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Risk Management Analysis in the Implementation of the Mataram Mayor's Office Development Project

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ABSTRACT
In the implementation of construction projects, particularly the Mataram Mayor's Office Development Project, various risks may lead to cost overruns, delays in project completion, and reduced work quality. During the construction phase, contractors face various uncertainties; therefore, effective risk management is required. This study aims to identify risk sources, conduct risk assessments, and formulate risk mitigation strategies. The method employed in this study is the Risk Breakdown Structure (RBS) for risk identification and the AS/NZS 4360:2004 standard for determining risk levels and categories. The identification results revealed that 44 risk variables were identified in the project. Following the risk assessment, 6 risks were categorized as high risk, 30 risks as medium risk, and 8 risks as low risk. Risk management strategies are implemented through monitoring and supervision to strengthen supply chains, manage logistics, and ensure preparedness in addressing uncertainties such as delays and material shortages. Furthermore, improving work culture, implementing Occupational Health and Safety Management (OHSM), applying systematic change management, enhancing effective communication, and developing adaptive weather planning are key measures to minimize risks and maintain project continuity.

INTRODUCTION

The construction of the Mataram Mayor's Office Development Project is a strategic initiative that supports public services and governance (Haqi, 2023; Raodah, 2023; Suryaningrat et al., 2025; Sutarna et al., 2025). However, during its implementation, the project often encounters various challenges, including its location on a heavily trafficked road, which may cause delays in material delivery, operational disruptions, and environmental impacts (Kurniawan et al., 2025). Given its substantial investment value, this project requires effective management, particularly in risk management, to ensure timely completion, cost control, and quality assurance (Ayuza, 2025).

Considering that construction projects are inherently exposed to various uncertainties and obstacles that may result in project losses and delays, early risk identification and management are essential to minimize potential impacts and ensure that project objectives are achieved (Alshehhi, 2024).

Risk management in construction projects is a structured process designed to identify, analyze, and respond to potential risks, such as delays, cost increases, and workplace accidents, to ensure successful project execution (Zhasmukhambetova et al., 2025). This process consists of several key stages, including risk identification, risk analysis, risk evaluation, risk mitigation, and continuous monitoring throughout the project life cycle (Messio et al., 2023).

When risks occur in construction projects, contractors are among the most affected parties because they serve as the primary implementers and are directly responsible for project performance, particularly in terms of cost, quality, and schedule. Many risks, including material delivery delays, workplace accidents, design changes, implementation errors, and disruptions to field productivity, generally occur during the construction phase, which is largely under the contractor’s control and directly influences project performance (Ibrahim et al., 2022).

Furthermore, contractors often bear the greatest consequences when risks arise, including operational cost overruns, project delays that may result in liquidated damages, reduced work quality, and potential contractual disputes (Alshihri et al., 2022; Antoniou & Tsioulpa, 2024; Chammout et al., 2024; Fakhereldin, 2024; Jabbar & Khoiry, 2025; Kebede, 2022). Risks can also affect contractors' business reputation and long-term sustainability, particularly when project failures reduce the project owner's confidence in their performance (Habetemeherit et al., 2025). Therefore, contractors are frequently regarded as the parties most affected by and most involved in the implementation of construction project risk management.

The implementation of risk management enables contractors to achieve project objectives more effectively. Through risk management practices, contractors can identify potential risks that may emerge during project execution. Moreover, risk management helps reduce the likelihood of adverse events and minimize their impacts. Effective risk management also enhances decision-makers' awareness, allowing them to develop appropriate strategic actions based on risk analysis outcomes (ALSaadi & Norhayatizakuan, 2021). Based on this background, this study aims to analyze risk management in the Mataram Mayor's Office Development Project.

Previous studies have applied various risk assessment methods in construction projects. Kurniawan et al. (2025) applied AS/NZS 4360:2004 and HIRARC methods in construction projects, while Nazali et al. (2025) integrated the Risk Breakdown Structure (RBS) with AS/NZS 4360 for housing projects in West Lombok. Yousri et al. (2023) conducted risk identification in building construction projects in Egypt using questionnaire surveys. However, the integration of RBS and AS/NZS 4360 specifically for government office construction projects in Indonesia remains relatively underexplored, particularly in projects located in densely populated urban areas with high traffic intensity.

