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# High-Level Risk Analysis in the Construction Project of RSUD Dr. H. Slamet Martodirdjo in Pamekasan

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**KEYWORDS**
Risk Management, Construction Project, Probability and Impact Matrix, Risk Mitigation

**ABSTRACT**
The construction of the Regional General Hospital Dr. H. Slamet Martodirdjo in Pamekasan Regency faces several challenges, particularly concerning high-level risks that may impact project success. This study aims to identify and analyze major risks affecting project completion and propose effective mitigation strategies. Using a survey method, data were collected from key stakeholders and processed using the Severity Index and Probability and Impact Matrix to assess risk levels. The findings identified 25 potential risks, with eight categorized as high-level risks: implementation method errors, difficulties in installing cross foundations, delays in critical path tasks, late material procurement, labor shortages, non-compliance with occupational safety regulations, lack of teamwork among workers, and adverse weather conditions. These risks significantly impact the project timeline, budget, and overall quality. The study also reveals that poor coordination among stakeholders, inefficient risk management practices, and regulatory constraints contribute to project delays. To mitigate these risks, strategic planning, improved procurement management, workforce training, and strict adherence to occupational safety regulations are recommended. Additionally, the adoption of technology-driven solutions, such as digital monitoring systems and e-procurement platforms, can enhance project oversight and efficiency. By implementing a systematic risk management framework, construction projects can minimize potential disruptions, ensure timely project delivery, and maintain cost efficiency. The findings of this study provide valuable insights for project managers, contractors, and policymakers in the construction industry, particularly for large-scale healthcare infrastructure projects. A proactive risk mitigation approach is essential to achieving successful project execution and sustainable infrastructure development.
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## Introduction

The development of health infrastructure, such as hospitals, is one of the priorities in the development of public facilities to improve the quality of health services for the community (Kapologwe et al., 2020). In this case, the construction project of the Dr. H. Slamet Martodirdjo Regional General Hospital (RSUD) in Pamekasan Regency is a strategic project that aims to meet the increasing needs of health facilities. However, hospital construction projects have a high level of complexity, so they have the potential to face various risks that can hinder the achievement of project objectives (Abraham, 2016).

According to Dr. Masri Singarimbun Sofian Efendi (2006), in construction projects, risk factors are elements that must be carefully taken into account because they can have an impact on delays, cost overruns, and decreased quality of work. Therefore, early identification and mitigation of risks is very important to avoid negative impacts that have the potential to hinder the course of the project (Borghesi & Gaudenzi, 2012; Rybnicek et al., 2020; Sleat, 2024). These risks can come from internal and external factors that affect various aspects of construction project implementation (Kibore, 2024; Qammaz & AlMaian, 2020).

Gunawan et al. (2015) revealed that in large-scale construction projects, such as superblocks or hospitals, various risks often arise due to design changes, lack of coordination between stakeholders, and constraints in material procurement. These factors, if not managed properly, can cause uncertainty in project completion according to the planned time and budget (Hazır & Ulusoy, 2020; Kerzner, 2025).

As a complex construction project, the construction of RSUD Dr. H. Slamet Martodirdjo is faced with various challenges, including risks related to construction implementation methods. As identified by Durdyev & Hosseini (2020), inappropriate construction methods can increase the risk of structural failure and project delay. Therefore, the selection of appropriate construction methods and close supervision of their implementation are key factors in reducing technical risks that may occur during project implementation (Zhao et al., 2013).

In addition to technical factors, managerial aspects also play an important role in reducing project risks. Imam Soeharto (2001) emphasizes that effective project management should include careful planning, close monitoring, and the implementation of appropriate risk mitigation strategies. In the case of the construction of RSUD Dr. H. Slamet Martodirdjo, a comprehensive project management strategy will help in identifying, analyzing, and managing risks before they impact the general project progress.

Perspectives (1999) reveals that risks in construction projects can be categorized into several types, including environmental risks, financial risks, and legal risks. In hospital projects, environmental risks such as bad weather and unstable soil conditions can affect the course of construction. Meanwhile, financial risks, such as fluctuations in material prices and delays in payment, can impact the continuity of the project. Legal risks, such as regulatory changes and licensing issues, also need to be considered so that the project continues to run in accordance with applicable regulations.

