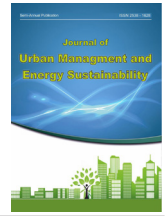


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Examining the Effect of Project Risk Management on Demolition Performance in Construction Projects: A Case Study of the Dilapidated Buildings of Najaf City, Iraq

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ABSTRACT

Demolition is the first and inherently most hazardous stage of the urban-regeneration cycle, yet within the construction risk-management literature it has received a disproportionately small share of attention. In historic and religious urban fabrics such as Najaf city in Iraq, the demolition process is compounded by high building density. The present study aims to determine the extent to which project risk management affects demolition performance in construction projects, focusing on the dilapidated buildings of the city of Najaf. The research is applied in purpose and descriptive-survey in method. The statistical population comprised 175 project managers, supervising engineers, site superintendents, and safety experts involved in demolition projects in Najaf. Data were gathered with a researcher-made questionnaire on a five-point Likert scale whose content validity and reliability were confirmed. Data were analysed in SPSS using the Kolmogorov-Smirnov test, Pearson correlation, and simple linear regression. Project risk management was a significant predictor of demolition performance. The adjusted coefficient of determination was 0.717, indicating that 71.7% of the variance in demolition performance is explained by project risk management; the standardized regression coefficient of 0.847 denotes a strong, positive linear relationship, confirmed at a significance level of 0.0001 with a Durbin-Watson statistic of 2.264. Investment in project risk management yields a significant improvement in the safety, schedule, cost, and quality of demolition. For historic religious fabrics such as Najaf, a systematic, context-sensitive risk-management framework based on the five-stage PMBOK process should be institutionalized as a legal prerequisite for issuing demolition permits.

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INTRODUCTION

Construction projects in historic and sensitive urban fabrics face a twofold challenge: on the one hand they must improve deteriorating infrastructure, and on the other they must preserve the cultural and physical integrity of fabrics that resist standardized intervention. The demolition stages the first and inherently most hazardous phase of the urban-regeneration cycle concentrates these tensions. Unlike construction activities, demolition is characterized by irreversible structural interventions, high uncertainty regarding the true condition of the structure, and the compound exposure of adjacent buildings and local communities to cascading risks. Despite these distinctive features, the demolition phase has occupied a disproportionately small place in the construction project risk-management literature, where research has concentrated largely on the design and construction phases. The holy city of Najaf is a vivid instance of this convergence. The old fabric of the city centre surrounding the sacred shrine of Imam Ali is a dense, multi-layered historic tissue that has undergone successive cycles of demolition and reconstruction cycles often driven by political and security imperatives rather than systematic urban planning. Contemporary renewal schemes, including the recent demolition and redevelopment of properties around Sahat al-Sayyid, reveal a vital tension: the need to improve services for a growing pilgrim population stands against the fragility of a traditional fabric that embodies irreplaceable architectural and social capital. Demolition processes in Najaf's sacred core have shown that they can accelerate urban transformation in ways that place the identity and human-scale qualities defining the city's heritage at risk of erosion. In this context, demolition is not merely a technical operation but a high-risk intervention whose failure modes include structural collapse, damage to adjacent historic structures, disruption of religious and commercial activity, and the irreversible loss of cultural fabric. A substantial body of research has shown

that systematic risk management comprising identification, assessment, response, and control has a measurable effect on project performance outcomes, including cost, schedule, and quality (Su & Khallaf, 2022; Turkyilmaz & Polat, 2025). Systematic reviews have catalogued the mechanisms through which risk propagates to project performance and have repeatedly stressed the need for more context-sensitive frameworks that treat risk assessment as an integrated system rather than a set of isolated variables (Amaechi et al., 2025; Lin & Chen, 2021). Emerging research on demolition risk assessment has likewise begun to develop structured procedures for quantifying structural risks such as collapse, overturning, and falling during building demolition (Kim et al., 2025; Patel & Patel, 2025). Nevertheless, the existing literature reveals two fundamental gaps. First, demolition risk-management research is predominantly technical and structural in nature, and insufficient attention has been paid to integrating project-level risk-management processes that encompass organizational, environmental, regulatory, and social dimensions (Silva & Santos, 2024). Second, no systematic study has yet addressed whether and how the principles of project risk management—largely developed in greenfield construction contexts can be generalized to the unique constraints of demolition in historic and sacred urban centres such as Najaf. This gap is not merely academic. The absence of a validated, context-sensitive framework for managing demolition risks in Najaf's old fabric means that project decisions are made without systematic evidence on which risk dimensions most strongly influence performance outcomes. Recent incidents worldwide show that uncontrolled structural collapse during demolition can jeopardize public safety, disrupt surrounding communities, and generate cascading liabilities. In the specific context of Najaf—where demolition takes place in the vicinity of religious sites of global significance and within a fabric that sustains both residents' lives and the pilgrimage economy the consequences of unmanaged risk