This study integrates the Risk Breakdown Structure (RBS) method with AS/NZS 4360. The Risk Breakdown Structure is used to systematically identify and categorize various risk variables that may arise during project implementation, whereas AS/NZS 4360 is applied to assess and classify risk levels (Nazali et al., 2025). To further identify project-specific risks, interviews were conducted with the contractor involved in the project.

Risk management studies are essential due to the high level of uncertainty and potential risks associated with construction projects. The findings of this study are expected to provide a reference for contractors in anticipating and managing potential risks, particularly in the implementation of the Mataram Mayor's Office Development Project.

METHODS

This study employed a qualitative descriptive approach with a case study design in the Mataram Mayor's Office Development Project. Data were collected through questionnaires distributed to contractor personnel involved in the project. The study involved 11 respondents, representing the total number of contractor workers.

Risk variables were identified and categorized based on risk sources, construction activities, involved parties, and project implementation stages. The initial risk variables were developed using the Risk Breakdown Structure (RBS) through a bottom-up approach by compiling risk factors identified from relevant literature. The RBS method was used to systematically categorize project risks and support the risk management process (Bepari et al., 2022). The identified risk variables were then incorporated into an initial questionnaire to determine their relevance to the project conditions based on assessments from experienced respondents.

The research was conducted in three stages. The first stage involved a preliminary survey through the distribution of questionnaires to five experienced respondents to verify, clarify, and validate the risk variables obtained from the literature review. This stage also aimed to improve the quality of the questionnaire design for subsequent risk analysis (Jiang et al., 2019). The second stage involved conducting the risk assessment survey, while the third stage focused on developing risk mitigation strategies based on the assessment results.

RESULTS AND DISCUSSION

Based on a survey of respondents in the Mataram Mayor's office construction project, demographic information was collected to characterize the respondents. Information about the respondents' gender, position, educational background, and working period is shown in the following figure:

Figure 1 Respondents by gender
Source: processed data results, 2026

From Figure 1, it is known that the respondents are 100% male. Thus, no female respondents were included in this study.

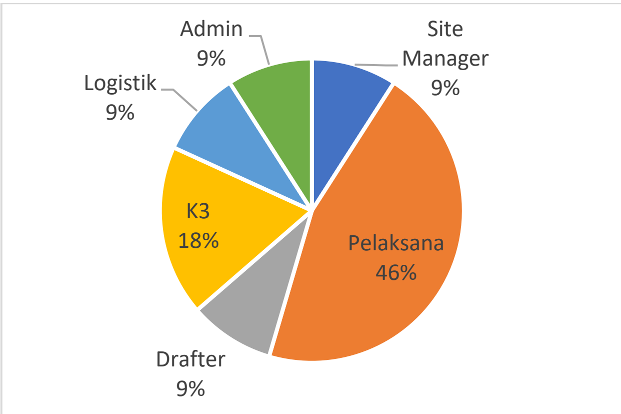

Figure 2 Respondents by position
Source: processed data results, 2026

Based on the position shown in Figure 2, 46% of respondents are site supervisors, 18% are Occupational Health and Safety (OHS), and respondents in Site Managers, logistics, admin, and drafting each account for 9% or more.

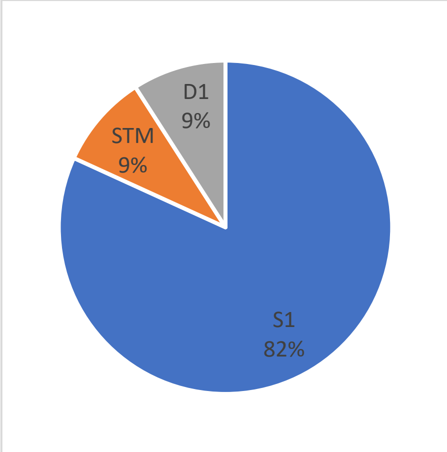

Figure 3 Respondents based on educational background
Source: processed data results, 2026

Figure 3 shows that the majority of undergraduate respondents had S1 education, with a presentation rate of 82%, while respondents with D1 and STM education levels had presentation rates of 9% each.

