a whole, with a total correlation coefficient of 0.599 and a 99% confidence level. The results also show a strong, statistically significant positive correlation between the monitoring dimension and all dimensions of the crisis management stages, both

individually and as a whole, with a total correlation coefficient of 0.579 and a 99% confidence level. Furthermore, the table reveals a strong, statistically significant positive correlation between the prediction dimension and all dimensions of the crisis management stages, with a correlation coefficient of 0.597 and a 95% confidence level. Finally, the table shows a strong, statistically significant positive correlation between the evaluation dimension and all dimensions of the crisis management stages, with a correlation coefficient of 0.591 and a 95% confidence level.

b. Testing the Hypotheses on the Impact of the Independent Variable (Boundary Spanning) and its Dimensions on the Dependent Variable (Crisis Management)

Testing the impact hypothesis requires determining the strength of the independent variable's influence on the dependent variable. This is achieved by applying statistical methods such as the regression coefficient (β) and the coefficient of determination (R^2), which explains the proportion of the independent variable's influence on the dependent variable. The significance value is then compared to indicate whether the hypothesis is accepted or rejected.

Hypothesis 2: Boundary Spanning processes and their dimensions have a statistically significant impact on crisis management and its dimensions, both at the macro and micro levels, within the organization under study, at a statistical significance level of ($\alpha \leq 0.05$).

Table 5. shows the results of the impact of Boundary Spanning and its dimensions on the stages of crisis management.

Dependent variable	Independent variable	R ²	α	B	S.E	C.R	P	relationship
Crisis management stages	Survey	0.424	3.713	0.535	0.036	14.671	0.000	High morale
	Monitoring	0.474	3.475	0.569	0.035	16.231	0.000	High morale
	Prediction	0.369	1.718	0.560	0.043	13.073	0.000	High morale
	Evaluation	0.327	3.386	0.469	0.039	11.910	0.000	High morale
	Boundary Spanning	0.531	3.485	0.712	0.039	18.196	0.000	High morale

Source: Prepared by the researcher using AMOS V.20 software.

Table (5) shows the impact test of Boundary Spanning on crisis management phases. The results show a coefficient of determination (R^2) of (0.531), indicating that Boundary Spanning contributes (53.1%) to the changes in crisis management phases. This means that any one-unit increase in the Boundary Spanning value leads to an increase in crisis management phases, represented by a regression coefficient (β) of (0.712). The critical value (C.R) of (18.196) was greater than the critical value of (1.96) at a significance level of (0.01). The standard error (S.E.) of (0.039) indicates the consistency of the effect value. Thus, the second main hypothesis is accepted, which is (there is a statistically significant effect of Boundary Spanning processes in their dimensions on crisis management in its dimensions, whether at the macro or micro level, in the organization under study, at a statistical significance level ($\alpha \leq 0.05$)).

Third Hypothesis: There is a statistically significant indirect effect of the independent variable (Boundary Spanning processes) on the dependent variable (crisis management) through the mediating variable (artificial intelligence), at a statistical significance level of ($\alpha \leq 0.05$).

Table 6. shows the mediating effect of artificial intelligence between Boundary Spanning and the stages of crisis management.

Variables	relationship direction		direct impact	indirect effect	Overall impact	R ²
Boundary Spanning processes	→	Artificial Intelligence	0.810	0.000	0.810	0.505
Boundary Spanning processes	→	Crisis Management	0.443	0.269	0.712	-
Artificial intelligence	→	Crisis Management	0.332	0.000	0.332	0.606

The regression weights indicate that Boundary Spanning has a strong positive direct effect on crisis management ($\beta = 0.810$), suggesting that an increase in Boundary Spanning is strongly associated with an increase in artificial intelligence. This is the strongest relationship in the model. Furthermore, Boundary Spanning has a moderate positive direct effect on crisis management ($\beta = 0.443$), indicating that Boundary Spanning directly contributes to explaining variances in crisis management. The results also show that artificial intelligence has a positive direct effect on crisis management ($\beta = 0.332$). This result suggests that artificial intelligence acts as a significant predictor of crisis management, supporting the assumed causal relationship between these two variables. Regarding the mediating effect, the effects analysis reveals that the Boundary Spanning variable has an indirect effect on the crisis management variable through the artificial intelligence variable of 0.269 ($0.810 \times 0.332 \approx 0.269$). Therefore, the overall effect of Boundary Spanning on crisis management is 0.712, comprised of:

(Direct effect: 0.443, Indirect effect: 0.269, Total effect: 0.712). Since both the direct and indirect effects are positive, the results indicate partial mediation, meaning that Boundary Spanning influences crisis management both directly and indirectly through artificial intelligence. The R² for artificial intelligence is 0.505, meaning that Boundary Spanning explains 50.5% of the variance in artificial intelligence. The R² for crisis management is 0.606, indicating that Boundary Spanning and artificial intelligence together explain 60.6% of the variance in crisis management. These values suggest that the structural model has moderate to strong explanatory power, particularly for crisis management, meaning the results support the proposed structural relationships. The Boundary Spanning variable strongly influences the artificial intelligence variable and has both direct and indirect effects on the crisis management variable. The presence of an indirect effect indicates The statistically significant direct correlation across the artificial intelligence variable indicates that AI acts as a partial mediator in the relationship between Boundary Spanning and crisis management. Furthermore, the model explains more than half of the variance in both endogenous variables, demonstrating satisfactory predictive power.