extend beyond project metrics to encompass irreparable cultural loss and social disruption. The present study addresses this problem by examining the effect of project risk management on demolition performance in the dilapidated buildings of Najaf. Accordingly, the objective of the research is to determine the extent to which project risk management affects the improvement of the demolition process in the dilapidated building projects of Najaf. In line with this objective, the research question is formulated as follows: to what extent does project risk management affect the improvement of the demolition-process performance in the dilapidated building projects of Najaf? Correspondingly, the research hypothesis states that project risk management is a significant predictor of improved demolition-process performance in the dilapidated building projects of Najaf. By situating this question in a specific and under-studied context, the study aims both to advance the theoretical understanding of the contextual contingency of risk management and to provide evidence-based guidance for the authorities and project managers who confront the distinctive hazards of demolition in historic Islamic urban environments.

MATERIALS AND METHODS

International studies on project risk management

Karugu et al. (2026) examined the relationship between risk-management practices, contract-management practices, and the performance of construction projects in the Nairobi metropolitan region of Kenya, testing the moderating effect of project managers' managerial skills. Regression analysis showed that risk-management and contract-management practices are positive and significant predictors of construction-project performance, with the combined model explaining 60.6% of the variance in project performance; the moderating effect of managerial skills was not significant and produced only a marginal increase in explanatory power. Teng and Latif (2026), studying construction projects in Qingdao, China, and drawing on the

resource-based view and contingency theory, built a multidimensional model of the effect of management safety, organizational commitment, and risk management on construction performance and tested the moderating role of project complexity. A PLS-SEM analysis of 279 valid questionnaires showed that management safety strengthens schedule and cost stability by reducing accidents and rework; organizational commitment enhances employee participation and collaborative effectiveness; and risk management, through proactive engagement with uncertainty, curbs delay and cost overrun. Project complexity had a negative moderating effect on the risk-management-performance relationship, weakening the benefits of risk management in high-uncertainty environments. Canbal Vedi and Sözen (2026), focusing on the Turkish construction industry, investigated the effect of the maturity level of organizational risk management on project success and the role of contractual conditions, emphasizing that under crisis conditions such as the global pandemic, economic contraction, geopolitical uncertainty, and the major Turkish earthquakes risk-management maturity has become a key factor shaping firms' crisis resilience, the stability of project processes, and long-term success strategy. Turkyilmaz and Polat (2025) conducted a bibliometric review and content analysis of the existing construction-risk literature to identify research clusters and trending themes and to build a risk breakdown structure; through a systematic review of 137 Scopus-indexed documents they identified four principal clusters of construction-risk research and, via content analysis, extracted 37 risk factors classified into five categories, subsequently validating the risk breakdown structure through a focus-group interview with 12 construction-industry experts. Zhasmukhambetova et al. (2025) performed a systematic review of the integration of risk assessment and scheduling in road-construction projects, critically examining risk-assessment methods such as the probability-impact method, Monte-Carlo simulation, fuzzy-set

theory, and the analytic hierarchy process, alongside traditional scheduling methods such as the critical-path method and the program evaluation and review technique.