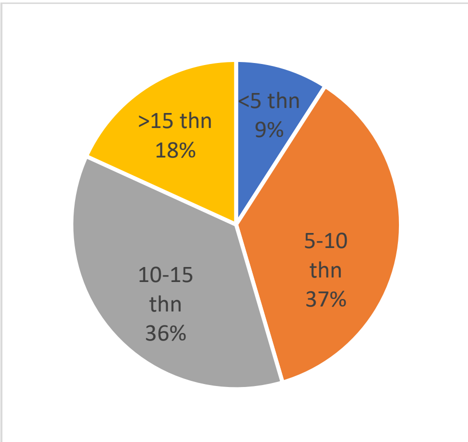

Figure 4 Respondents by tenure
Source: processed data results, 2026

Figure 4 shows the respondents' presentation based on work experience. From the figure, respondents with 5-10 years of service were the most numerous, with 37%, followed by 36% with 10-15 years of service, 18% with >15 years of service, and 9% with <5 years of service.

Preliminary Survey

Before conducting a preliminary survey, the risks identified from the literature review and project observations were assessed using the RBS method. The risks were identified through a four-level classification (levels 0 to 3), with each level providing more in-depth details. After the risk was identified using the RBS method, 46 risk variables were identified and used in the preliminary survey to assess their relevance. In the relevance test phase of the risk variables, the researchers used the Guttman scale, and respondents were asked whether or not they agreed with the possible risks. A statement of agreement indicates that a risk variable is likely to occur during project execution. In contrast, a statement of disagreement indicates that a risk variable is unlikely to occur or has not occurred. For positive or agree answers, a score of 1 is given, while for negative or disagreeable answers, a score of 0 is given. The answer score is then summarized: if the total score is > half the number of respondents in the preliminary survey, the answer is positive; otherwise, it is negative (Yousri et al., 2023). The results of the identification and relevance test are shown in Table 1.

Table 1 RBS Identification Results and Relevance Test

Level 0	Level 1	Level 2	Level 3	Agree		Disagree	
Mataram Mayor's Office Project Risks	Internal Factors	Ingredients	Rising material prices	4	80%	1	20%
			Material scarcity	5	100%	0	0%
			Delay in material delivery	5	100%	0	0%
			Material damage	5	100%	0	0%
			Excessive use of substances (waste materials)	3	60%	2	40%
			Changes in material specifications	3	60%	2	40%
		Equipment	Equipment that no longer fits	3	60%	2	40%
			Equipment delivery delays	4	80%	1	20%
			Incomplete equipment	3	60%	2	40%
			Equipment misplacement	3	60%	2	40%
			Loss of equipment	4	80%	1	20%
		Workforce	Lack of labor availability	5	100%	0	0%
			Lack of skills/skills of the workforce	3	60%	2	40%
			Riots between workers	4	80%	1	20%
			Strikes	3	60%	2	40%
			Poor work culture	5	100%	0	0%
		Kontrak	Change the order	5	100%	0	0%
			Contract clauses that are not complied with	1	20%	4	80%
			Ambiguity of the article in the contract	3	60%	2	40%
		Finance	Premature payments	4	80%	1	20%
			Inaccuracy of work volume payments	3	60%	2	40%
			Fluctuations or uncertainty in the interest rate of loans in banks	0	0%	5	100%
			Not paying attention to unexpected costs	4	80%	1	20%
		Contractor management	Lack of project manager experience	3	60%	2	40%
			Lack of coordination between parties	5	100%	0	0%
			Lack of supervision of contractors and suppliers	3	60%	2	40%
			Lack of control over work execution schedules	4	80%	1	20%
		Physical condition of the location	Difficulties in access to heavy equipment mobilization to project sites	3	60%	2	40%
			Difficult land acquisition conditions	3	60%	2	40%
			Poor location and *location* conditions	3	60%	2	40%

