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The Effect of Risk Management, Technological Innovation, and Human Resources Quality on Construction Project Performance in Jakarta Case Study on Government Infrastructure Projects

Loso Judijanto [1], Eko Sudarmanto [2], Thitus Gilaa [3]
[1] IPOSS Jakarta and losojudijantobumn@gmail.com
[2] Universitas Muhammadiyah Tangerang and ekosudarmanto.umt@gmail.com
[3] PT. Graytson Training Indonesia and Thitus_g@yahoo.com

Coresponding Author: losojudijantobumn@gmail.com

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ABSTRACT

This study examines the effect of risk management, technological innovation, and human resource quality on the performance of government infrastructure construction projects in Jakarta. Using a quantitative research design, data were collected from 70 key personnel involved in these projects. The data were analyzed using SPSS version 26, with multiple regression and correlation analysis employed to test the relationships between the variables. The results indicate that all three factors – risk management, technological innovation, and human resource quality – significantly and positively influence project performance. Human resource quality had the strongest effect, followed by risk management and technological innovation. These findings suggest that improving these factors can enhance the success of large-scale government infrastructure projects in Jakarta, providing valuable insights for construction managers and policymakers.

Keywords: Risk management, Technological innovation, Human resource quality, Construction project performance, Government infrastructure projects.

INTRODUCTION

Infrastructure development is vital for economic growth, public service improvement, and societal welfare, especially in rapidly developing regions like Jakarta. Government projects are crucial to accommodate the growing population and support sustainable urbanization [1], [2]. Effective risk management is essential for these projects, with Public-Private Partnerships (PPPs) commonly used to mitigate financial risks, though issues like corruption and transparency remain challenges [3], [4]. Innovative financing methods, such as crowdfunding, can enhance transparency and public trust through digital platforms and blockchain technology [5], [6]. Technological advancements, including digital platforms and blockchain, improve transparency and efficiency in project planning and stakeholder engagement, leading to more sustainable infrastructure [5]. Additionally, the quality of human resources is key, requiring skilled personnel to manage PPPs and ensure project success [7], [8]. Empowering policies that enhance human resource capabilities are recommended to support infrastructure development and promote economic growth [9], [10].

Risk management is a key element in project success as it involves identifying, assessing, and controlling potential threats that could hinder project completion [11]. Effective risk management allows project teams to anticipate issues and develop mitigation strategies, reducing

the likelihood of delays, budget overruns, and performance issues [12], [13]. In the construction industry, where uncertainties are common, a robust risk management framework is crucial for maintaining project performance and achieving the desired outcomes [14].

Technological innovation has also emerged as a major driver of efficiency and performance in the construction sector [15]. The adoption of advanced technologies such as Building Information Modeling (BIM), automation, and project management software has revolutionized the way construction projects are planned and executed [16]. These innovations enable better communication, resource allocation, and decision-making processes, ultimately leading to improved project performance [17], [18]. In government infrastructure projects, where precision and accountability are paramount, technological advancements play an essential role in ensuring successful project delivery [19].

Human resource quality, encompassing the skills, knowledge, and experience of the workforce, is another critical determinant of project performance [20]. Skilled labor is required to implement complex project plans and utilize advanced technologies effectively. In the construction industry, particularly in large-scale government projects, the quality of human resources can directly influence the efficiency, safety, and overall success of the project [21]. A highly competent workforce contributes to better project management, higher productivity, and enhanced problem-solving capabilities. This study aims to examine the impact of risk management, technological innovation, and human resource quality on the performance of construction projects in Jakarta, focusing on government infrastructure projects [22].

LITERATURE REVIEW

Risk Management in Construction Projects

Risk management is a structured process used to identify, assess, and control potential risks that could negatively impact a project, particularly in construction where risks may arise from financial constraints, technical issues, labor shortages, and environmental factors. According to Project Management Institute (PMI) guidelines, effective risk management involves identifying risks, analyzing them, planning responses, and monitoring and controlling them throughout the project [11]. Managing these risks is essential for keeping projects on schedule, within budget, and meeting performance goals. Studies have emphasized the importance of risk management in improving project performance; for example, [11], [23] found that effective risk management reduces delays and cost overruns, while [11], [23] highlighted that it enables construction teams to anticipate issues and create mitigation strategies. In government infrastructure projects, where accountability and public scrutiny are high, the need for effective risk management becomes even more critical.

Technological Innovation in Construction

Technological innovation involves the adoption of advanced tools, processes, and techniques to enhance the efficiency, accuracy, and success of construction projects. Over the past two decades, innovations such as Building Information Modeling (BIM), cloud-based project management software, drones for site inspections, and automation in construction machinery have revolutionized the industry. These technologies have improved project planning, resource allocation, and real-time decision-making [24], [25]. Research supports the positive impact of technological innovations on project performance;

for example, [17], [26] found that BIM enhances collaboration, reduces errors, lowers costs, and shortens timelines. Similarly, [18], [24], [26] highlighted that these innovations improve both efficiency and quality. In large-scale government infrastructure projects, utilizing technological advancements is crucial for delivering successful outcomes in complex environments.