4. Discussion

The findings demonstrate that boundary-spanning processes play an important role in strengthening crisis management within the Diyala Governorate Office. The relatively high overall mean for boundary spanning indicates that employees recognize the importance of environmental surveying, monitoring, forecasting, and evaluation in identifying organizational threats and opportunities. Among these dimensions, environmental surveying obtained the highest mean, suggesting that the Office has a comparatively strong ability to collect information regarding internal and external developments. However, forecasting received the lowest mean, indicating that the available information has not yet been fully transformed into accurate predictions of future risks. This condition is consistent with the relatively low performance of the early

detection and warning stage compared with the other crisis management stages. Although the Office demonstrates a strong capacity for crisis containment and mitigation, its lower early-warning capability suggests that crisis management practices remain more responsive than preventive. The significant positive relationship between boundary spanning and crisis management confirms that systematic environmental observation can improve preparedness, containment, recovery, and organizational learning. Furthermore, the coefficient of determination shows that boundary-spanning processes explain 53.1% of the variation in crisis management, while the positive regression coefficient indicates that improvements in boundary-spanning practices directly enhance organizational crisis-management capabilities. Artificial intelligence also strengthens this relationship by supporting machine learning and big-data analysis, enabling the organization to process large volumes of information, identify hidden patterns, and provide more timely predictions. The mediation analysis confirms that artificial intelligence partially mediates the relationship between boundary spanning and crisis management, as boundary spanning affects crisis management both directly and indirectly through artificial intelligence. The combined explanatory power of boundary spanning and artificial intelligence, accounting for 60.6% of the variance in crisis management, indicates that technological integration substantially improves the Office's ability to move from reactive crisis handling toward proactive, data-driven management. Therefore, the results emphasize the need to develop predictive analytics, integrated databases, intelligent early-warning systems, and employee competencies in artificial intelligence so that environmental information can be converted into reliable strategic decisions before crises escalate [26], [27], [28].

5. Conclusions

In light of the theoretical and field findings of the research, a set of conclusions could be drawn, which are as follows:

1. It was found that the dimensions of Boundary Spanning, namely surveying, monitoring, forecasting, and evaluation, constitute an integrated system that contributes to enhancing the organization's ability to detect early signs of crises and prepare to confront them.
2. The research results revealed that artificial intelligence has become one of the essential technological enablers in contemporary organizations, due to its advanced capabilities in data processing and analysis, and in deducing patterns and indicators that support decision-making.
3. The results showed a statistically significant correlation between Boundary Spanning processes and the stages of crisis management, confirming that a higher level of Boundary Spanning practice is associated with higher crisis management efficiency in the organization under study.
4. The results showed a significant impact of Boundary Spanning processes on the stages of crisis management, which indicates that enhancing Boundary Spanning practices leads to improved organizational capacity for detection and early warning, preparedness and prevention, crisis containment, recovery, and organizational learning.
5. The results showed a correlation and influence between artificial intelligence (AI) and the stages of crisis management, indicating that employing AI applications contributes to enhancing the effectiveness of organizational crisis response and mitigating its negative impacts.
6. The research findings revealed a significant mediating role for AI in the relationship between Boundary Spanning processes and the stages of crisis management. AI contributed to strengthening the organization's ability to

transform environmental data into strategic information that supports appropriate decision-making during crises.

5.1 Recommendations

Based on the research findings, the researcher recommends the following:

1. Developing the Bureau's capabilities in the areas of surveying, monitoring, forecasting, and evaluation by adopting scientific methods and modern methodologies that contribute to anticipating potential risks and challenges before they escalate into actual crises.
2. Expanding the use of artificial intelligence technologies within the Bureau, particularly in the areas of big data analysis, predicting future events, and building intelligent databases that support decision-making.
3. Establishing a specialized organizational unit for Boundary Spanning and crisis management, comprising qualified personnel in the fields of strategic analysis, information technology, and artificial intelligence, to monitor environmental indicators and provide early warnings to decision-makers.
4. Developing early warning systems within the Bureau by employing artificial intelligence technologies and linking them to existing databases, thereby contributing to the detection of early signs of crises and prioritizing timely responses.
5. Developing ongoing training programs for Bureau employees aimed at enhancing their Boundary Spanning skills and the use of artificial intelligence applications in crisis management, thereby strengthening their preparedness to deal with emergencies.
6. Building an integrated and continuously updated database that includes information and data related to past risks and crises, which contributes to providing an information environment that supports analysis, prediction and sound decision-making.

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