

Relationship Between Crisis Management Stages and Design Thinking in Palestinian Municipalities: Evidence from Jenin Municipality

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Abstract: This study examined the relationship between crisis management stages and design thinking in Palestinian municipalities, using Jenin Municipality as a case study. The municipality operates within a service and administrative environment characterized by recurring crises and increasingly complex citizen needs. The study adopted a descriptive-analytical research design and employed a questionnaire to collect data from a convenience sample of 239 employees working at Jenin Municipality. Crisis management was measured across five dimensions: warning-signal detection, preparedness and prevention, damage containment, activity recovery, and post-crisis learning. Design thinking was measured across four dimensions: orientation, visualization, integration and experimentation, and evaluation and implementation. The findings showed a strong, positive, and statistically significant relationship between crisis management and design thinking, with an overall correlation coefficient of $r = .876$ ($p < .001$). Regression analysis further demonstrated that crisis management scores were significantly associated with design thinking scores. The model explained 76.7% of the variance in design-thinking scores ($R^2 = .767$). Because the data were cross-sectional and self-reported, the findings indicate association rather than causation. Overall, the findings suggest crisis-management practices may support organizational learning, adaptation, and design thinking in municipalities. Accordingly, the study recommends developing an institutionalized crisis management system, adopting design thinking as an organizational approach to addressing municipal challenges, and strengthening organizational learning in the post-crisis phase.

Keywords: Crisis management; design thinking; Jenin municipality; Palestinian municipalities; municipal innovation.

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1. Introduction

Palestinian municipal authorities face persistent challenges in service delivery across finance, administration, politics, and infrastructure (Abu-Jaber, 2011). In addition, they have limited capacity for digital transformation, institutional effectiveness, strategic planning, and the implementation of e-government initiatives (Arqawi, 2025). Thus, design thinking has gained relevance as an approach that supports innovation, experimentation, and community engagement, ultimately improving the quality of services delivered by the public sector (Starostka et al., 2022; Brinkman et al., 2023; McGann et al., 2018). Despite growing research on crisis management and innovation in the public sector, few studies have examined how the stages of crisis management relate to design thinking in Palestinian municipalities, particularly those facing ongoing crises. Thus, it remains unclear whether municipal practices move beyond reactive responses to contribute to innovation and service improvement. Related research has also paid little attention to how warning detection, experience, preparation, containment, recovery, and post-crisis learning relate to practices such as problem orientation, visualization, experimentation, evaluation, and implementation. Research on Jenin Municipality and other Palestinian local authorities indicates moderate progress in digital transformation. These institutions continue to face challenges involving technological infrastructure, strategic planning, institutional performance, and e-government implementation (Arqawi, 2025; Abu-Jaber, 2011). These findings suggest the need for managerial approaches that improve organizational adaptability, innovation, and responsiveness to citizens needs. The recurring nature of financial, political, administrative, and service disruptions in the Palestinian municipal context makes this setting particularly relevant for examining whether crisis-management practices are associated with the development of innovation-oriented organizational capabilities.

In this study, the proposed relationship is interpreted through an organizational learning and adaptive capacity pathway. Crisis management activities generate information about emerging problems, expose weaknesses in existing procedures, require the coordination of organizational resources, and create opportunities for reflection after disruptions. Design thinking provides a structured managerial approach through which this experience-based knowledge can be used to redefine problems, examine stakeholder needs, visualize alternatives, test possible solutions, and evaluate their implementation. Crisis management is therefore positioned as the explanatory construct because the study examines whether accumulated crisis management practices are statistically associated with employees' perceptions of design thinking capabilities. The study does not assume that this relationship is necessarily causal or unidirectional, and its cross-sectional design permits conclusions only about statistical association. Accordingly, the problem addressed by this study is whether crisis-management practices in Jenin Municipality are statistically associated with organizational conditions that support design thinking and the development of innovative municipal solutions despite resource constraints and environmental uncertainty.

1.1. Research Questions

The study seeks to answer the following main research question: What is the nature of the relationship between crisis management stages and design thinking in Palestinian municipalities? The following sub-questions emerge from the main question.

1. What is the current state of crisis management in Jenin Municipality from the perspective of the study participants?
2. What is the current state of design thinking in Jenin Municipality from the perspective of the study participants?
3. What is the relationship between the dimensions of crisis management and the dimensions of design thinking in Jenin Municipality?
4. To what extent are overall crisis-management scores statistically associated with overall design-thinking scores in Jenin Municipality?

As a supplementary analysis, the study also examines whether perceptions of crisis management and design thinking vary by gender, administrative or job position, and years of experience. These demographic comparisons are secondary and are not intended to be the study's main theoretical contribution.