Yu et al. (2024), aiming to examine the relationship between integrated risk management and the performance of complex urban-renewal projects, tested the mediating role of organizational resilience and found that in urban-renewal projects with a historic fabric, integrated risk management plays a more decisive role in reducing delay and controlling cost. Chen and Liu (2024) investigated the effect of risk-management practices on the success of demolition projects in high-density urban areas; multiple regression analysis showed that the three dimensions of risk identification, response planning, and monitoring and control are the strongest predictors of demolition-project success, together explaining 64% of the variance in project success, and that in high-density areas the risks associated with adjacent structures and urban-traffic disruption carry the highest priority. Complementing these findings, Zhao et al. (2024) showed that risk management is closely intertwined with innovative construction technologies in improving building-safety performance, and Lin and Chen (2021), in a study of Taiwanese construction projects, demonstrated that the systematic implementation of the risk-management process significantly improves project outcomes. Abotaleb et al. (2023) proposed a comprehensive framework for the risk assessment of demolition projects in historic urban fabrics, showing that structural risks (such as collapse and instability) and socio-cultural risks (such as damage to cultural heritage and community resistance) carry the highest weight in historic fabrics; in terms of study context and its context-sensitive approach, this study is the closest to the present research. International studies on the demolition process Adi et al. (2025) combined building information modelling with a Bayesian network to develop a comprehensive decision-support framework for the “go/no-go” decision in building-demolition

projects; their findings showed that inadequate structural integrity (70%) and high renovation cost (59%) are the key drivers of the demolition decision, that the model estimated the probability of demolition at 55.1%, and that the mechanical demolition method, owing to its high efficiency and low risk, was selected as the preferred option (56%). Patel and Patel (2025) developed a demolition-project hazard index to assess the risk level of demolition projects, validating it by establishing a correlation between the index and the safety budget of several demolition projects and enabling stakeholders to allocate resources for safety management on a more realistic assessment of hazard. Kim et al. (2025) proposed a practical procedure for risk assessment in the structural-safety management of building demolition; through demolition guidelines, accident cases, and expert review they constructed a risk profile, proposed a simplified assessment framework for the preliminary-review stage and a detailed assessment framework for the demolition-plan stage, and applied them to a sample building, computing a representative post-planning risk score of 0.57 (moderate). Amaechi et al. (2025), in the *Journal of Building Engineering*, published a systematic literature review of knowledge management for project risk management in construction, finding that knowledge mapping is a valuable visual tool for representing the interrelationships among risk factors and identifying digital-technology enablement, organizational-learning mechanisms, and the risk-supply-chain-governance nexus as important current research directions. Ayyildiz et al. (2025) developed an integrated framework for risk prioritization in construction and demolition waste management that combines the classic FMEA/Fine-Kinney criteria with a picture-fuzzy multi-criteria decision-making method, finding severity to be the most influential criterion, followed by exposure and probability. In the same vein, Soltanzadeh et al. (2022) analysed the health, safety, and environmental risks of construction projects using the fuzzy analytic hierarchy pro-

cess, identifying 37 hazard sources across nine project-management knowledge areas, of which 20 were at an unacceptable and 17 at a tolerable risk level, while Ding and Liu (2024) advanced interval type-2 fuzzy methods for the safety-risk assessment of building projects. Nakamura et al. (2024), studying demolition projects of aging buildings in Japan, proposed a systematic procedure for safety-risk management comprising four stages, preliminary assessment, detailed planning, controlled execution, and post-demolition monitoring, whose validation on three sample projects showed that its implementation can reduce the accident rate by up to 47%. Silva and Santos (2024), through a systematic review of 98 articles published between 2010 and 2023, analysed the environmental and social dimensions of risk management in demolition projects, and García-Prada et al. (2023), through a comparative analysis of the legal and operational frameworks of five European countries, showed that countries mandating a dedicated risk-management plan and independent supervision report lower rates of occupational accidents. A broader stream of scientometric work on construction and demolition waste management further situates these risks within circular-economy and sustainability agendas (Soyinka et al., 2023; Islam et al., 2024; Schützenhofer et al., 2022; Nadazdi et al., 2022), underlining that environmental and social risk dimensions are integral to, rather than separate from, demolition performance.

Project risk management

Risk is defined as an uncertain event or condition that, if it occurs, has a positive or negative effect on project objectives, and is the product of the probability of occurrence and the severity of consequence (Project Management Institute [PMI], 2021). Project risk management is a systematic process aimed at increasing the probability and impact of positive events and decreasing the probability and impact of negative events. According to the PMBOK standard, project risk management comprises five dimensions:

- Risk management planning: formulating the risk-management plan, including methodology, roles, budget, and risk thresholds (PMI, 2021).

- Risk identification: documenting potential risks and their characteristics through techniques such as brainstorming and the Delphi method (PMI, 2021).