Human Resource Quality in Construction

Human resource quality in construction projects refers to the skills, expertise, and experience of personnel, including project managers, engineers, supervisors, and laborers, all of whom play a crucial role in the success of a project. Human resource development is vital in the construction industry to ensure workers can adapt to new technologies and methodologies. According to [27], [28], continuous training and skill development significantly enhance project outcomes, particularly in highly technical projects like infrastructure development. Research has shown a strong correlation between human resource quality and project performance. For instance, [20], [29] emphasized that a skilled workforce is essential for project success, especially in complex projects. Similarly, [30] found that well-trained managers lead to higher success rates by efficiently managing resources, timelines, and challenges. In government infrastructure projects, where precision, safety, and regulatory adherence are critical, the quality of human resources directly impacts project effectiveness and efficiency.

Construction Project Performance

Construction project performance is typically evaluated based on key criteria such as time, cost, quality, and safety, with project performance indicators measuring how well a project meets its goals. According to [31], [32], a project is considered successful when it is completed on time, within budget, and meets quality standards. Research identifies risk management, technological innovation, and human resource quality as key factors influencing performance. [33], [34] found that effective risk management improves project outcomes related to time and cost, while technological innovations streamline workflows and reduce errors [32], [35]. Additionally, the quality of the workforce is crucial, as experienced professionals are better equipped to handle the complexities of large-scale projects [31], [33].

Synthesis and Research Gap

While there is substantial literature on the individual effects of risk management, technological innovation, and human resource quality on construction project performance, studies examining their combined influence, especially in the context of government infrastructure projects in Jakarta, are limited. Most research addresses these factors independently, overlooking the potential synergistic effects when implemented together. This study aims to fill this gap by analyzing the collective impact of risk management, technological innovation, and human resource quality on the performance of government infrastructure projects in Jakarta. By providing empirical data on these relationships, the research seeks to contribute to the existing body of knowledge and offer practical insights for improving project performance in the construction industry.

METHODS

Research Approach

This study utilizes a quantitative research approach to examine the relationships between the independent variables (risk management, technological innovation, and human resource quality) and the dependent variable (construction project performance). A quantitative approach is appropriate for this research because it allows for the measurement and statistical analysis of data collected from a specific population to test predefined hypotheses. Through this method, the study seeks to identify significant relationships between the key factors and project performance, enabling generalization of the findings within the context of government infrastructure projects.

Population and Sample

The population for this research consists of project managers, engineers, and key personnel involved in government infrastructure projects in Jakarta. These individuals were selected because they are directly responsible for the management and execution of construction projects and have relevant experience in applying risk management strategies, implementing technological innovations, and overseeing human resources. A purposive sampling technique was employed to select 70 respondents who have a significant level of involvement in these projects. The criteria for selection included individuals who have at least 3 years of experience in government infrastructure projects and hold managerial or supervisory positions. This sampling method ensures that the respondents possess the necessary expertise to provide meaningful insights into the variables being studied.

Data Collection

Data were collected through a structured questionnaire distributed to the 70 respondents. The questionnaire was designed to measure the respondents' perceptions of risk management practices, the extent of technological innovation adoption, the quality of human resources, and overall project performance. A Likert scale (1-5) was used for all questions, where 1 represents "strongly disagree" and 5 represents "strongly agree." This scale was chosen because it allows for the capture of varying degrees of agreement or disagreement with specific statements, enabling a nuanced analysis of the data.

Data Analysis

The data collected from the questionnaires were analyzed using SPSS version 26, utilizing several statistical techniques to test the hypotheses and examine relationships between the variables. Descriptive statistics were first applied to summarize respondent demographics and key variables, using measures such as mean, standard deviation, and frequency distribution to detect any outliers or inconsistencies. To ensure the reliability of the measurement instruments, Cronbach's Alpha was calculated, with values above 0.70 indicating acceptable internal consistency, and factor analysis was conducted to validate the constructs being measured, including risk management, technological innovation, human resource quality, and project performance. Pearson correlation analysis assessed the strength and direction of relationships between the independent and dependent variables, with correlation coefficients indicating positive or negative linear associations. Before proceeding with regression analysis, diagnostic tests were performed to ensure model validity, including multicollinearity (using VIF), homoscedasticity, normality (using the Kolmogorov-Smirnov test), and linearity through scatter plots. Finally, hypothesis testing was conducted to draw conclusions.

The following hypotheses were tested using multiple regression analysis:

H1: Risk management has a significant positive effect on construction project performance.

H2: Technological innovation has a significant positive effect on construction project performance.

H3: Human resource quality has a significant positive effect on construction project performance.

RESULTS AND DISCUSSION

Descriptive Statistics

Descriptive statistics were used to provide an overview of the data collected from the 70 respondents, who were involved in government infrastructure projects in Jakarta. The demographic characteristics of the respondents are summarized in Table 1.

