IJSSR
International Journal of Social Service and Research

Vol. 5, No. 2, February 2025
e-ISSN: 2807-8691 | *p*-ISSN: 2807-839X

ANALYSIS OF THE ROLE OF OWNER AND PROJECT MANAGER IN THE PERFORMANCE OF DESIGN AND BUILD CONTRACTS (CASE STUDY OF RUMAH SAKIT SURABAYA TIMUR (RSST) PROJECT)

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Keywords

design and build; multiple linear regression; Pearson correlation; project risk; time performance

ABSTRACT

The construction industry plays a significant role in infrastructure development, including healthcare facilities like hospitals. This research aims to comprehensively identify, analyze, and evaluate the impact of design and build risk factors on the time performance of hospital construction projects. The study focuses on two main objectives: first, to analyze the impact variables related to owner and project manager factors on project time performance; and second, to develop effective mitigation strategies to manage and minimize these risks during implementation. The analysis process included data cleaning and verification, validity and reliability testing, descriptive analysis, Pearson correlation analysis, and multiple linear regression analysis to evaluate the relationships between risk factors and the success of the hospital construction project. The results show that the Owner and Project Manager (PM) factors include several key variables with strong to perfect and significant correlations to project success, particularly key variables within each category. Project success is significantly influenced by the effective management of risk factors with high and significant correlatives, especially key variables in each category, namely, Project Management Competence (PM). This research contributes to the construction industry by providing insights and practical strategies tailored to the complexities of healthcare infrastructure, thereby advancing the development of risk management practices in this critical sector.

INTRODUCTION

The construction industry plays a significant role in infrastructure development, including healthcare facilities like hospitals. The design and build method is increasingly popular in construction projects due to its ability to integrate design and construction phases into a single contract, making it more time- and cost-efficient (Edwards & Bowen, 1998). However, despite its advantages, this method carries various risks that can affect project performance, particularly regarding delays in completion.

Based on previous studies, risk factors in design and build projects can be categorized into several aspects. One is the management capability of the owner, often related to the lack of readiness in setting realistic schedules and limited experienced personnel (Tarigan et al., 2018). The

role of the project manager, as the primary controller, also significantly impacts coordinating all project stages to ensure they run on schedule (Tarigan et al., 2018).

In the context of hospital construction, project success is assessed not only by quality and cost but also by the timeliness of completion. Delays can lead to increased project costs, reduced quality, and failure to achieve the planned project objectives (Abbasi et al., 2020; Gunduz & Al-Naimi, 2022; Khaled et al., 2019; Mahamid, 2021; Ogbeifun & Pretorius, 2022). Therefore, identifying risk factors that affect project time performance is essential. Understanding these risks enables the formulation of effective mitigation strategies to minimize their impact and ensure the project progresses according to the target (Tumanggor & Simanjuntak, 2019).

Construction projects in high-complexity regions, such as Hong Kong, require a comprehensive risk management framework. Risks emerging in the design and implementation stages must be identified and addressed early to minimize delays (C. Z. Li et al., 2016; Luo et al., 2019; Zhang et al., 2018). There is a significant relationship between effective risk management and improved project time performance. Research found that risks related to design, material procurement, and labor limitations are dominant factors influencing construction project success (Hamad et al., 2021; Mohammadi et al., 2018; Santoso & Gallage, 2020).

Risks in design and build methods for hospital construction projects are often influenced by limited human resources, repeated design changes, and suboptimal coordination between project owners, contractors, and design teams (Q. Li et al., 2021; Nabi & El-adaway, 2021; Smith et al., 2023). Several theories on the origin of land settlement accompanying compaction have been proposed (Patriadi et al., 2022). Accurate risk identification and the application of appropriate mitigation strategies can minimize the impact of risks on project time and costs (El-Sayegh et al., 2021; Rehman et al., 2022; Shibani et al., 2022). Based on these studies, it can be concluded that risk management in design and build projects plays a significant role in project success, particularly in maintaining time performance. Risks that are not properly identified and managed can lead to project delays, increased costs, and decreased work quality.

The design and build contract is an integrated contract type where the design and construction processes are included in a single contract. This system is often considered the fastest procurement system because it promotes continuity between the design and construction phases. Construction can begin even while the design process is ongoing, minimizing discrepancies at the project site and optimizing implementation. The resulting design also minimizes the likelihood of changes during the planning phase.

In recent years, the Surabaya city government has implemented the design and build system, particularly for strategic regional projects. The design and build system is used for construction work categorized as complex and/or urgent, as regulated by the Ministry of Public Works and Public Housing Regulation No. 1 of 2020 on Standards and Guidelines for Integrated Design and Build Procurement through Providers. Projects in Surabaya that have adopted this system include: 1. Joyoboyo Intermodal Terminal Construction, 2. RSUD. Mohamad Soewandhie Hospital (Phase 1), 3. RSUD. Mohamad Soewandhie Hospital (Phase 2), 4. East Surabaya Hospital Construction.