	Construction Methods and Technologies	Changes in construction methods	5	100%	0	0%
		Incompatibility of the plan drawings with real conditions in the field	5	100%	0	0%
		Difficulties in implementing new/specialized technologies	3	60%	2	40%
		Incomplete data on subsurface conditions	3	60%	2	40%
		Incorrect or incomplete design	5	100%	0	0%
	K3	Accidents caused by human error	5	100%	0	0%
		Accidents occur due to equipment failure	3	60%	2	20%
		Poor Occupational Health and Safety (K3) Procedures	4	80%	1	20%
External Factors	Natural Conditions	Bad weather conditions	5	100%	0	0%
		Natural disasters	5	100%	0	0%
	Social conditions	Demonstration, wandering around the project site	3	60%	2	40%
		Air pollution/pollution during project implementation	4	80%	1	20%
		Cultural conditions and customs of the surrounding community that hinder the project	3	60%	2	40%
	Government Policy	Changes in government political policies that make it difficult to complete projects	3	60%	2	40%
		Monetary instability	3	60%	2	40%
		Bureaucratic obstacles to licensing/term management	4	80%	1	20%

After the RBS method identified risks and their relevance was tested, 44 relevant risk variables and 2 irrelevant risk variables were identified, as they had a total score < half the total score. These 44 relevant variables will then be used in the main questionnaire survey for risk analysis.

Main surveys

Risk assessment is carried out by measuring the likelihood of risk occurrence and the magnitude of the consequences using the Australian/New Zealand Standard method (AS/NZS 4360:2004). According to AS/NZS 4360, this process aims to support decision-making and the determination of corrective actions to make resource use more effective and efficient. Once the project's risks were identified, a primary questionnaire survey was conducted for risk analysis, distributing a probability-and-impact questionnaire to 11 Contractor respondents. The scale of possibilities and consequences is shown in Tables 2 and 3, respectively.

Table 2 Scale of possible risks

	Possible risks	Information
1	Rarity	This is certainly very unlikely to happen
2	No possible	Almost unlikely (likely to happen at some point)
3	Possible	Between happening or not happening (likely happening at some time)

4	Kemungkinan	This is likely to happen (most likely at some point)
5	Almost Definitely	Almost certain to happen (Occurs in almost all situations)

Table 3 Scale of risk consequences

Risk consequences		Information
1	Insignificant	It has no effect
2	Minor	The effect is still acceptable
3	Medium	Minor improvements, SOPs, and managed information management
4	Home	Significant improvements are required or contract standards
5	Catastropik	Total rejection or need to improve policies/regulations

After respondents provided probability and consequence values in the main questionnaire, a risk analysis was conducted to determine potential risks and the average consequences for each variable. The following are the results of the risk analysis for each risk, as shown in Table 4.

Table 4 Risk analysis results

Code	Risk variable	Probability (P)	Hairy (P)	Impact (I)	Hairy (I)	PxI	Category Risk
A1	Rising material prices	1.64	2	2.09	2	4	Medium
A2	Material scarcity	1.55	2	3.55	4	8	Height
A3	Delay in material delivery	2.55	3	3.45	3	9	Height
A4	Material damage	1.82	2	2.73	3	6	Medium
A5	Excessive use of substances (waste materials)	1.55	2	1.91	2	4	Medium
A6	Changes in material specifications	2.00	2	1.55	2	4	Medium
B1	Equipment that no longer fits	1.91	2	2.91	3	6	Medium
B2	Equipment delivery delays	1.82	2	2.45	2	4	Medium
B3	Incomplete equipment	1.64	2	2.82	3	6	Medium
B4	Equipment misplacement	1.45	1	1.55	2	2	Low
B5	Loss of equipment	1.82	2	3.09	3	6	Medium
C1	Lack of labor availability	2.27	2	1.82	2	4	Medium
C2	Lack of skills/skills of the workforce	1.82	2	2.09	2	4	Medium
C3	Riots between workers	2.18	2	2.91	3	6	Medium
C4	Strikes	1.45	1	3.36	3	3	Low
C5	Poor work culture	3.45	3	3.36	3	9	Height
D1	Change the order	3.91	4	3.00	3	12	Height

