International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Assessment of Construction Risk Management Practices Through Questionnaire-Based Statistical Analysis

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Submitted: 02/02/2026 **Revised**: 19/03/2026 **Accepted**: 27/03/2026

Abstract: Construction projects are exposed to various risks that can influence cost, time, quality, safety, and overall project performance. This study investigates major construction risks and the challenges associated with risk management through questionnaire-based statistical analysis. Data were collected from 126 construction professionals and analysed using IBM SPSS Statistics. The study applied descriptive statistics, reliability analysis, independent t-tests, ANOVA, correlation analysis, regression analysis, and risk ranking methods. Reliability analysis confirmed strong internal consistency, with Cronbach's Alpha values above 0.90. Among the identified risks, safety risks recorded the highest mean score (4.0968), followed by technical and quality risks. Correlation analysis revealed strong positive relationships among the major risk categories, while regression analysis showed that implementation challenges had the strongest influence on overall project risk ($\beta = 0.657$, $p < 0.001$). The findings suggest that although risk management is widely recognised as essential in construction projects, its effective implementation is often constrained by limited awareness, inadequate training, and ineffective communication. The study therefore emphasises the importance of structured and data-driven risk management practices to improve project performance and reduce project uncertainties.

Keywords: *Construction Risk Management, SPSS, T-Test, ANOVA, Correlation Analysis, Regression Analysis, Risk Ranking.*

Introduction

The construction industry plays an important role in economic growth and infrastructure development. However, construction projects involve large investments, multiple stakeholders, and complex activities, making them highly vulnerable to risks affecting cost, time, quality, safety, and overall project performance. Construction risks can arise from financial issues, design errors, labour shortages, material price fluctuations, technical problems, environmental conditions, and poor communication among project participants. If these risks are not properly managed, they may lead to delays, cost overruns, disputes, reduced productivity, and safety concerns. Hence, effective risk management is essential for improving project outcomes and reducing uncertainties. As construction activities become more complex, the need for systematic and data-driven risk analysis has increased. Statistical techniques such as correlation, regression, t-tests, and ANOVA help evaluate risk factors, identify relationships among variables, and assess their impact on project performance. Questionnaire-based studies also offer practical insights into industry perceptions and risk management practices.

This study examines construction risk management practices using SPSS-based statistical analysis. It focuses on identifying major risk factors, analysing implementation challenges, and evaluating their influence on overall project performance through questionnaire-based data analysis.

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Questionnaire Design and Data Collection

i. Respondent Profile: The study included responses from site engineers, project engineers, supervisors, project managers, and other professionals from the construction industry.

Participants with varying levels of experience, organizational backgrounds, and project exposure were considered to obtain a broader understanding of construction risk management practices.

ii. Risk Categories: The questionnaire was prepared based on a detailed review of literature related to construction risk management. It examined the importance of risk management, major risk factors, and challenges in implementing risk management practices. The identified risks were classified into eight categories: Safety, Technical, Cost, Quality, Environmental, Managerial, Contractual & Legal, and Technological Risks. Statements related to implementation challenges were also included. All responses were recorded using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

iii. Data Collection Procedure: The questionnaire was distributed through Google Forms to construction professionals working in different organizations. A total of 142 responses were received, and after data screening, 126 valid responses were retained

for analysis. The collected data were coded and analysed using IBM SPSS Statistics for both descriptive and inferential analysis.

Statistical Analysis Methods

i. Reliability Analysis: Reliability analysis was conducted to evaluate the internal consistency of the questionnaire using Cronbach's Alpha in IBM SPSS Statistics. The obtained Cronbach's Alpha values were above 0.90 for all major sections, indicating excellent reliability and confirming that the questionnaire was suitable for further statistical analysis.

ii. Risk Ranking: Risk ranking analysis was performed to identify the most critical risks affecting construction projects. Mean scores and standard deviations were calculated for all risk categories, and composite mean values were used to rank the risks based on their impact on project performance. This helped identify priority risk areas requiring greater attention.

iii. T-Test and ANOVA: Independent sample t-tests and one-way ANOVA were used to examine differences in risk perception among respondents from different demographic groups. The t-test compared responses between participants involved and not involved in risk management activities, while ANOVA analysed variations based on factors such as professional background and experience level. These tests helped determine whether demographic characteristics influence perceptions of construction risks and risk management practices.

iv. Correlation and Regression Analysis: Correlation analysis was conducted using Pearson correlation coefficients to examine relationships among construction risk categories and implementation challenges. The analysis helped identify the strength and direction of relationships between variables.