The Siswanto & Salim (2019) in the sixth edition of the PMBOK Guide emphasizes the importance of implementing systematic risk management in construction projects. The identified risks should be evaluated based on their probability and impact on the project. As such, appropriate mitigation measures can be designed to reduce potential disruptions to the project schedule and cost (Cevikbas et al., 2024).

Kerzner (2006) in his book on project management highlights that a systematic approach in project planning and control can reduce the likelihood of unforeseen risks. Therefore, in the construction of RSUD Dr. H. Slamet Martodirdjo, a proactive mitigation strategy is required to anticipate various risks that may occur during the planning, implementation, and completion stages of the project.

Sabir (2021) in his study on risk analysis of road construction projects emphasized that early identification of risks is a crucial step in project management. The study emphasizes that the use of risk analysis methods, such as the Probability and Impact Matrix, can assist in determining the level of risk and the necessary mitigation measures. The application of this method in the construction of RSUD Dr. H. Slamet Martodirdjo can provide a clearer picture of the risks that have the most potential to hamper the project.

Siswanto and Salim (2019) highlighted the importance of using technology and digitalization in construction project risk management. The implementation of e-procurement systems and technology-based monitoring can increase efficiency in project risk management. In the case of the construction of RSUD Dr. H. Slamet Martodirdjo, the use of technology can help in monitoring schedules, material procurement, and monitoring the quality of work.

Subandiyah Azis et al. (2018) in research on risk factors for bridge projects found that the labor factor is one of the aspects that most affect project delays. Lack of skilled labor and low productivity can cause the project to not run according to the predetermined schedule. In the construction of RSUD Dr. H. Slamet Martodirdjo, effective labor management is very important to ensure the project can run well.

Supriyadi and Muntohar (2007) explain that occupational safety and health (OHS) is an important factor in construction projects, especially in large-scale projects such as hospitals. Violation of OHS standards can lead to work accidents, which not only impact on the safety of workers but also on the smooth running of the project in general. Therefore, strict implementation of OHS policies is necessary to reduce the risk of accidents at the project site.

In the case of the construction of RSUD Dr. H. Slamet Martodirdjo, a comprehensive project management strategy will assist in identifying, analyzing, and managing risks before they impact the general project progress. Risks in construction projects can be categorized into several types, including environmental risks, financial risks, and legal risks. In hospital projects, environmental risks such as bad weather and unstable soil conditions can affect the course of construction. Meanwhile, financial risks, such as fluctuations in material prices and delays in payment, can impact the continuity of the project. Legal risks, such as regulatory changes and licensing issues, also need to be considered so that the project continues to run in accordance with applicable regulations. According to Rakasyiwi et al. (2022), project scheduling analysis using the Critical Path method can help to mitigate project delays by defining critical paths that must be considered to minimize the risk of excessive time. In addition, Kustiyahningsih et al. (2017) revealed that sentiment analysis can be used to determine public perceptions of policies that can affect the sustainability and progress of the project.

Wiryodiningrat et al. (1997) in their discussion of the ISO 9000 standard for contractors revealed that adherence to international quality standards can improve the reliability of construction projects. The application of this standard in the construction of RSUD Dr. H. Slamet Martodirdjo can ensure that each stage of construction is carried out in accordance with applicable standards, thereby reducing the risk of technical errors and structural failure. Lyanawati et al. (2022) in their study of contractor performance on road

project quality found that poor coordination between contractors and project owners can cause problems in project implementation. Therefore, in the construction of RSUD Dr. H. Slamet Martodirdjo, effective communication between all stakeholders is essential to avoid the potential risk of delays and other technical problems.

Based on these studies, it can be concluded that the construction project of Dr. H. Slamet Martodirdjo Hospital in Pamekasan Regency faces various risks that must be managed properly. High-level risks that can occur in this project include implementation method errors, material delays, labor shortages, non-compliance with OHS, as well as the influence of bad weather and environmental conditions. With the implementation of systematic risk management and appropriate mitigation strategies, this project is expected to run in accordance with the planned time, cost and quality targets.