D2	Ambiguity of the article in the contract	1.82	2	2.36	2	4	Medium
E1	Premature payments	2.82	3	1.82	2	6	Medium
E2	Inaccuracy of work volume payments	2.27	2	3.27	3	6	Medium
E3	Not paying attention to unexpected costs	3.36	3	1.82	2	6	Medium
F1	Lack of project manager experience	1.27	1	3.09	3	3	Low
F2	Lack of coordination between parties	1.64	2	2.82	3	6	Medium
F3	Lack of supervision of contractors and suppliers	1.45	1	2.55	3	3	Low
F4	Lack of control over work execution schedules	1.45	1	2.64	3	3	Low
G1	Difficulties in access to heavy equipment mobilization to project sites	1.82	2	2.45	2	4	Medium
G2	Difficult land acquisition conditions	1.64	2	2.82	3	6	Medium
G3	Poor location and location conditions	1.73	2	1.73	2	4	Medium
H1	Changes in construction methods	3.09	3	1.91	2	6	Medium
H2	Incompatibility of the plan drawings with real conditions in the field	3.45	3	1.91	2	6	Medium
H3	Difficulties in implementing new/specialized technologies	1.82	2	2.27	2	4	Medium
H4	Incomplete data on subsurface conditions	3.18	3	1.91	2	6	Medium
H5	Incorrect or incomplete design	2.64	3	2.45	2	6	Medium
I1	Accidents caused by human error	2.82	3	3.73	4	12	Height
I2	Accidents occur due to equipment failure	2.00	2	3.09	3	6	Medium
I3	Poor Occupational Health and Safety (K3) Procedures	1.55	2	3.27	3	6	Medium
J1	Bad weather conditions	4.09	4	3.45	3	12	Height
J2	Natural disasters	1.73	2	3.27	3	6	Medium
K1	Demonstration, wandering around the project site	1.64	2	3.00	3	6	Medium
K2	Air pollution/pollution during project implementation	1.73	2	2.91	3	6	Medium
K3	Cultural conditions and customs of the surrounding community that hinder the project	1.91	2	2.64	3	6	Medium

L1	Changes in government political policies that make it difficult to complete projects	2.09	2	2.09	2	4	Medium
L2	Monetary instability	1.45	1	1.82	2	2	Low
L3	Bureaucratic obstacles to licensing/term management	1.64	2	1.73	2	4	Medium

Based on the results of the risk analysis in Table 4, the following is an example of the risk analysis for the A1 risk variable, namely "Increase in material prices". Based on the probability data obtained, namely 5 respondents gave a value of 1 (probability almost did not occur), 5 respondents gave a value of 2 (probability occurred at one time), 1 respondent gave a value of 3 (probability occurred at one time), and no one gave a value of 4 (most likely to occur at one time) and 5 (occurred in almost every circumstance). As for the consequence data, namely 2 respondents gave a score of 1 (No effect), 6 respondents gave a score of 2 (The effect is still acceptable), 3 respondents gave a score of 3 (Small improvements, SOPs, and information management are needed), and no respondents gave a score of 4 (Major improvements or contract standards are needed) and 5 (Full rejection or need for policy/regulatory improvements). From this data, A1 risk analysis calculations can be performed as follows.

$$\text{Average frequency} = \frac{(1x5)+(2x5)+(3x1)+(4x0)+(5x0)}{11}$$

$$\text{Average frequency} = \frac{18}{11}$$

$$\text{Average frequency} = 1.63$$

The calculation results show that the average risk frequency of 1.63 falls within the interval 1.50 ≤ average risk frequency < 2.50, so it is included in the "rare (2)" category. The formula used to calculate the average consequences is the same as that for average risk frequency.