1.2. Study Hypotheses

Drawing on literature that views crisis management as an organizational capability for response, learning, and adaptation, and design thinking as a structured approach to understanding problems, testing alternatives, and evaluating outcomes, the study developed the following hypotheses:

H1: There is a statistically significant correlation at the significance level of $\alpha \leq 0.05$ between the dimensions of crisis management and the dimensions of design thinking in Jenin Municipality.

H2: There is a statistically significant positive association at the significance level of $\alpha \leq 0.05$ between the overall crisis-management score and the overall design-thinking score in Jenin Municipality.

The demographic analyses concerning gender, administrative or job position, and years of experience were conducted as supplementary exploratory comparisons and were not formulated as central hypotheses.

2. Literature Review and Theoretical Framework

2.1. Crisis Management as an Organizational Capability in Municipalities

Crisis management is an essential element of management and public administration because of its close relationship with organizational continuity, resilience, and effectiveness under conditions of uncertainty. Rather than referring only to a disruptive event, a crisis represents a high-pressure situation that threatens the achievement of organizational objectives and requires coordinated organizational action. Crisis management should therefore be understood as an integrated process of anticipating, responding to, recovering from, and learning from crises (Bundy et al., 2017). For local government institutions, crisis management is especially important, as cities provide vital public utilities that could be affected by a crisis. Thus, crisis management goes beyond minimizing losses to encompass communication, coordination, decision-making, and leadership under conditions of uncertainty (Boin et al., 2016). Current scholarly literature also connects crisis management with organizational resilience by emphasizing the roles of information technology, human resource management, organizational processes, structure, and culture (Horák, 2025). Similarly, the strategic use of decision-support systems can strengthen crisis management by enabling municipal decision-makers to use available information more systematically under conditions of uncertainty (Sidahmed and Zaraté, 2024). The process-oriented crisis-management model comprises five stages: detecting warning signals, preparedness and prevention, damage containment, activity recovery, and learning after the crisis has passed. Together, they represent the municipality's capacity to anticipate, respond to, recover from, and learn from crises.

Palestinian municipalities face recurring service, financial, structural, political, and security pressures. Between January and April 2025, humanitarian partners delivered approximately 7,500 cubic meters of water to more than 27,000 people, including 15,500 residents of Jenin, following damage to public water networks (OCHA, 2025). In 2026, 925 movement obstacles affected access and service delivery in the West Bank (OCHA, 2026), while UNOSAT documented damage in Jenin, Tulkarm, and Nur Shams refugee camps (UNOSAT, 2025). These conditions increase the importance of preparedness, continuity, recovery, and organizational learning.

2.2. Design Thinking as an Approach to Innovation in Public Sectors and Municipalities

Design thinking is an organized way of solving problems. The process includes identifying stakeholder needs, redefining problems, generating possible solutions, testing proposed solutions, and assessing their effectiveness. Applying the design thinking methodology in the public sector requires engaging with stakeholders and providing organizational support for collaborative work, experimentation, continuous learning and adaptation (Brinkman et al., 2023; Lewis et al., 2020; McGann et al., 2018). Design thinking for municipalities depends on conditions related to culture, collaboration, experimentation and user focus (Starostka et al., 2022), while systemic design stresses connections among problems, stakeholders, resources and decisions (Palm et al., 2024). This study defines design thinking along four dimensions: orientation, visualization, integration and experimentation, and evaluation and implementation. These dimensions reflect the municipality's ability to identify stakeholder needs, develop and test alternative solutions, assess results and apply the most appropriate solutions.

2.3. From Crisis Management to Design Thinking: Building Theoretical Relationships Between Variables

This study conceptualizes crisis management and design thinking as separate but complementary organizational capabilities. Crisis management generates knowledge through the detection of warning signals, preparation, crisis response, recovery, and post-crisis learning. Design thinking provides a structured process for applying that knowledge to define problems, generate alternatives, test proposed solutions, and evaluate implementation. The proposed relationship draws on ideas of organizational learning and adaptive capacity. Crisis management emphasizes readiness, response, recovery, and learning (Boin et al., 2016; Bundy et al., 2017), whereas design thinking focuses on understanding problems, generating alternatives, experimentation, and evaluation (Brinkman et al., 2023; McGann et al., 2018). Thus, crisis experience can also support the application of design thinking. Crisis management activities expose weaknesses in services and procedures. Early warning systems strengthen problem orientation, preparedness supports visualization, and containment encourages integration and experimentation. Recovery informs evaluation and implementation, and post-crisis learning transfers successful practices to the design of future services. The relationships proposed here overlap rather than being one-to-one. For example, organizational learning supports orientation, experimentation, and evaluation, whereas preparedness involves problem definition, visualization, and contingency testing. Research supports a broader pathway underlying these relationships. Evidence also suggests that learning, adaptation, and resource reallocation during crises help public organizations respond more effectively to turbulence (Horák, 2025). (Conversely, design thinking performs well in supportive environments that foster participation, experimentation, learning, and adaptation to local conditions (Lewis et al., 2020; Palm et al., 2024).