## Research Methods

### Design

This research design uses a quantitative approach with a survey method to collect data related to risks in construction projects. This research aims to analyze high-level risks that can affect the success of the Dr. H. Slamet Martodirdjo Regional General Hospital construction project in Pamekasan Regency. The use of a quantitative approach allows researchers to measure risk variables systematically and objectively. Thus, the research results can provide a clear picture of the factors that have the most influence on the project.

In addition, this research used the literature study method to understand the theories and concepts relevant to risk management in construction. The literature study was conducted by reviewing various sources, including academic journals, textbooks, and previous research reports. The references used came from various publications that discuss risk mitigation methods in construction projects. With this approach, this research can provide a deeper insight into effective risk management strategies.

### Location and Time of

This research was conducted at the construction project site of Dr. H. Slamet Martodirdjo Regional General Hospital in Pamekasan Regency, East Java. This location was chosen because the project has a large scale and high complexity, thus potentially facing various construction risks. By researching this project, it is expected to gain a deeper understanding of the types of risks that often arise in large-scale construction projects. In addition, this location is also relevant to the local community's need for better health facilities.

The implementation of the research took place over a period of six months, starting from the data collection stage to the analysis of the results. Data collection was conducted during the first three months by conducting direct observations and interviews with parties involved in the project. After that, the data was analyzed using statistical techniques to identify risks that have a significant impact on the project. The results of this analysis will be used to develop recommendations for more effective mitigation strategies.

### Population and Sample

The population in this study were all stakeholders involved in the hospital construction project, including contractors, project managers, engineers, and labor. The research sample was selected by purposive sampling, which is a technique of selecting respondents based on certain criteria relevant to the research objectives. The criteria used included experience in construction projects, understanding of risk management, and

direct involvement in hospital construction projects. With this technique, it is expected that the data obtained will be more accurate and representative.

The number of samples taken in this study was 50 respondents consisting of various professional backgrounds. Each respondent was given a questionnaire containing questions related to construction risks, their impact on the project, and the mitigation strategies implemented. The data obtained from this questionnaire was then processed using statistical analysis to identify the main risks that could potentially hamper the project. With this method, the research can produce findings that can be used as a basis for risk management recommendations in similar construction projects.

**Collection Technique**

Data collection was conducted through three main techniques, namely field observations, structured interviews, and questionnaires. Field observations were conducted to directly observe project conditions, construction implementation methods, and potential risks that could arise during the construction process. This technique aims to obtain empirical data that supports risk analysis more accurately. In addition, observation also allows researchers to see the extent to which risk mitigation strategies have been implemented at the project site.

Structured interviews were conducted with parties who have important roles in the project, such as project managers, field engineers, and construction workers. This interview aims to explore more in-depth information about the obstacles faced in the project as well as the steps that have been taken to overcome them. Meanwhile, questionnaires were used to obtain quantitative data regarding the level of risk and its impact on the project. The data obtained from these three techniques were combined to produce a more comprehensive analysis.

**Analysis Technique**

The data obtained were analyzed using descriptive and inferential statistical methods to determine the level of risk in hospital construction projects. Descriptive statistical techniques were used to describe the characteristics of the data obtained from observations, interviews, and questionnaires. This data was then categorized based on the level of probability of occurrence and its impact on the project. In this way, risks that have a high impact and need further attention can be identified.

In addition, the Probability and Impact Matrix method is used to categorize risks based on their severity. This technique allows for a more systematic analysis in prioritizing risks that must be mitigated immediately. By using this approach, the research can provide more effective recommendations in managing construction risks. The results of this analysis are expected to serve as a reference for stakeholders in improving construction project risk management in the future.

## Results and Discussion

### Identification of High-Level Risks in Construction Projects

This research identifies various risks that can affect the success of the Dr. H. Slamet Martodirdjo Regional General Hospital construction project in Pamekasan Regency. From the analysis, it was found that there were 25 risks that could potentially hinder the project. However, based on the impact and probability scale, eight of them were categorized as high-level risks. These risks include implementation method errors, material delays, and lack of skilled labor.