This research aims to enhance the understanding of risk management among contractors, consultants, and project owners involved in design and build contracts, specifically within the context of healthcare projects that have distinct requirements. The study focuses on two main objectives: first, to analyze the impact of risk variables related to owner and project manager factors on the time performance of the East Surabaya Hospital construction project; and second, to develop effective mitigation strategies to manage and minimize these risks during implementation. The research contributes to the construction industry by providing insights and practical strategies

tailored to the complexities of healthcare infrastructure, thereby advancing the development of risk management practices in this critical sector.

The current research identifies gaps in existing literature, particularly when compared to studies like Adafin et al. (2021), which focuses solely on budget performance without addressing time performance or the interplay of management and owner factors. Similarly, Jafari & Noorzai (2021) emphasizes project manager selection but overlooks the broader risk factors affecting design and build contracts. This research contributes novel insights by integrating the analysis of both owner and project manager roles, employing a quantitative approach through Pearson correlation and multiple linear regression to assess risk factors' impact on project time performance, and proposing tailored mitigation strategies for the healthcare construction sector, thus enhancing understanding of effective risk management in this context.

METHODS

The objective of this research is to comprehensively identify, analyze, and evaluate the risk factors, impacts, and mitigation strategies related to the Surabaya Timur Hospital project, which is executed under a design and build contract. The study aims to pinpoint critical risk factors that may arise at various project stages, including the management capabilities of the owner, procurement processes, design team performance, execution quality, contractor competencies, and the project manager's role. By assessing the impacts of these risks on project performance—particularly concerning time management, cost efficiency, and quality assurance—the research endeavors to propose effective mitigation strategies. These strategies may involve enhanced coordination among project teams, the adoption of advanced technologies such as Building Information Modeling (BIM), and the implementation of comprehensive project management practices, ultimately contributing to best practices in managing risks within healthcare infrastructure projects.

Conducted from September 2024 to January 2025, the research involved several stages: problem formulation, theoretical basis establishment, data collection method determination, data gathering, processing, analysis, discussion of findings, and report presentation. Data comprised primary sources, collected via questionnaires from stakeholders like owners, contractors, and project managers, and secondary sources from relevant institutions. The analysis process included data cleaning and verification, validity and reliability testing, descriptive analysis, Pearson correlation analysis, and multiple linear regression analysis to evaluate the relationships between risk factors and project time performance. The findings were interpreted narratively to highlight the significance of risk factors and their impacts, leading to recommendations for effective risk mitigation strategies based on the research outcomes.

RESULTS

Validity and Reliability Testing

The data analysis results indicate that all questionnaire items have R-count values greater than the R-table values, thereby deemed valid. This validity confirms that each statement in the research instrument effectively measures the intended variables. Following the validation process, a reliability test was conducted to assess the consistency of the instrument. The test results show that all variables have Cronbach's Alpha values above 0.6, indicating that the instrument is reliable. Thus, the questionnaire is declared to have a high level of reliability and is suitable for further data analysis, hypothesis testing, and addressing the research objectives.

Relationship Between Design and Build Risk Factors and Project Success

The analysis of the relationship between design and build risk factors and the success of the East Surabaya Hospital construction project was conducted using simple correlation methods. The results of this analysis provide output in the form of relationships indicated through Pearson correlation coefficients and demonstrate whether or not a relationship exists based on a significance level that must be less than 0.05.

Table 1. Pearson Correlation

Factor	Pearson's Correlation	Type of Correlation	Sig.
Owner	0.536	Moderate Correlation	0.15
	0.71	Strong Correlation	< 0.001
	0.336	Weak Correlation	0.135
	0.17	No Correlation	0.39
	0.52	Moderate Correlation	0.02
	0.746	Strong Correlation	< 0.001
	0.44	Moderate Correlation	0.06
	0.134	No Correlation	0.47
	0.304	Weak Correlation	0.18
	0.818	Perfect Correlation	< 0.001
	0.475	Moderate Correlation	0.04
Project Manager (PM)	0.782	Strong Correlation	< 0.001
	0.064	No Correlation	0.66
	0.638	Strong Correlation	0.002
	0.109	No Correlation	0.52
	0.386	Weak Correlation	0.095
	0.35	Weak Correlation	0.12
	0.149	No Correlation	0.43

Based on the results of simple correlation analysis using Pearson coefficients in the table, it can be concluded that the relationship between risk factors and project success varies depending on the correlation level and significance level. For the Owner factor, several variables show a strong and significant relationship with project success. For example, there is a strong correlation with values of 0.71 and 0.746, both with the same significance level (<0.001). Additionally, there is a perfect correlation of 0.818, indicating the dominant role of this factor in supporting project success. However, there are variables that do not exhibit significant correlations, with respective values of 0.17 and 0.134, and inadequate significance levels. This indicates that not all elements of the Owner factor have a significant influence.