Crisis management is positioned as the explanatory construct in the present study because crisis management stages generate the operational experiences and institutional knowledge that may subsequently be reflected in employees' perceptions of design-thinking capability. This direction is theoretically appropriate for examining whether preparedness, response, recovery, and learning practices are associated with stronger problem-orientation, visualization, experimentation, evaluation, and implementation practices. Nevertheless, the relationship may also be reciprocal, as design-thinking capabilities could improve how municipalities prepare for and respond to crises. The cross-sectional design of the study cannot establish temporal order, causality, or bidirectionality; it can only assess whether the constructs are statistically associated within the study sample. Accordingly, stronger crisis management practices are expected to be positively associated with stronger design-thinking practices in Jenin Municipality, providing the theoretical basis for H1 and H2. The proposed conceptual model linking crisis-management stages to design-thinking dimensions through organizational learning and adaptive capacity is presented in Fig. 1.

2.4. Previous Empirical Studies and Research Gap

This study contributes theoretically by examining whether systematically managed crisis experiences generate institutional knowledge and adaptive capacity that support problem reframing, experimentation, and solution evaluation. It also provides evidence from Jenin Municipality, although findings from a single municipality should not be automatically generalized to other Palestinian or international municipalities. Arabic-language and international studies emphasize crisis governance, preparedness, resilience, coordination, institutional performance, public innovation, stakeholder engagement, experimentation, and service development. Despite these contributions, limited empirical research has examined whether crisis-management practices are associated with design-thinking capabilities within municipal governance systems. Existing research linking crisis management to organizational learning and innovation establishes that crises may stimulate adaptation and institutional change, but it does not sufficiently explain how the distinct stages of crisis management relate to the design-thinking activities of orientation, visualization, experimentation, evaluation, and implementation.

This gap is particularly important in Palestinian municipalities because recurring crises are not exceptional events but persistent features of the operating environment. Such conditions may require municipal organizations to learn continuously, adapt services, reallocate resources, and reconsider conventional problem-solving procedures. Consequently, the Palestinian context provides an important setting for examining whether crisis-management capability is associated with innovation-oriented forms of managerial thinking. The theoretical contribution of the present study lies in proposing and empirically examining an organizational learning pathway that links crisis management stages to design thinking capabilities. The research builds on prior work on the association between crisis management and institutional performance and explores whether crisis-related organizational behaviors lead to problem reframing, visualization, experimentation, or solution evaluation. Therefore, the contributions of this research stem from the premise that systematically managed crisis experiences can provide institutional knowledge and adaptive capacity that support design-thinking. In addition to providing a theoretical contribution, the research assesses this relationship in the context of Jenin Municipality. As such, the study will provide empirically based data on an understudied form of municipal governance, but it is important to recognize that results obtained from one municipality cannot be assumed to apply to other forms of municipal government (Palestinian or international) without further examination.

3. Research Methodology

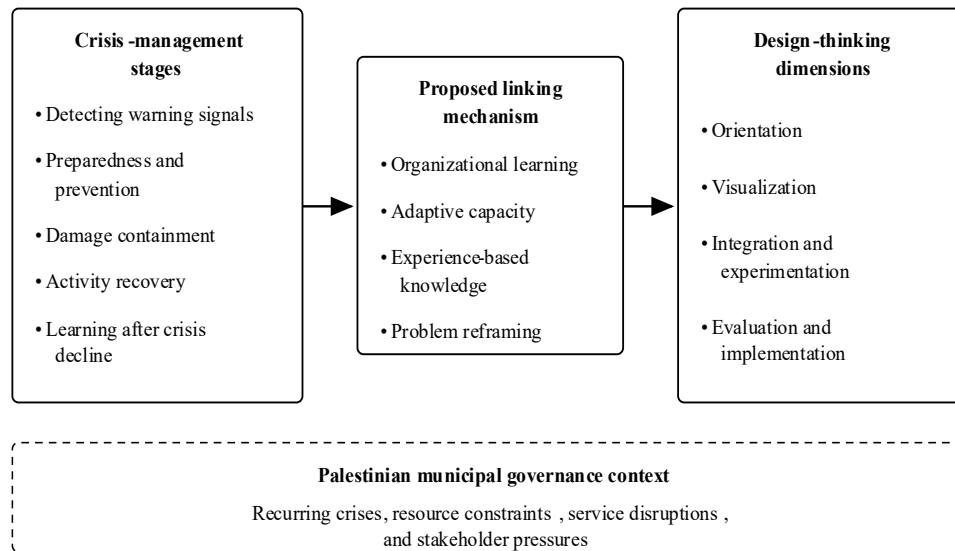


Fig. 1. Proposed conceptual model linking crisis management stages and design thinking dimensions