Multiple regression analysis was further performed to evaluate the impact of key variables on overall project risk. The analysis mainly examined how the perceived importance of risk management and implementation challenges influence project performance and overall construction risks.

Results and Discussion

i. **Importance of Risk Management:**

The descriptive analysis indicated that respondents strongly agreed on the importance of risk management in construction projects. Most statements related to risk management achieved mean scores above 4.0, showing that construction professionals

consider risk management essential for improving project safety, reducing uncertainties, minimizing delays, and enhancing overall project performance.

The findings also suggest that respondents are aware of the role of risk management in improving decision-making and maintaining better control over construction activities. This reflects the growing importance of structured risk management practices within the construction industry.

Table1. Mean Scores for Importance of Risk Management

STATEMENT	Mean
Risk management helps identify critical risks before they impact project cost and time.	4.29
Safety levels improve when risks are managed properly.	4.18
Risk management improves construction performance.	4.13
Risk management increases client satisfaction	4.13
Quality performance improves with systematic risk management.	4.11
Risk management improves overall project efficiency.	4.10
Risk planning helps in anticipating future project problems.	4.08
Systematic risk evaluation helps identify potential cost escalation at early stages.	4.07
Risk management supports long-term project sustainability.	4.07
Risk management should be mandatory in construction projects.	4.06

ii. Ranking of Risk Factors:

The analysis of different risk categories revealed that safety risks were considered the most critical risks affecting construction projects, followed closely by technical risks and quality risks. Composite mean scores were calculated to rank the identified risk categories according to their level of impact on project performance.

Table 2. Ranking of Major Construction Risk Categories

Type of risk	**Mean**	**Rank of Risk Type**
Safety Risks	4.0968	**1**
Technical Risks	4.0937	**2**
Quality Risks	4.0735	**3**
Managerial Risks	4.0714	**4**
Cost Risks	4.0709	**5**

The results indicate that safety-related risks remain a major concern due to accidents, unsafe working conditions, and inadequate safety measures at construction sites. Technical risks were also identified as significant because of design complexities, technical failures, and construction errors. Similarly, quality risks were considered important because of their direct influence on project standards and long-term project performance. Although the differences between the mean values were relatively small, the ranking helped identify the priority risk areas that require greater attention and effective mitigation strategies.

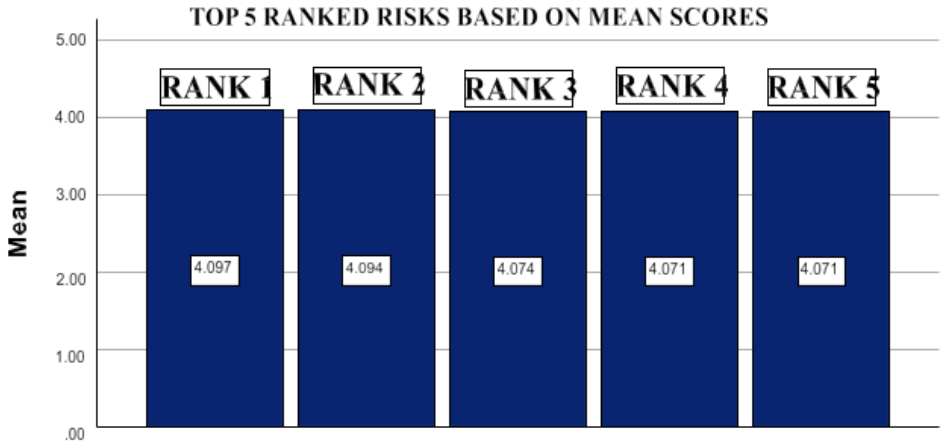

Figure 1. Graphical Representation of Risk Ranking

iii. Implementation Challenges:

The analysis of implementation challenges showed that respondents strongly agreed on the existence of several difficulties affecting the practical application of risk management practices in construction projects. Major challenges identified in the study included lack of awareness, insufficient training, poor communication, inadequate planning, and limited use of formal risk management techniques.