- Quantitative and qualitative risk analysis: prioritizing risks by probability and severity using methods such as the probability–impact matrix and Monte-Carlo simulation (Zhasmukhambetova et al., 2025).

- Risk response planning: developing preventive measures such as structural assessment, temporary shoring, and selection of a suitable demolition method (Nakamura et al., 2024).

- Risk monitoring and control: continuous monitoring, identification of new risks, and evaluation of the effectiveness of measures (Kim et al., 2025).

Chen and Liu (2024) showed that the identification, response-planning, and control dimensions are strong predictors of the success of demolition projects.

Demolition performance

Demolition performance is defined as the degree of success of the demolition process in achieving the following four-dimensional objectives:

- Demolition safety: safeguarding the health of workers, residents, and passers-by and preventing incidents such as collapse and damage to adjacent structures. Nakamura et al. (2024) reported a 47% reduction in accidents through the implementation of a preventive risk-management framework.

- Time performance of demolition: compliance with the schedule and prevention of delays arising from uncertainties (Zhasmukhambetova et al., 2025).

- Cost performance of demolition: conformity of actual costs with the budget and prevention of cost deviation. Yu et al. (2024) confirmed the decisive role of risk management in cost control in historic-fabric renewal projects.

- Execution quality of demolition: conformity with technical standards, environmental requirements, and stakeholder expectations. Silva and Santos (2024) emphasized the need to integrate environmental and social dimensions into demolition quality.

Theoretical framework and conceptual model

The theoretical framework is grounded in the resource-based view (risk management as a strategic organizational capability) and contingency theory (the dependence of the effectiveness of procedures on contextual conditions). Teng and

Latif (2026) showed that project complexity has a negative moderating effect on the risk-management–performance relationship. On this basis, the conceptual model of the study comprises an independent variable (project risk management with five dimensions) and a dependent variable (demolition performance with four dimensions), and the research hypothesis that project risk management predicts the improvement of demolition performance in the dilapidated buildings of Najaf is formulated accordingly. Figure 1 depicts the conceptual model and the hypothesized relationship.

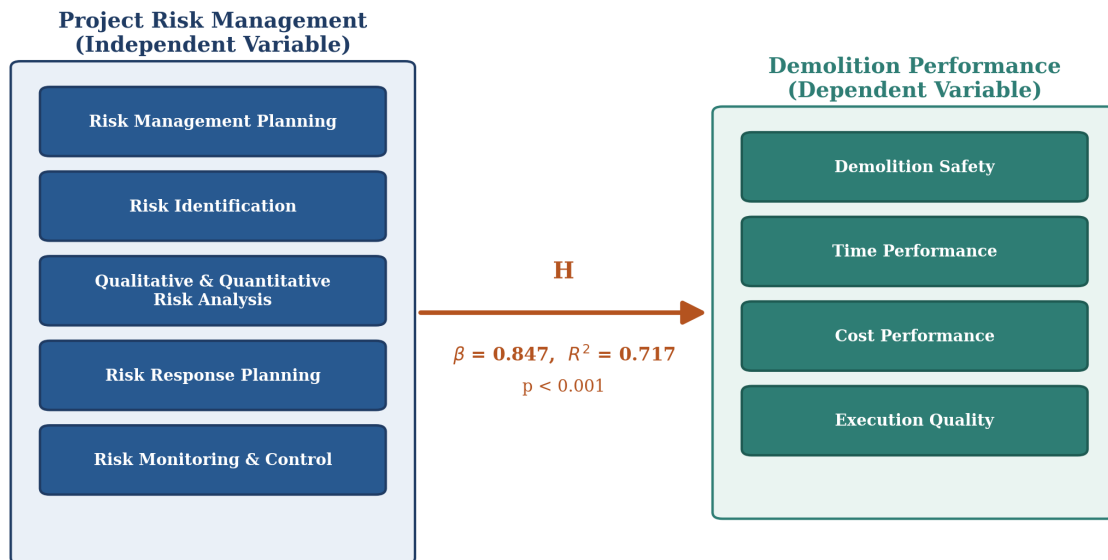


Figure 1: Conceptual model of the study, grounded in the resource-based view and contingency theory.