Note: The arrows represent the proposed theoretical pathway. The cross-sectional design examines statistical association and does not establish causality.

3.1. Research Design

The study adopted a descriptive-analytical design and a quantitative approach to examine the relationship between crisis-management stages and design thinking among employees of Jenin Municipality. Data were collected using a structured questionnaire and analyzed statistically to assess response levels and relationships among the study variables. This approach was appropriate for quantitatively examining the relationships specified in the research objectives and questions (Creswell and Creswell, 2023; Saunders et al., 2023; Sekaran and Bougie, 2019). Because the study used a cross-sectional survey design, the analysis identified statistical associations rather than temporal or causal relationships.

3.2. Study Population and Sample

The study population comprised all 404 employees actively employed by Jenin Municipality in 2025. Krejcie and Morgan (1970) recommend a minimum sample of 196 for a population of approximately 400. Convenience sampling yielded 239 valid responses, representing 59.2% of the population and exceeding the minimum recommended sample size. Gender category 1 included 122 respondents (51.0%), and category 2 included 117 respondents (49.0%); job-position category 1 included 124 respondents (51.9%), and category 2 included 115 respondents (48.1%). The retained records did not document the number of questionnaires distributed, returned, or excluded. Therefore, a formal assessment of response rate and non-response bias could not be reported. The sample should not be treated as statistically representative of all Palestinian municipalities because it was drawn using a non-probability sampling procedure from a single municipality. Accordingly, the findings describe the perceptions of the participating employees and should be generalized only with caution. Data collection was conducted in February 2025 and was not linked to, conducted during, or undertaken immediately after any specific crisis event. Accordingly, the responses are interpreted as employees' general perceptions of crisis management and design thinking practices within the municipality's broader operating context, rather than as evaluations of a particular crisis. The analyses were based on the 239 responses identified as valid in the original study records. A separate missing-data treatment or imputation procedure was not documented; therefore, no such procedure is claimed.

3.3. Research Instrument and Response Scale

A 35-item questionnaire, developed for the present study, was used to assess perceptions of crisis management and design thinking (Creswell and Creswell, 2023; Saunders et al., 2023). The complete instrument is provided in the Supplementary Material. The crisis management dimensions were informed by literature addressing preparedness, response, recovery, and organizational learning (Boin et al., 2016; Bundy et al., 2017). The design-thinking dimensions were informed by literature addressing problem orientation, stakeholder needs, alternative generation, experimentation, evaluation, and implementation in public-sector settings (Brinkman et al., 2023; McGann et al., 2018; Starostka et al., 2022). The questionnaire items were aligned with the operational definition of each dimension. The available study documentation did not identify a single previously validated instrument from which the complete questionnaire was adopted. Accordingly, the instrument is described as being structured for the present study rather than as a previously validated scale. The 15 crisis management items spanned five dimensions, with three items per dimension. Likewise, the 20 design thinking items spanned four dimensions, with five items per dimension. Overall and dimensional scores were calculated as averages of the appropriate items. Higher average item ratings indicated greater perceived implementation. All questionnaire items were administered in Arabic to the research participants. The English versions of the items are also included in the supplementary material. Because the retained documents did not provide evidence of formal forward and backward translation, the translation could not be formally validated. Responses were measured using a five-point Likert scale. Scores were interpreted as low (1.00–2.32), moderate (2.33–3.66), or high (3.67–5.00).