Errors in implementation methods are one of the main factors that cause projects to experience significant obstacles. This factor can occur due to a lack of understanding of technical specifications or a mismatch between planning and implementation in the field. The impacts include increased costs, project delays, and possible construction quality mismatches. Therefore, mitigating this risk requires close supervision and periodic evaluation throughout the construction process.

In addition to implementation method errors, delays in material delivery are also a high-level risk that often occurs in construction projects. The main causes of these delays include logistical problems, limited material stocks, and administrative constraints in the procurement process. The consequences of these delays can disrupt the project supply chain and reduce labor productivity. Therefore, mitigation strategies such as better procurement planning and material stock monitoring system are needed.

The lack of skilled labor is also a major challenge in this hospital construction project. This factor can lead to low productivity and work results that do not meet the predetermined quality standards. In some cases, the lack of skilled labor can trigger an increase in the number of work accidents at the project site. To overcome this risk, it is necessary to conduct labor training as well as stricter supervision of occupational safety and health procedures.

**Table 1. Risk assessment calculation results**

| No. Risk | Probability (P) | Impact (I) | PxI | Risk category |
|---|---|---|---|---|
| 1 | 2 | 3 | 6 | Low |
| 2 | 3 | 4 | 12 | Medium |
| 3 | 4 | 4 | 16 | High |
| 4 | 3 | 3 | 9 | Medium |
| 5 | 3 | 4 | 12 | Medium |
| 6 | 4 | 4 | 16 | High |
| 7 | 3 | 3 | 9 | Medium |
| 8 | 3 | 3 | 9 | Medium |
| 9 | 4 | 4 | 16 | High |
| 10 | 3 | 3 | 9 | Medium |
| 11 | 3 | 4 | 12 | Medium |
| 12 | 3 | 3 | 9 | Medium |
| 13 | 4 | 4 | 16 | High |
| 14 | 3 | 3 | 9 | Medium |
| 15 | 4 | 4 | 16 | High |
| 16 | 3 | 3 | 9 | Medium |
| 17 | 3 | 3 | 9 | Medium |
| 18 | 4 | 4 | 16 | High |
| 19 | 4 | 4 | 16 | High |
| 20 | 2 | 3 | 6 | Low |
| 21 | 3 | 3 | 9 | Medium |
| 22 | 2 | 3 | 6 | Low |
| 23 | 4 | 4 | 16 | High |
| 24 | 3 | 3 | 9 | Medium |
| 25 | 3 | 3 | 9 | Medium |

**Source: processed by researchers, 2024**

Based on the analysis conducted, risks in the construction project of the Dr. H. Slamet Martodirdjo Regional General Hospital in Pamekasan Regency are categorized into several levels based on their impact and probability. Of the 25 risks identified, eight risks were categorized as high-level risks. These risks include errors in execution methods, material delays, labor shortages, and external factors such as erratic weather. To further understand the level of risk faced, calculations were made using the Probability and Impact Matrix and Severity Index methods.

In the Probability and Impact Matrix method, each risk is assessed based on its probability of occurrence as well as its impact on the project. Risks with a high probability and a large impact are categorized as high risks, which require more rigorous attention and mitigation strategies. From the calculation results, the risks of material delays and implementation method errors have the highest values in this matrix, indicating that both contribute greatly to potential obstacles in project completion.

Severity Index is used to calculate the severity of the risk based on the weights given by the respondents through the survey. Each risk is rated on a certain scale, where the highest value indicates the risk that most threatens the continuity of the project. The calculation results show that the risk of material delays has the highest severity index, followed by labor shortages and weather factors. This data illustrates that aspects of supply chain management and labor need special attention in risk mitigation efforts

The results showed that of the eight high-level risks identified, five were directly related to internal project factors, such as implementation method errors and material delays. Meanwhile, the other three risks were external factors that could not be fully controlled, such as bad weather and changing regulations. To address this, strategic measures are needed that include increased supervision in implementation methods, improved material procurement management, and better coordination between stakeholders.