Methodology

This section sets out, in a structured manner, the design, scope, instrumentation, sampling, and analytical procedures of the study, so that the findings reported in Section 4 rest on a transparent and replicable methodological basis.

Scope of the study

The spatial scope of the study is the city of Najaf al-Ashraf specifically the dilapidated fabric of the city centre and the demolition and regeneration projects surrounding the sacred shrine of Imam Ali. The temporal scope is the data-col-

lection period of the year 1404 in the Iranian calendar (2025–2026 CE). The thematic scope is the examination of the effect of project risk management on demolition performance in construction projects, with a focus on the dilapidated buildings of Najaf city. The study employs two data-collection methods. The library method was used to formulate the theoretical foundations, review the literature, and extract the indicators and components of risk management and demolition performance, drawing on credible sources such as books, scientific research articles, dissertations, the PMBOK standard, and

domestic and international databases. The field method was used to gather the data required to test the hypothesis, through a researcher-made questionnaire distributed among project managers, supervising engineers, site superintendents, safety experts, and other personnel involved in demolition projects in Najaf. The principal data-collection instrument is a questionnaire organized in two parts. Part one, respondents' characteristics captures demographic information such as gender, age, level of education, work experience, type of organization/company, role in the project, and number of demolition projects experienced. Part two, measurement of the study variables comprises items relating to the dimensions of project risk management (risk-management planning, risk identification, quantitative and qualitative risk analysis, risk-response planning, and risk monitoring and control) and items relating to demolition performance (safety, time, cost, and execution quality). Responses were measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). After initial design, the questionnaire was reviewed by several academic and industry experts so that the necessary

revisions could be applied, and it was then distributed among the statistical population both in person and electronically. Two methods were used to assess the validity of the questionnaire. For content validity, the questionnaire was submitted to a number of professors and experts in construction management and risk management, and the content validity ratio and content validity index were computed; items scoring below the acceptable threshold were removed or revised. For construct validity, confirmatory factor analysis / principal-component analysis was conducted in SPSS, with the criterion that item factor loadings exceed 0.5. Reliability. Reliability was assessed using Cronbach's alpha coefficient. After a pilot administration of the questionnaire to 30 members of the statistical population, Cronbach's alpha was computed for each dimension and for the questionnaire as a whole; a value above 0.7 was taken as evidence of acceptable internal consistency (Tavakol & Dennick, 2011). As Table 1 shows, all dimensions and the overall instrument (alpha = 0.91) exceeded this threshold, confirming the reliability of the instrument. (Tab. 1)

Table 1: Cronbach's alpha coefficients of the questionnaire.

Variable / dimension	Number of items	Cronbach's alpha
Risk management planning	5	0.78
Risk identification	6	0.81
Quantitative and qualitative risk analysis	6	0.83
Risk response planning	5	0.79
Risk monitoring and control	5	0.80
Project risk management (total)	27	0.89
Demolition safety	5	0.82
Time performance of demolition	4	0.76
Cost performance of demolition	4	0.77
Execution quality of demolition	4	0.80
Demolition performance (total)	17	0.86
Whole questionnaire	44	0.91

Statistical population and sampling

The statistical population comprised the project

managers, supervising engineers, site superintendents, safety experts, technical experts,

and other personnel involved in the demolition projects of Najaf's dilapidated buildings, initially estimated at 175 persons. Sample size was determined using the Cochran/Krejcie–Morgan approach for a finite population (Krejcie & Morgan, 1970); on this basis 120 persons were selected. Through simple random sampling and in consultation with a statistics adviser, 120 questionnaires were distributed by lottery, and after extensive follow-up a total of 120 completed questionnaires were retained as the final sample. The collected data were analysed in SPSS (version 26) in the following stages. (1) Descriptive statistics: frequency, percentage, mean, standard deviation, minimum, and maximum for respondents' characteristics and questionnaire items. (2) Normality testing: The Kolmogorov–Smirnov test was used to verify the normality of the distribution of the study variables (project risk management and demolition performance) so that the assumptions required for parametric tests were satisfied; where the significance level (p) exceeds 0.05, the null hypothesis of normality is confirmed. (3) Correlation analysis: Pearson's correlation coefficient between the inde-

pendent variable and the dependent variable and their dimensions. (4) Regression analysis: simple linear regression to test the research hypothesis. (5) Hypothesis testing: the hypothesis was tested using the regression coefficients (B), the coefficient of determination (R^2), the F statistic, and the significance level (p), with a significance level of 0.05.