Table 1. Summary of Arabic and international studies on crisis management and design thinking

No.	Study	Year	Objective	Key Findings	Relevance
1	De Wulf and Voets	2026	Examine crisis management in local governments.	Effective crisis management depends on political-administrative integration and proactive leadership.	Supports coordination and decision-making dimensions.
2	Salameh	2025	Examine the effect of crisis management practices on institutional performance.	Planning, leadership, information systems, and decision-making improved performance.	Supports the Palestinian municipal context.
3	Akkan and Najj	2025	Examine strategic planning and crisis management.	Strategic planning improved crisis management effectiveness.	Supports planning in crisis management.
4	Čermák et al.	2025	Explore the role of small municipalities in crisis governance.	Resilience was strengthened through flexibility and local collaboration.	Supports containment, recovery, and learning dimensions.
5	Källström et al.	2025	Investigate design thinking in collaborative policymaking.	Design thinking enhances collaboration and innovation.	Supports design thinking dimensions.
6	Zaytoon	2025	Examine the effectiveness of strategic and crisis management.	Adopted early warning, preparedness, containment, recovery, and learning dimensions.	Supports the crisis management construct.
7	Kim et al.	2024	Examine institutionalization of design practices.	Sustainable design practices require organizational legitimacy.	Supports design thinking as an organizational capability.
8	Graf et al.	2024	Analyze transitions to crisis mode.	Crisis readiness depends on organizational and technological preparedness.	Supports preparedness and recovery dimensions.
9	Brinkman et al.	2023	Identify strategies supporting design thinking implementation.	Institutional support and contextual alignment facilitate adoption.	Supports municipal design thinking implementation.
10	Lewis et al.	2020	Examine design thinking in public-sector innovation.	Design thinking promotes innovation but faces organizational constraints.	Supports theoretical foundations of design thinking.

3.4. Validity, Reliability, and Common Method Bias

Content validity was assessed through expert review of item clarity and alignment with the intended constructs. The items were revised based on the reviewers' feedback (Creswell and Creswell, 2023). The available records did not report on the experts' characteristics or indicate whether a separate pilot test was conducted. These details are therefore not reported. To assess the questionnaire's reliability, Cronbach's alpha coefficient was used as a test of internal consistency. Cronbach's alpha was selected because it is widely used to assess the consistency of items intended to measure the same multidimensional construct (Hair et al., 2019). The available study documentation confirms that Cronbach's alpha was used during the original assessment of the questionnaire. However, the coefficient-level output for the individual dimensions and the two overall constructs was not available when preparing the revised manuscript. Accordingly, no unverified reliability coefficients are reported. The absence of these coefficients limits the independent evaluation of the instrument's internal consistency and is acknowledged as a methodological limitation. As the study used self-reported questionnaire data from a single source at a single time point, several procedural strategies were employed to minimize common method bias (Podsakoff et al., 2003). These procedures included expert review of the questionnaire items, assurances of anonymity and confidentiality, and the organization of the crisis-management and design-thinking items into separate sections of the instrument. A post hoc statistical assessment of common method variance, such as Harman's single-factor test, was not

documented in the available analytical output. Therefore, residual common method variance cannot be ruled out, and the strong correlations and regression results should be interpreted with caution.

3.5. Statistical Analysis

For data analysis, frequencies and percentages were used to summarize participant characteristics, while arithmetic means and standard deviations were used to describe levels of crisis management and design thinking. Cronbach's alpha was used during the original assessment of the questionnaire's internal consistency, although the detailed coefficient-level output was unavailable for reporting in the revised manuscript. Independent-samples t-tests were used to examine differences by gender and job position, while a one-way analysis of variance was used to examine differences by years of experience. Pearson correlation analysis was used to assess the direction and strength of the relationships between the crisis-management dimensions and the design-thinking dimensions. Simple linear regression was then used to examine the statistical association between the overall crisis management score (the explanatory variable) and the overall design-thinking score (the outcome variable). Using the overall crisis management score avoided the simultaneous entry of strongly intercorrelated crisis-management dimensions into the same regression model. All statistical tests were conducted at the 5% significance level ($\alpha \leq 0.05$). The regression findings were interpreted as statistical associations rather than causal effects because the data were cross-sectional, self-reported, and collected at a single time point. Because the regression model contained only one explanatory variable, multicollinearity among multiple predictors was not applicable. Detailed diagnostic output concerning residual normality, homoscedasticity, independence, and influential observations was not available in the retained analytical records. Therefore, no unverified Durbin-Watson, variance inflation factor, Shapiro-Wilk, or residual-diagnostic statistics are reported.

4. Results

Research Question 1: What is the level of crisis management practices in Jenin Municipality?

To answer the first research question, means, standard deviations, and evaluation levels were calculated for the five crisis-management dimensions: detecting warning signals, preparedness and prevention, damage containment, activity recovery, and learning after crisis decline. The results are presented in Table 2.

