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

Anang Aprillah[1], Ngudiyono[2], Made Mahendra[3]
Master's Program in Civil Engineering Studies, University of Mataram, Mataram, Indonesia[1]
Department of Civil Engineering, University of Mataram, Mataram, Indonesia[2,3]
Email: anang2104ap@gmail.com[1]

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ABSTRACT
In the implementation of construction projects, especially the Mataram Mayor's Office project, various risks can lead to cost overruns, delays in completion, and reduced work quality. During construction, contractors face various uncertainties, so risk management is required. This research aims to identify the source of risk, conduct risk assessments, and formulate mitigation efforts. The method used in this study is the Risk Breakdown Structure (RBS) to identify risks and the AS/NZS 4360:2004 standard to determine the level and category of risk. The identification results showed that 44 risk variables were identified in the project. After the assessment, 6 risks were identified as high risk, 30 as medium risk, and 8 as low risk. Risk management strategies are implemented through monitoring and surveillance to strengthen supply chains, manage logistics, and ensure readiness to address uncertainties such as delays and material shortages. In addition, improving work culture, implementing OHS, systematic change management, effective communication, and adaptive weather planning are key to minimizing risks and maintaining the smooth running of projects.

INTRODUCTION

The construction of the Mataram Mayor's Office is a strategic project that supports public services and governance. However, during implementation, it often faces various challenges, including the project's location in a heavily trafficked lane, which can lead to delays in material supply, operational disruptions, and environmental impacts (Kurniawan et al., 2025). With a high investment value, this project demands effective management, especially in risk management, to maintain on-time delivery, cost control, and quality (Ayuza, 2025).

Given that construction projects are always faced with various uncertainties and obstacles that can lead to project losses and delays, identifying and managing risks early on is important to minimize their impact and ensure the project runs according to the target (Alshehhi, 2024).

Risk management in construction projects is a structured process that aims to identify, analyze, and address various potential risks, such as delays, increased costs, and work accidents, to ensure the successful execution of the project (Zhasmukhambetova et al., 2025). This process includes key stages: risk identification, analysis, evaluation, mitigation, and ongoing monitoring throughout the project cycle (Mesiono et al., 2023).

When there is a risk in a construction project, the Contractor is the most impactful party because they are the main implementer, directly responsible for the project's success, especially regarding cost, quality, and time (Ullah et al., 2024). Most risks, such as material delays, work accidents, job changes, misimplementation, and field productivity disruptions, generally occur during the construction stage under the Contractor's control, thereby directly affecting its performance (Ibrahim et al., 2022).

In addition, when risks occur, contractors usually bear the greatest consequences, whether in the form of operational cost overruns, delays in project completion that result in liquidated damages, reduced work quality, or potential contract disputes (Eldosouky et al., 2023). Risk can also affect a contractor's business reputation and sustainability, especially if project failure lowers the project owner's confidence in its performance (Habetemeherit et al., 2025). Therefore, contractors are often seen as the most affected and most interested parties in the implementation of construction project risk management.

Implementing risk management helps contractors achieve project objectives effectively. Through risk management, contractors can identify potential risks that may arise during project execution. In addition, risk management can reduce the likelihood of side effects and their impact. Good risk management also increases decision-makers' awareness, enabling them to formulate the right strategic steps based on the results of risk analysis (ALSaadi & Norhayatizakuan, 2021). Based on this background, this study aims to analyze risk management in the Mataram Mayor's Office construction project.

This study combines the risk decomposition structure method with AS/NZS 4360. Risk damage is used to identify and aggregate various risk variables that may arise in a project. In contrast, AS/NZS 4360 is used to assess and classify risk levels (Nazali et al., 2025). To address the risks, interviews were conducted with the Contractor on the project.

Risk management studies are essential, given the high potential risks in construction projects (Wang et al., 2025). The results of this study are expected to serve as a reference for contractors in anticipating and managing risks that may arise, especially during the Mataram Mayor's Office construction project.

METHODS

This research approach uses a qualitative descriptive method with a case study in the Mataram Mayor's office construction project. The data collection results were based on distributing questionnaires to contractor workers on the project. The number of respondents in this study was 11 people (the total number of contractor workers).

Risks can be grouped based on several approaches, such as the source of risk, the type of construction, the parties involved, and the stage of project implementation (Othman, 2024). The determination of the initial variables is carried out using the Risk Breakdown Structure (RBS) through a bottom-up approach, namely by collecting various risk variables from literature studies (Afif & Singgih, 2023). The RBS method helps understand the distribution of risk in a project to support more effective risk management (Bepari et al., 2022). Furthermore, the collected risk variables are used in the initial questionnaire to select the most relevant variables and to reflect the project's actual conditions, based on assessments by experienced respondents (Musarat et al., 2024).