FINDINGS AND DISCUSSION

Respondents' profile

The demographic characteristics of the 120 respondents are summarized in Table 2. The profile is dominated by experienced male practitioners: 90% were men, 75% were between 30 and 50 years of age, 90% held a bachelor's degree or higher, and 85% had at least five years of work experience. The distribution of professional roles project managers (20%), supervising engineers (25%), site superintendents (20%), safety experts (15%), and technical experts (20%) indicates that the responses reflect the full spectrum of expertise involved in demolition projects, strengthening the credibility of the findings.

Table 2: Demographic characteristics of the respondents ($n = 120$).

Characteristic	Group	Frequency (n)	Percentage
Gender	Male	108	90
	Female	12	10
Age	Under 30 years	18	15
	30–40 years	54	45
	41–50 years	36	30
	Over 50 years	12	10
Education	Associate	12	10
	Bachelor's	60	50
	Master's	36	30
	Doctorate	12	10
Work experience	Under 5 years	18	15
	5–10 years	42	35
	11–15 years	36	30
	Over 15 years	24	20
Role in project	Project manager	24	20

Role in project	Supervising engineer	30	25
	Site superintendent	24	20
	Safety expert	18	15
	Technical expert	24	20

Normality of the data

Prior to the regression analysis and hypothesis testing, the Kolmogorov–Smirnov test was applied to the data gathered from the 120 respondents to verify the normality of the study variables. As Table 3 shows, the significance level for project risk management and its five dimen-

sions, and for demolition performance and its four dimensions, was greater than 0.05 in every case, indicating that the data are normally distributed and that the assumption required for parametric tests such as Pearson correlation and linear regression is satisfied.

Table 3: Results of the Kolmogorov–Smirnov test for the study variables.

Variable	n	Mean	K–S Z	Sig.	Result
Project risk management (total)	120	3.87	0.89	0.396	Normal
Risk management planning	120	3.79	0.94	0.342	Normal
Risk identification	120	3.92	0.87	0.415	Normal
Quantitative and qualitative risk analysis	120	3.84	0.91	0.378	Normal
Risk response planning	120	3.81	0.88	0.402	Normal
Risk monitoring and control	120	3.95	0.85	0.463	Normal
Demolition performance (total)	120	3.76	0.92	0.361	Normal
Demolition safety	120	3.83	0.90	0.385	Normal
Time performance of demolition	120	3.71	0.93	0.352	Normal
Cost performance of demolition	120	3.68	0.95	0.327	Normal
Execution quality of demolition	120	3.80	0.89	0.398	Normal

Testing the research hypothesis

The research hypothesis states that project risk management is a significant predictor of improved demolition-process performance in the dilapidated buildings of Najaf. Let Y denote the criterion (dependent) variable—improvement of demolition-process performance and X the predictor (independent) variable—project risk management. A simple linear regression model was fitted to test the effect of X on Y. As the anal-

ysis of variance in Table 4 shows, a significant linear relationship exists between project risk management and the improvement of demolition performance: the model is significant at $p = 0.0001$ with $F(1,118) = 328.89$, the correlation coefficient is $R = 0.847$, the adjusted coefficient of determination is $R^2 = 0.717$, and the Durbin–Watson statistic of 2.264 confirms the independence of the residuals and the adequacy of the regression model. (Tab. 4)

Table 4: Analysis of variance for the effect of project risk management on the improvement of demolition performance.

Model	Sum of squares	df	Mean square	F	Sig.	R	R ²	Durbin–Watson
Regression	10.736	1	10.736	328.887	0.0001	0.847	0.717	2.264
Residual	4.243	118	0.033	—	—	—	—	—
Total	14.979	119	—	—	—	—	—	—

The standardized and unstandardized regression coefficients are presented in Table 5. The constant term is 2.349 ($t = 27.376$, $p = 0.0001$) and the unstandardized coefficient of project risk management is 0.402 ($t = 18.135$, $p = 0.0001$), giving the fitted model $\hat{Y} = 2.349 + 0.402X$. Accordingly, the effect of project risk management on the improvement of demolition performance is positive and significant,

with a standardized coefficient (β) of 0.847; that is, for every one-standard-deviation increase in project risk management, demolition performance improves by 0.847 of a standard deviation. Because $R^2 = 0.717$, project risk management explains 71.7% of the variance in demolition performance, while the remaining 28.3% is attributable to variables outside the model.