Table 2. Means, standard deviations, and evaluation levels of crisis management dimensions in Jenin Municipality

Dimension	Mean	SD	Evaluation Level
Detecting Warning Signals	3.686	0.421	High
Preparedness and Prevention	3.440	0.475	Moderate
Damage Containment	3.517	0.617	Moderate
Activity Recovery	3.201	0.765	Moderate
Learning After Crisis Decline	3.370	0.760	Moderate
Overall Crisis Management	3.443	0.472	Moderate

Overall, crisis management was moderate ($M = 3.443$, $SD = 0.472$). Detecting warning signals was the highest-rated dimension ($M = 3.686$, $SD = 0.421$), whereas activity recovery was the lowest-rated dimension ($M = 3.201$, $SD = 0.765$). The remaining dimensions were rated at moderate levels.

Research Question 2: What is the level of design thinking practices in Jenin Municipality?

To answer the second research question, means and standard deviations were calculated for the four design-thinking dimensions: orientation, visualization, integration and experimentation, and evaluation and implementation. The results are presented in Table 3.

Table 3. Means, standard deviations, and evaluation levels of design thinking dimensions

Dimension	Mean	SD	Evaluation Level
Orientation	3.480	0.836	Moderate
Visualization	3.216	0.968	Moderate
Integration and Experimentation	3.189	0.862	Moderate
Evaluation and Implementation	3.328	0.675	Moderate
Overall Design Thinking	3.304	0.757	Moderate

Overall design thinking was moderate ($M = 3.304$, $SD = 0.757$). Orientation was the highest-rated dimension ($M = 3.480$, $SD = 0.836$), whereas integration and experimentation were the lowest-rated dimensions ($M = 3.189$, $SD = 0.862$). All four dimensions were rated at moderate levels.

Research Question 3: What is the relationship between crisis management and design thinking?

To examine the relationship between crisis management and design thinking, Pearson correlation coefficients were calculated between the five crisis-management dimensions, the four design-thinking dimensions, and the two overall construct scores. The results are presented in Table 4.

Table 4. Correlation matrix between crisis management and design thinking dimensions

Design Thinking Dimensions	Warning Signals	Preparedness	Damage Containment	Activity Recovery	Learning After Crisis	Crisis Management Total
Orientation	.268**	.619**	.698**	.685**	.799**	.834**
Visualization	.528**	.350**	.656**	.528**	.673**	.724**
Integration and Experimentation	.567**	.602**	.635**	.640**	.674**	.813**
Evaluation and Implementation	.470**	.567**	.492**	.754**	.777**	.821**
Design Thinking Total	.509**	.580**	.693**	.708**	.801**	.876**

Note: All correlations were statistically significant at $p < .01$; $N = 239$.

All crisis-management dimensions were positively and significantly correlated with the design-thinking dimensions. Overall, crisis management was strongly associated with overall design thinking ($r = .876$, $p < .001$). Learning after crisis decline had the strongest correlation with overall design thinking ($r = .801$, $p < .001$), whereas detecting warning signals had the weakest correlation ($r = .509$, $p < .001$). Because the data were cross-sectional and self-reported, these relationships do not establish causality. H1 was therefore supported.

Research Question 4: To what extent is overall crisis management statistically associated with design thinking in Jenin Municipality?

Simple linear regression was used to examine the statistical association between overall crisis management and overall design thinking. The overall crisis management score was entered as the explanatory variable, and the overall design-thinking score was entered as the outcome variable. The overall score was used instead of simultaneously entering the five crisis-management dimensions because the dimensions were strongly intercorrelated. The results are presented in Table 5.

Table 5. Simple linear regression of overall crisis management and design thinking

Predictor	B	Std. Error	Beta	t	Sig.	95% CI for B
Constant	0.234	0.112	—	2.089	.038	[0.014, 0.454]
Crisis Management (Total)	0.891	0.032	0.876	27.56	< .001	[0.827, 0.955]

Note: Model Summary: $R = .876$, $R^2 = .767$, Adjusted $R^2 = .766$, $F(1, 237) = 759.6$, $p < .001$.

The simple linear regression model was significant ($F(1, 237) = 759.6$, $p < .001$) and accounted for 76.7% of the observed variance in design thinking scores ($R^2 = .767$). Overall, crisis management was positively associated with design thinking ($B = .891$, $SE = .032$, $\beta = .876$, $p < .001$). Because both variables were measured through the same cross-sectional self-report questionnaire, the result indicates statistical association rather than causation. H2 was supported.

4.5. Supplementary Demographic Analysis of Crisis Management Perceptions

As a supplementary analysis, independent-samples t-tests examined differences in perceptions of crisis management by gender and job position, while a one-way analysis of variance examined differences by years of experience. These demographic comparisons were secondary to the study's primary analysis of the relationship between crisis management and design thinking.