The research consists of three (3) stages, namely: the first stage, a preliminary survey by distributing a preliminary questionnaire to 5 experienced respondents among other respondents to verify, clarify, and find out whether the risk variables obtained through literature studies and preliminary surveys are relevant or not, as well as helping to improve the quality of the questionnaire design related to risk analysis later (Jiang et al., 2019). The second stage is to conduct a risk analysis survey, and the third stage is to formulate a mitigation strategy based on the 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 (Dethan et al., 2022). Information about the respondents' gender, position, educational background, and working period is shown in the following figure:

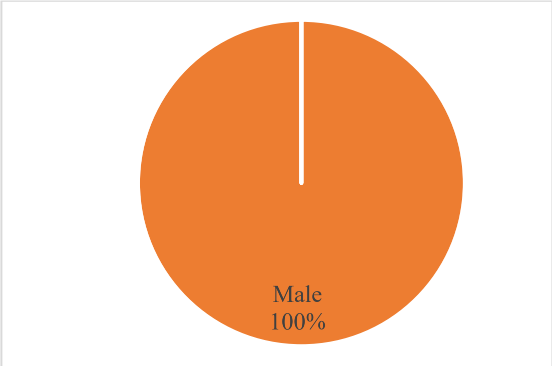

Figure 1 Respondents by gender
Source: processed data results, 2026

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

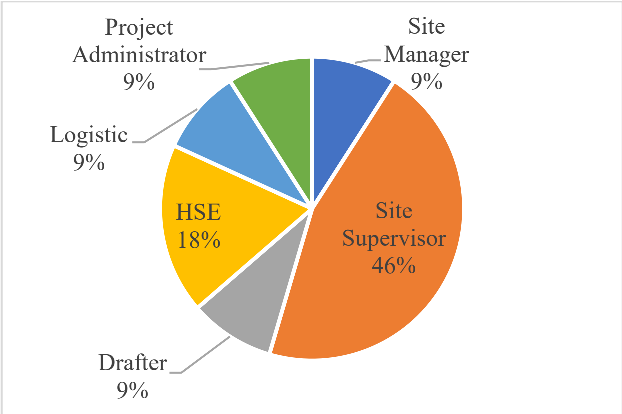

Figure 2 Respondents by position
Source: processed data results, 2026

Based on the position shown in Figure 2, 46% of respondents are site supervisors, 18% are Health, Safety, and Environment (HSE), and respondents in Site Managers, Logistics, Project Administration, and Drafter each account for 9% or more.

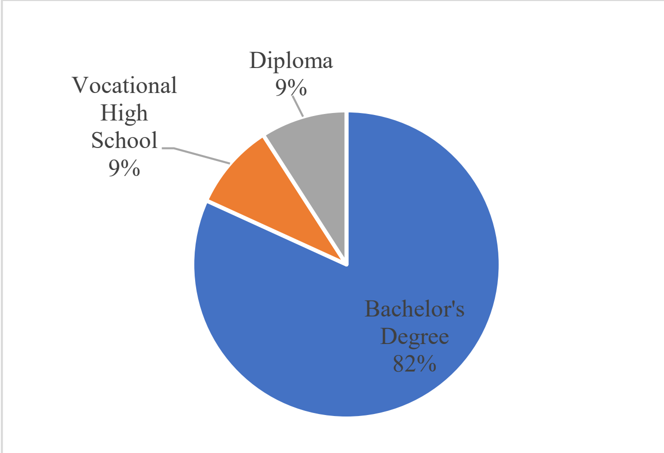

Figure 3 Respondents based on educational background
Source: processed data results, 2026

Figure 3 shows that the majority of undergraduate respondents had a Bachelor's Degree in Engineering, with a presentation rate of 82%, while respondents with Vocational High School and Diploma Engineering education levels had presentation rates of 9% each.

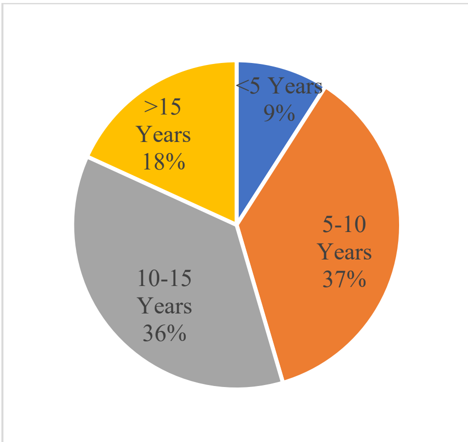

Figure 4 Respondents by tenure
Source: processed data results, 2026

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 (Medaa et al., 2025). 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%
		Contract	Change the order	5	100%	0	0%
			Contract clauses that are not complied with	0	0%	5	100%
			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%

Level 0	Level 1	Level 2	Level 3	Agree		Disagree	
			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 the 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%
		Occupational Health and Safety	Accidents caused by human error	5	100%	0	0%
			Accidents occur due to equipment failure	3	60%	2	20%
			Poor Occupational Health and Safety (OHS) 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 a risk occurring and the magnitude of its 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	Likely	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	Major	Significant improvements are required in 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)	Value (P)	Impact (I)	Value (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	High
A3	Delay in material delivery	2.55	3	3.45	3	9	High
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	High
D1	Change the order	3.91	4	3.00	3	12	High
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

Code	Risk variable	Proba bility (P)	Value (P)	Impact (I)	Value (I)	PxI	Category Risk
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	High
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	High
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 OHS 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 collection using the RBS method in this study, the project implementation risks are 44. Of the 44 risks, after risk assessment and risk categorization using AS/NZS 4360, the results showed 6 high risk, 30 medium risk, and 8 low risk. From interviews on high-risk mitigation, construction project risk management strategies emphasize careful planning, effective resource management, and a structured, integrated management system. These efforts include strengthening supply chains through diversification and selection of reliable suppliers, good logistics controls, and preparedness for uncertainties such as delays and material shortages. On the internal side, improving work culture, implementing OHS, and strong leadership are key in minimizing human error and improving team performance. In addition, systematic change management, effective communication between stakeholders, and adaptation to weather conditions through flexible planning also support the smooth running of the project. Thus, a comprehensive and proactive approach is a key factor in mitigating risk and maintaining project success.

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