Table 5: Regression coefficients for the effect of project risk management on demolition performance.

Predictor	B	Std. error	β (standardized)	t	Sig.
Constant	2.349	0.086	—	27.376	0.0001
Project risk management	0.402	0.022	0.847	18.135	0.0001

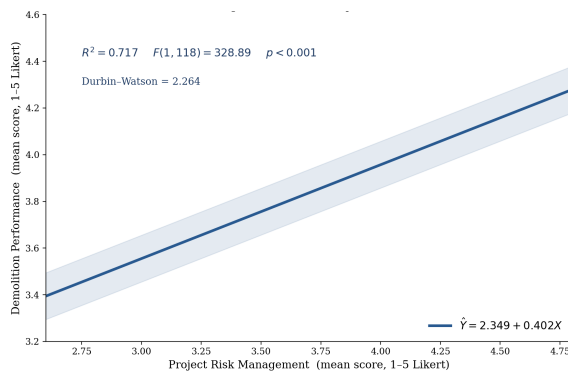


Figure 2: Fitted simple-linear-regression line relating project risk management to demolition performance.

Interpretation and comparative positioning of the findings

The magnitude of the explained variance places the present study at the upper end of comparable empirical work. The value of $R^2 = 0.717$ exceeds the 60.6% reported by Karugu et al. (2026) for the combined risk- and contract-management model in Nairobi and the 64% reported by Chen and Liu (2024) for demolition-project success in high-density urban areas (Fig. 3). The stronger explanatory power observed here is consistent with the heightened stakes of demolition in Najaf's dense, historic, and religious fabric, where the absence of systematic risk management can precipitate more catastrophic consequences, cascading collapse, damage to adjacent historic structures, and disruption of the pilgrimage

economy so that variation in risk-management practice translates more directly into variation in performance. The high descriptive means of the risk-monitoring-and-control (3.95) and risk-identification (3.92) dimensions, together with the comparatively lower means of the cost (3.68) and time (3.71) performance dimensions, further suggest that practitioners already recognize the centrality of proactive control while the cost and schedule outcomes remain the most exposed to residual uncertainty.

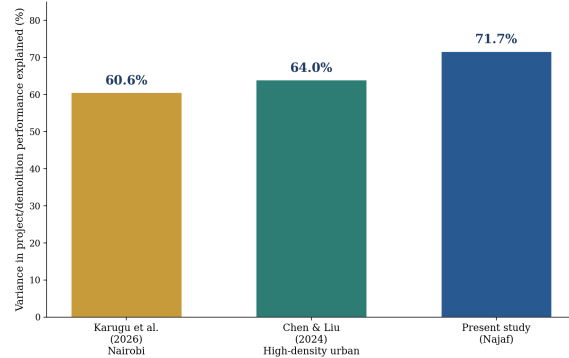


Figure 3: Explained variance in performance across comparable risk-management studies.

RESULTS AND CONCLUSION

The present study set out to determine the extent to which project risk management affects demolition performance in construction projects, focusing on the dilapidated buildings of Najaf. The findings of the linear-regression analysis

showed that project risk management is a significant predictor of demolition performance: the adjusted coefficient of determination of 0.717 indicates that 71.7% of the variance in demolition performance is explained by project risk management, and the standardized regression coefficient of 0.847 denotes a strong, positive linear relationship, confirmed at a significance level of 0.0001 with $F = 328.887$ and a Durbin-Watson statistic of 2.264 attesting to the independence of the residuals and the adequacy of the model. This finding is consistent with, and even stronger than, the results of Karugu et al. (2026), who found the combined risk- and contract-management model to explain 60.6% of the variance in the performance of Nairobi construction projects, and Chen and Liu (2024), who attributed 64% of the variance in demolition-project success in high-density areas to risk-management dimensions; the difference in explanatory power can be ascribed to the more hazardous and sensitive nature of the demolition process in Najaf's dilapidated and religious fabric, where a failure to manage risk can carry more catastrophic consequences such as cascading collapse, damage to adjacent historic structures, and disruption of the pilgrimage economy. The findings also align with Teng and Latif (2026), who demonstrated a negative moderating effect of project complexity on the risk-management-performance relationship since the high complexity of Najaf's historic fabric redoubles the need for systematic risk management and with Yu et al. (2024), who confirmed the mediating role of organizational resilience in the relationship between integrated risk management and the performance of urban-renewal projects. Furthermore, the results are congruent with Kim et al. (2025) and Patel and Patel (2025), who emphasized the quantitative assessment of structural risks and the development of a demolition-project hazard index, and show that risk management affects not only structural safety but all dimensions of demolition performance, safety, time, cost, and quality. The findings are likewise in line with Abotaleb et al. (2023), who