No statistically significant differences in crisis management perceptions were found between the two gender categories (Table 6), between the two job-position categories (Table 7), or according to years of experience (Table 8). Learning after crisis declined was not significant, although it approached the threshold ($F(2, 236) = 2.942$, $p = .055$). Overall, the supplementary analyses identified no statistically significant demographic difference in perceptions of crisis.4.6. Supplementary Demographic Analysis of Design Thinking Perceptions

Additional exploratory analyses examined whether perceptions of design thinking differed by gender, job position, and years of experience. These demographic comparisons provided contextual information about the sample and were secondary to the study's primary theoretical model.

The supplementary analyses also examined differences in design-thinking perceptions by gender and job position. No statistically significant differences were found between the two gender categories (Table 9) or between the two job-position categories (Table 10).

According to Table 11, no statistically significant differences in perceptions of design thinking were found across years of experience. Because one experience category had very few respondents, this result should be interpreted with caution. Overall, the supplementary analyses identified no statistically significant demographic differences in perceptions of design thinking. Crisis management and design thinking were both perceived at moderate overall levels, with a strong positive association between the two constructs. The supplementary demographic analyses found no statistically significant differences by gender, job position, or years of experience.

Table 6. Independent-samples t-test results for crisis management by gender category

Dimension	Gender category	N	Mean	SD	t	Sig.
Detecting Warning Signals	1	122	3.694	0.428	0.291	0.771
	2	117	3.678	0.417		
Preparedness and Prevention	1	122	3.421	0.492	-0.662	0.509
	2	117	3.462	0.459		
Damage Containment	1	122	3.492	0.661	-0.654	0.514
	2	117	3.544	0.570		
Activity Recovery	1	122	3.172	0.800	-0.591	0.555
	2	117	3.231	0.730		
Learning After Crisis Decline	1	122	3.372	0.764	0.012	0.990
	2	117	3.370	0.759		
Overall Crisis Management	1	122	3.430	0.490	-0.440	0.661
	2	117	3.457	0.455		

Table 7. Independent-samples t-test results for crisis management by job-position category

Dimension	Position category	N	Mean	SD	t	Sig.
Detecting Warning Signals	1	124	3.702	0.425	0.586	0.558
	2	115	3.670	0.420		
Preparedness and Prevention	1	124	3.419	0.494	-0.721	0.472
	2	115	3.464	0.456		
Damage Containment	1	124	3.500	0.658	-0.452	0.651
	2	115	3.536	0.573		
Activity Recovery	1	124	3.185	0.799	-0.321	0.748
	2	115	3.217	0.731		
Learning After Crisis Decline	1	124	3.398	0.753	0.566	0.572
	2	115	3.342	0.770		
Overall Crisis Management	1	124	3.441	0.491	-0.081	0.936
	2	115	3.446	0.453		

Table 8. One-way ANOVA results for crisis management by years of experience

Dimension	Source	SS	df	MS	F	Sig.
Detecting Warning Signals	Between Groups	0.331	2	0.165	0.929	0.396
	Within Groups	42.022	236	0.178		
Preparedness and Prevention	Between Groups	0.406	2	0.203	0.896	0.410
	Within Groups	53.394	236	0.226		
Damage Containment	Between Groups	0.725	2	0.362	0.949	0.388
	Within Groups	90.064	236	0.382		
Activity Recovery	Between Groups	1.739	2	0.869	1.490	0.228
	Within Groups	137.732	236	0.584		
Learning After Crisis Decline	Between Groups	3.346	2	1.673	2.942	0.055
	Within Groups	134.204	236	0.569		
Overall Crisis Management	Between Groups	1.049	2	0.525	2.378	0.095
	Within Groups	52.073	236	0.221		

5. Discussion

Crisis management and design-thinking practices were both perceived at moderate overall levels. Detecting warning signals was the highest-rated crisis-management dimension, whereas activity recovery was the lowest. This pattern suggests that early-warning practices were comparatively more developed than recovery practices and is consistent with literature emphasizing coordination, adaptation, and organizational learning in public-sector crisis management (Boin et al., 2016; Bundy et al., 2017). Orientation was the highest-rated design-thinking dimension, whereas integration and experimentation were the lowest. Attention to citizens' needs, therefore, appeared more developed than the systematic testing and modification of proposed solutions. This finding aligns with research identifying stakeholder understanding, problem reframing, experimentation, and evaluation as central components of public-sector design thinking (Brinkman et al., 2023; McGann et al., 2018; Starostka et al., 2022). The strong positive association between crisis management and design thinking supports the proposed organizational learning and adaptive capacity pathway. Learning after crisis decline had the strongest association with overall design thinking, suggesting that post-crisis reflection may support problem reframing, experimentation, and service improvement. Nevertheless, the cross-sectional, self-reported design prevents causal

interpretation, and the high R^2 value may partly reflect shared method variance. Supplementary demographic analyses did not identify statistically significant differences based on gender, job position, or years of experience. These results provide context but are secondary to the main focus on crisis management stages and design thinking. The findings might be relevant to municipalities that regularly face recurring crises, service disruptions, funding limitations, and stakeholder pressures; however, they should not be generalized beyond Jenin Municipality.