$$\text{Average consequences} = \frac{(1x2)+(2x6)+(3x3)+(4x0)+(5x0)}{11}$$

$$\text{Average consequences} = \frac{23}{11}$$

$$\text{Mean consequence} = 2.09$$

The calculation results show that the average consequence value of 2.09 is at an interval of 1.50 ≤ the average index < 2.50, so the risk consequence falls into the category of "effects are still acceptable (2)". After obtaining the average probability and consequence, the two values are multiplied to obtain the risk category value. The following are the results of mapping on the Risk Map based on the risk category value obtained. The Risk Map used is based on AS/NZS 4360. The Risk Map is shown in Table 5.

Table 5 Risk Map

					Risk impact		
			Insignificant	*Minor*	*Moderate*	*Major*	*Calastropic*
			1	2	3	4	5
Risk frequency	*Almost certain*	5					
	Likely	4			D1, J1		

	Possible	3		H1, E1, E3, H2, H4, H5	A3, C5	I1	
	Unlikely	2		A1, A5, A6 B2, C1, C2, D2, G1, H3, L1, L3	A4, B1, B3, B5, C3, E2, F2, I2, I3, J2, K1, K2, K3	A2	
	Rare	1		B4, G3, L2	C4, F1, F3, F4, G2		

: Low : Medium : High : Extreme high

The table shows that 8 risk indicators are in the low-risk category, 30 in the moderate-risk category, 6 in the high-risk category, and none in the extreme-risk category.

Risk Mitigation Strategy

In this study, because there is no extreme category risk, only high-risk categories will be analyzed for risk management strategies, namely A2, A3, C5, D1, I1, and J1. Risk mitigation was carried out based on interviews with respondents.

Strategies to address material scarcity are carried out through careful needs planning, long-term cooperation with multiple suppliers, and diversification of material sources. Market monitoring and the use of substitutes are also important, along with stable supplier selection, to avoid reliance on a single supplier.

Strategies to address material delivery delays include careful procurement planning, early ordering, and selecting suppliers with a good track record. Other efforts include establishing backup suppliers, regularly monitoring logistics, maintaining buffer stocks of critical materials, and adopting multi-supplier and multi-route approaches to reduce the risk of delays.

Job change handling is carried out through a structured change management system, with clear approval and documentation procedures, and effective communication between parties. A cost and time impact analysis needs to be done quickly, supported by clarity about the scope of work from the outset and stakeholder involvement to minimize revisions.

The strategy to minimize accidents due to human error involves strengthening the K3 system through routine training, the use of PPE, and strict supervision. In addition, hazard identification and risk evaluation are carried out regularly, as well as avoiding high-risk assignments for inexperienced workers, and using tools or automation.

The risk of severe weather is mitigated through flexible work schedules, the use of weather forecasts, the preparation of alternative work methods, and the protection of work areas. To avoid this, essential work is scheduled in more stable weather conditions and avoided during extreme seasons.

CONCLUSION

Based on the results of risk identification using the Risk Breakdown Structure (RBS) method in this study, 44 project implementation risks were identified. After conducting risk assessment and categorization using AS/NZS 4360, the results indicated that 6 risks were categorized as high risk, 30 risks as medium risk, and 8 risks as low risk.

Based on interviews regarding high-risk mitigation strategies, construction project risk management emphasized careful planning, effective resource management, and the implementation of a structured and integrated management system. These efforts included strengthening supply chains through supplier diversification and the selection of reliable suppliers, improving logistics control, and preparing contingency measures to address uncertainties such as delays and material shortages. Internally, improving work culture, implementing Occupational Health and Safety (OHS) practices, and strengthening leadership were identified as important factors in minimizing human errors and enhancing team performance. Furthermore, systematic change management, effective communication among stakeholders, and adaptation to weather conditions through flexible planning supported the continuity of project implementation. Therefore, a comprehensive and proactive approach was essential for mitigating risks and maintaining project success in the Mataram Mayor's Office Development Project.

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