The findings indicate that although construction professionals understand the importance of risk management, its practical implementation is often affected by organizational and operational limitations. These challenges reduce the effectiveness of risk management practices and increase the possibility of project uncertainties and failures.

Table 3. Major Challenges in Risk Management Implementation

STATEMENTS	Mean
Risk management is often ignored during early project stages.	4.23
Lack of standard procedures increases uncertainty.	4.17
Limited resources affect risk management practices.	4.13
Lack of awareness affects risk identification.	4.10
Construction teams rely more on experience than data.	4.10
Resistance to change affects implementation.	4.09
Communication gaps hinder risk mitigation	4.09
Insufficient training reduces effectiveness.	4.09
Poor documentation leads to repeated risks.	4.08
Risk information is not shared effectively.	4.06

iv. Influence of Demographic Factors:

An independent sample t-test was conducted to compare responses between respondents involved and not involved in risk management activities. The results showed no statistically significant difference in perceptions regarding construction risks and risk management practices ($p > 0.05$). This indicates that respondents shared similar opinions irrespective of their direct involvement in risk management activities.

One-way ANOVA was also performed to examine differences in responses across various experience levels and professional backgrounds. The analysis revealed no significant variation among demographic groups ($p > 0.05$), suggesting that perceptions regarding construction risks remain relatively consistent among respondents with different levels of experience and organizational backgrounds.

Table 4. Summary of T-Test and ANOVA Results

Variable	T-Test (p-value)	ANOVA (p-value)
SECTION-A	0.043	0.971
TOP_RISKS	0.039	0.816
SECTION-C	0.003	0.384

v. Relationship Between Risks and Project Performance:

Correlation analysis revealed strong positive relationships among different construction risk categories, indicating that construction risks are closely interconnected. The results suggest that an increase in one type of risk can influence other project-related risks and negatively affect overall project performance.

Regression analysis was further conducted to evaluate the influence of major variables on overall project risk. The findings showed that implementation challenges had the strongest impact on project performance, followed by the importance of risk management practices. The regression results indicate that practical difficulties in implementing risk management significantly contribute to increased construction project risks.

Table 5. Regression Analysis Summary

Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	2.760	0.758	-	3.641	<0.001
SECTION A	0.123	0.018	0.339	7.000	<0.001
SECTION C	3.063	0.226	0.657	13.545	<0.001

The overall findings suggest that effective implementation of structured risk management practices can help reduce uncertainties, improve project control, and enhance the overall performance of construction projects.

Conclusion

This study analyzed construction risk management practices using questionnaire-based statistical analysis and identified the major risks and implementation challenges affecting construction projects. The findings revealed that safety risks, technical risks, and quality risks are among the most critical factors influencing project performance. The study also showed that construction professionals strongly recognize the importance of risk management in reducing uncertainties, improving safety, and enhancing overall project efficiency.

The statistical analysis further indicated strong relationships among different risk categories, highlighting that construction risks are closely interconnected. Regression analysis revealed that implementation challenges such as lack of awareness, insufficient training, poor communication, and limited use of formal risk management techniques have a significant impact on overall project risk.

The results emphasize that effective risk management in construction projects depends not only on risk identification and assessment but also on the proper implementation of risk management practices. Adopting more structured and data-driven approaches can help construction organizations improve decision-making, reduce project uncertainties, and achieve better project outcomes.

Overall, the study provides useful insights into construction risk management practices and highlights the importance of strengthening practical implementation strategies to enhance project performance in the construction industry.

Acknowledgement

The corresponding author sincerely expresses gratitude to Mr. Mohammed Jalaluddin, and Dr. Khaja Fareed Uddin for their valuable guidance, encouragement, and continuous support throughout the successful completion of this research work.

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