Table 9. Independent-samples t-test results for design thinking by gender category

Dimension	Gender category	N	Mean	SD	t	Sig.
Orientation	1	122	3.449	0.873	-0.572	0.568
	2	117	3.511	0.798		
Visualization	1	122	3.189	0.992	-0.459	0.647
	2	117	3.246	0.946		
Integration and Experimentation	1	122	3.154	0.886	-0.641	0.522
	2	117	3.226	0.839		
Evaluation and Implementation	1	122	3.321	0.685	-0.176	0.860
	2	117	3.337	0.668		
Overall Design Thinking	1	122	3.278	0.780	-0.526	0.599
	2	117	3.330	0.735		

Table 10. Independent-samples t-test results for design thinking by job-position category

Dimension	Position category	N	Mean	SD	t	Sig.
Orientation	1	124	3.468	0.863	-0.225	0.822
	2	115	3.492	0.809		
Visualization	1	124	3.229	0.971	0.203	0.839
	2	115	3.203	0.969		
Integration and Experimentation	1	124	3.176	0.890	-0.247	0.805
	2	115	3.203	0.835		
Evaluation and Implementation	1	124	3.321	0.684	-0.187	0.851
	2	115	3.337	0.669		
Overall Design Thinking	1	124	3.298	0.774	-0.109	0.913
	2	115	3.309	0.742		

Table 11. One-way ANOVA results for design thinking by years of experience

Dimension	Source of Variance	SS	df	MS	F	Sig.
Orientation	Between Groups	2.024	2	1.012	1.455	0.236
	Within Groups	164.185	236	0.696		
Visualization	Between Groups	2.496	2	1.248	1.335	0.265
	Within Groups	220.637	236	0.935		
Integration and Experimentation	Between Groups	1.300	2	0.650	0.874	0.419
	Within Groups	175.592	236	0.744		
Evaluation and Implementation	Between Groups	0.908	2	0.454	0.996	0.371
	Within Groups	107.602	236	0.456		
Overall Design Thinking	Between Groups	1.574	2	0.787	1.377	0.254
	Within Groups	134.880	236	0.572		

This study has several limitations. First, it used a cross-sectional, single-source design, which limits the ability to assess changes over time and increases the risk of common method bias. Second, the convenience sample came from only one municipality, restricting the generalizability of the findings. The study also lacked complete diagnostic tests for common method bias, reliability, and regression assumptions. Future research should use longitudinal or mixed-methods designs,

collect data from at least two sources, conduct full diagnostic analyses, and include participants from at least three municipalities.

6. Conclusion

Crisis management and design thinking were moderately and positively related. The supplementary demographic analyses revealed no statistically significant differences based on gender, job position, or years of experience. This study makes an empirical contribution by examining crisis management and design thinking within a single model in Palestinian municipalities. The findings suggest that knowledge acquisition and adaptive capacity may link crisis management experience to problem reframing, experimentation, and service improvement. Jenin Municipality should strengthen its warning procedures, preparedness measures, continuity planning, and structured post-crisis reviews. It should integrate design thinking into practice through cross-departmental participation, small-scale testing, stakeholder feedback, and systematic evaluation. Capacity-building programs should develop both crisis management and design thinking capabilities.

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Author Contributions

Samer Mohammad Hassan Arqawi contributed to conceptualization, methodology, supervision, validation, writing of the original draft, review and editing. Nour Taher Mohammad Alaqraa contributed to investigation, data collection, formal analysis, literature review, writing of the original draft, reviewing, and editing. Both authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Institutional Review Board Statement

The study received ethical approval from the Institutional Research Ethics Committee at the authors' institution on 1 February 2025. The letter of approval did not include a separate reference number. Participation was voluntary, and all participants provided informed consent before data collection. Confidentiality and anonymity were maintained throughout the research process.

Declaration of Artificial Intelligence (AI) Tools

The authors used Grammarly solely for language editing, including improvements to grammar, spelling, clarity, and readability. Grammarly was not used to generate research ideas, develop the methodology, analyze or interpret the data, or produce the study conclusions. The authors reviewed and approved the entire manuscript and take full responsibility for its content.

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