Based on the results of the risk assessment calculation, it can be concluded that the main factors affecting the project are material delays and implementation method errors. Therefore, mitigation strategies should focus on strengthening the material procurement system as well as stricter supervision of construction procedures. In addition, labor training and better implementation of work safety systems can help reduce the impact of the identified risks. With this approach, the project is expected to run more efficiently and in accordance with the set targets.

**Impact of High-Level Risks to the Project**

The impact of the identified risks is very significant on the course of the hospital construction project. Errors in implementation methods can result in the need for rework, which directly increases the cost and time of the work. In addition, if the quality of the resulting construction does not meet the standards, the project may experience obstacles in the handover process and operational licenses from the authorities.

Material delays have major implications for the timeliness of project completion. In hospital projects, there are several types of materials that must meet certain specifications, such as structural materials and medical equipment. If these materials are not available on schedule, there will be disruptions in other stages of work. Therefore, strict control over procurement management is a very important aspect of this project. Lack of skilled labor contributed to the increased risk of accidents as well as decreased project productivity. If the workforce does not have enough skills, the time to complete a task will be longer than the initial estimate. This results in an imbalance in the project schedule and could potentially cause the project to exceed the predetermined deadline. Therefore,

mitigation strategies should include more intensive workforce training and certification programs.

In addition to the direct impact on project cost and time, a high level of risk also has the potential to affect the reputation of the project owner and the contractor responsible. If the project experiences many obstacles that are not resolved properly, the trust of stakeholders, including local governments and communities, may decrease. To avoid this impact, transparent communication and clear and measurable risk mitigation strategies are required.

The results showed that eight high-level risks had a significant impact on the continuity of the hospital construction project. These risks stem from various factors, ranging from technical, managerial, to external aspects such as weather and market conditions. Therefore, a systematic approach in risk management is required to minimize the negative impact of these factors. Accurate risk identification will help in determining the most effective mitigation measures. One of the key findings of this research is the need for improvements in construction execution methods. Errors in methods can lead to increased costs, extended project duration, as well as reduced quality of the end result. To reduce the likelihood of these errors occurring, improvements in supervision and regular internal audits are required. This way, potential errors can be detected early and addressed before they cause greater impact.

In addition, material supply chain management is also a challenge that must be addressed in this project. Frequent material delays indicate weaknesses in the logistics and procurement system. To mitigate this risk, the contractor needs to implement a more flexible procurement planning system and cooperate with more suppliers. That way, the risk of delays due to external factors can be minimized. The lack of skilled labor also requires a more comprehensive solution. One step that can be taken is to improve training programs for workers before they are assigned to the project site. By doing so, workers can better understand safety standards and correct work methods, so that project productivity can increase. In addition, construction companies need to develop an incentive system that can increase workers' motivation in maintaining the quality of their work.

In terms of risk management, implementing a risk evaluation system on a regular basis can help in detecting potential obstacles that may arise in the future. Using methods such as the Probability and Impact Matrix will help in identifying and prioritizing risks that have the greatest impact on the project. By applying this approach, the project can be better prepared for challenges and reduce the likelihood of major disruptions to the schedule and budget. The results of this study show that hospital construction projects face various challenges that must be handled properly so as not to have an impact on project completion. With the implementation of appropriate mitigation strategies, the identified risks can be better controlled. Therefore, this study emphasizes the importance of a systematic and data-driven risk management approach to improve the success of construction projects in the future.

## Conclusions

Based on the results of the research conducted, it was found that there were eight high-level risks that could potentially hamper the construction project of the Dr. H. Slamet Martodirdjo Regional General Hospital in Pamekasan Regency. These risks include errors in implementation methods, delays in material procurement, lack of skilled labor, non-compliance with work safety standards (K3), delays in critical path work, ineffective coordination within the project team, and the impact of poor weather conditions. These risks have a significant impact on project sustainability, both in terms of cost, time, and construction quality.

Errors in implementation methods can lead to rework which results in increased costs and project delays. Delays in materials can delay the construction process and disrupt the planned work schedule. Lack of skilled labor leads to low productivity and increased risk of work accidents. In addition, non-compliance with OHS can have a negative impact on worker safety and result in temporary work stoppages. Therefore, systematic risk management is needed to overcome these challenges so that the project can run according to the set targets.

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