The Project Manager (PM) factor shows contributions with a correlation value of 0.782 and is significant at <0.001. This variable indicates that the project manager's ability to manage teams and coordinate work has a significant impact on project success. Additionally, there is another strong correlation of 0.638 with a significance level of 0.002. However, some variables have low correlations with values of 0.064 and 0.149, indicating an insignificant role.

Based on the results of simple correlation analysis using Pearson coefficients, it can be concluded that the Owner and Project Manager (PM) factors have a significant influence on project success, as evidenced by several variables with strong to perfect correlations. These variables confirm that the involvement of project owners and the competence of project managers are key factors in supporting success. Meanwhile, some variables have weak or insignificant relationships.

Thus, the primary focus of risk management should be on variables with high and significant correlations to ensure the project runs optimally and successfully.

The Influence of Design and Build Risk Factors

The influence of design and build risk factors on the success of the construction project was analyzed using multiple linear regression methods. This analysis produced outputs indicating positive or negative influences through regression coefficients, with the most influential factors determined by a significance value of Sig. < 0.05.

Table 2. Regression Analysis

Factor	Variable	Regression Coefficient	t-value	Sig.
Owner	Constant	-2,666	-7,532	<0.001
	Setting a very strict project schedule by the owner	0,322	6,285	0.015
	Minimum availability of owner personnel for design and build work	0,426	9,981	0.001
	Owner's experience in planning to create design and build work	0,202	5,532	0.001
	Owner's understanding in setting the implementation time of design and build	0,102	1,708	0.39
	Owner's understanding of cost budgeting calculation based on TOR	0,312	6,027	0.002
	Owner's ability to evaluate design development results delivered in design and build work	0,448	11,009	0.01
	Limited owner personnel in the field of design and build	0,264	4,851	0.006
	Discrepancies in the cost budget prepared by the owner	0,08	1,339	0.47
	Health and safety of implementers	0,192	3,195	0.018
	Weakness of implementers in diverse design and build	0,491	14,078	0.001
	Incomplete final evaluation criteria data for implementer qualifications	0,285	5,344	0.04
Project Manager (PM)	PM's experience in carrying out design and build work	0,469	12,42	0,001
	Errors in PM's scheduling for design and build work	0,038	0,635	0,66
	PM's lateness in controlling the implementation time	0,383	8,206	0,002
	PM's inability to evaluate design results from designer work	0,065	1,086	0,52
	PM's lack of understanding of designer's design work results	0,232	4,142	0,095
	Weakness in PM's task delegation	0,21	3,599	0,12
	PM's ability in leadership and motivating their team	0,089	1,492	0,43

Based on the results of multiple linear regression analysis, the regression model obtained shows a positive influence of design and build risk factors on the success of the East Surabaya

Hospital construction project. Several factors have the most significant impact, such as the weaknesses of the implementer in design and build, which vary with a coefficient of 0.491 and the same significance level (0.001). This indicates that the competence and experience of the implementer are crucial aspects of project success. Other factors, such as the project manager's experience, have a coefficient of 0.469 and are significant (0.001), emphasizing the vital role of project management in ensuring the execution aligns with the target.

Additionally, the owner's ability to evaluate design results has a significant influence, with a coefficient of 0.448, as does the availability of a minimal owner personnel team for design and build work, with a coefficient of 0.426. These two variables indicate that active involvement and the availability of resources from the owner significantly affect the project's success.

Thus, risk management focusing on the owner's involvement and project management capabilities becomes a key factor in enhancing the success of design and build projects. Optimal handling of these factors will significantly impact the effectiveness and efficiency of project implementation, ensuring that project objectives are achieved according to the set targets.

CONCLUSION

The risk analysis of the East Surabaya Hospital Construction project reveals significant variations in the relationships between risk factors and project success, particularly concerning Owner and Project Manager (PM) factors, with correlations analyzed using Pearson's coefficient and deemed significant at a level of < 0.005. For the Owner factor, strong correlations of 0.71 and 0.746 were found, along with a perfect correlation of 0.818, indicating the critical role of active project owner involvement in decision-making and support; however, some variables showed low significance. In the PM factor, strong correlations of 0.782 and 0.638 highlight the importance of competent project managers in coordinating teams and maintaining project stability, although not all management aspects impacted outcomes significantly. Overall, the study underscores the necessity for active owner engagement and effective project management to enhance project success, while recommending further investigation into risk factors with strong correlations, improvement of project management competencies, evaluation of the bidding and contractor selection system, and the expansion of research through case studies on similar projects to validate findings and identify effective risk mitigation strategies.

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