identified structural and socio-cultural risks as carrying the highest weight in historic fabrics; Nakamura et al. (2024), who reported a 47% reduction in the accident rate through a preventive safety-risk-management framework; Silva and Santos (2024), who stressed the integration of environmental and social dimensions; García-Prada et al. (2023), who showed lower occupational-accident rates in countries mandating a dedicated risk-management plan and independent supervision; and Ayyildiz et al. (2025) and Soltanzadeh et al. (2022), who identified severity, exposure, and probability as the most influential risk criteria in construction and demolition contexts.

Theoretically, the results reinforce the resource-based view by positioning project risk management as a strategic organizational capability that generates measurable performance advantage, and they substantiate the contingency perspective by showing that this advantage is amplified in the exceptionally demanding context of historic religious fabrics. Practically, and by integrating the recommendations of the study, a coherent set of measures follows. It is proposed that Najaf municipality and the responsible authorities develop a systematic, context-sensitive framework for demolition risk management based on the five-stage PMBOK process risk-management planning, identification, quantitative and qualitative analysis, response planning, and monitoring and control and incorporate it as a legal requirement in the demolition-permit by-laws, so that no demolition project begins without an approved risk-management plan. Specialized training courses should be held for project managers, supervising engineers, site superintendents, and safety experts on the principles of risk management and on modern tools such as building information modelling, Bayesian networks, fuzzy assessment, and real-time monitoring systems. Demolition contractors should be ranked by professional competence and risk-management experience, so that sensitive historic-fabric projects are entrusted to qualified contractors.

A stakeholder-participation mechanism should be established coordination with religious authorities and the shrine custodianship, public information through local media, and pre-commencement public meetings to reduce social and cultural resistance, because in Najaf's religious fabric social risks can affect project performance as strongly as technical and structural risks. A system of continuous monitoring and evaluation of demolition performance should be instituted on the basis of key indicators such as the accident rate, the near-miss rate, schedule compliance, cost deviation, damage to adjacent structures, and community satisfaction. Sufficient resources should be allocated for preventive measures rigorous pre-demolition structural assessment, mapping of the building and adjacent structures, identification and removal of hazardous materials such as asbestos, temporary shoring of at-risk structures, protection of adjacent historic and religious buildings, and proper management of construction waste and debris. The demolition method should be matched to the level of hazard, so that in the vicinity of religious sites and sensitive historic structures the use of heavy, vibration-inducing machinery is limited and replaced by controlled, piecemeal manual demolition under the continuous presence of a structural engineer. Finally, a comprehensive risk database for the demolition of Najaf's dilapidated fabric should be created, after-action reviews should be held on completion of each project, and technologies such as drones, photogrammetry, Internet-of-Things sensors, and early-warning systems should be adopted while a culture of safety and risk management is institutionalized through the exemplary leadership of senior managers, recognition of staff with superior safety performance, and encouragement of fearless near-miss reporting. In sum, the evidence of this study supports a clear conclusion: investment in project risk management, as a key strategic capability, delivers a significant improvement in the safety, schedule, cost, and quality of demolition and minimizes the human, financial, and cultural hazards of demo-

lition projects in Najaf's historic fabric, thereby advancing sustainable urban development. Embedding a systematic, context-sensitive, and legally mandated risk-management process at the heart of demolition governance is therefore not an administrative formality but a decisive determinant of whether the transformation of Najaf's sacred fabric proceeds safely and with respect for its irreplaceable heritage.'

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