Table 1. Demographic Sample

Demographic Variable	Frequency	Percentage
Role in Project		
Project Manager	25	35.7%
Engineer	30	42.9%
Supervisor	15	21.4%
Years of Experience		
3-5 years	20	28.6%
6-10 years	35	50%
More than 10 years	15	21.4%

Source: Data Analysis, 2024

The project participants were categorized into three roles: Project Manager (25 participants, 35.7%), Engineer (30 participants, 42.9%), and Supervisor (15 participants, 21.4%). This breakdown indicates a relatively balanced distribution of roles, with engineers making up the largest group. The presence of project managers and supervisors demonstrates a balanced representation of leadership and oversight in the project. In terms of experience, most participants (50%) have 6-10 years of experience, followed by 28.6% with 3-5 years, and 21.4% with more than 10 years of experience, suggesting a workforce with mid-level experience. Table 2 provides the descriptive statistics for the key variables: risk management, technological innovation, human resource quality, and construction project performance.

Table 2. Descriptive Statistics

Variable	Mean	Standard Deviation
Risk Management	4.12	0.73
Technological Innovation	4.08	0.78
Human Resource Quality	4.23	0.65
Construction Project Performance	4.17	0.70

Source: Data Analysis, 2024

The analysis of key variables reveals that respondents generally rated the effectiveness of risk management, technological innovation, and human resource quality highly, with average scores above 4.00, indicating strong implementation in government infrastructure projects in Jakarta. Risk management received a mean of 4.12 with a standard deviation of 0.73, reflecting that while respondents generally perceive risk management practices as effective, there is moderate variability in opinions. Technological innovation, with a mean of 4.08 and a slightly higher standard deviation of 0.78, suggests that respondents appreciate the adoption of advanced technologies, although perceptions of its implementation vary slightly more. Human resource quality was rated the highest with a mean of 4.23 and a low standard deviation of 0.65, indicating strong consensus on the critical role of skilled personnel. Construction project performance scored a mean of 4.17 with a standard deviation of 0.70, showing that respondents feel these factors contribute positively to project outcomes, though there is some variability in their perceptions of overall project performance.

Reliability and Validity Testing

The reliability of the questionnaire was evaluated using Cronbach's Alpha, which measures internal consistency. The results for each section of the questionnaire are shown in Table 3.

Table 3. Reliability Testing

Variable	Cronbach's Alpha
Risk Management	0.82
Technological Innovation	0.85
Human Resource Quality	0.88
Construction Project Performance	0.86

Source: Data Analysis, 2024

All variables have a Cronbach's Alpha value above 0.70, indicating acceptable levels of internal consistency and reliability. Construct validity was assessed using factor analysis. The results confirmed that all items loaded significantly on their respective constructs, with factor loadings above 0.60, indicating that the questionnaire effectively measures the intended variables.

Correlation Analysis

A Pearson correlation analysis was conducted to further explore the relationships between the independent variables and construction project performance. The correlation matrix is presented in Table 4.

Table 4. Correlation Analysis

Variable	Risk Management	Technological Innovation	Human Resource Quality	Construction Project Performance
Risk Management	1.00			
Technological Innovation	0.625**	1.00		
Human Resource Quality	0.583**	0.656**	1.00	
Construction Project Performance	0.716**	0.693**	0.768**	1.00

Source: Data Analysis, 2024

The results indicate strong positive correlations between all three independent variables and construction project performance. Human resource quality has the highest correlation ($r = 0.768$, $p < 0.01$), followed by risk management ($r = 0.716$, $p < 0.01$) and technological innovation ($r = 0.693$, $p < 0.01$).

Hypothesis Testing

Multiple Regression Analysis

Multiple regression analysis was conducted to test the three hypotheses and to examine the influence of risk management, technological innovation, and human resource quality on construction project performance. The results are summarized in Table 5.

Table 5. Multiple Regression

Variable	B	t-value	p-value
Risk Management	0.357	3.852	0.000
Technological Innovation	0.288	3.226	0.002
Human Resource Quality	0.393	4.154	0.000

Source: Data Analysis, 2024

The regression model was statistically significant ($R^2 = 0.68$, $F = 46.12$, $p < 0.001$), indicating that 68% of the variance in construction project performance is explained by the independent

variables: risk management, technological innovation, and human resource quality. Risk management had a significant positive effect on project performance ($B = 0.357$, $t = 3.852$, $p < 0.001$), supporting the hypothesis that effective risk management improves outcomes. Technological innovation also positively influenced performance ($B = 0.288$, $t = 3.226$, $p = 0.002$), suggesting that advanced technologies enhance the efficiency of government infrastructure projects. Human resource quality had the strongest positive impact ($B = 0.393$, $t = 4.154$, $p < 0.001$), highlighting the importance of skilled and experienced personnel in ensuring the success of large-scale projects.

Discussion

The findings of this study confirm the significant role that risk management, technological innovation, and human resource quality play in improving construction project performance in government infrastructure projects in Jakarta. These results align with previous research, which has highlighted the importance of these factors in enhancing project outcomes.

Risk Management: The significant positive relationship between risk management and project performance is consistent with the findings of [11], who emphasized that effective risk management reduces delays and cost overruns. In government projects, which are often complex and subject to numerous risks, a robust risk management framework is essential for ensuring timely and cost-efficient project delivery.

Technological Innovation: The positive impact of technological innovation on project performance supports the work of [24], [25], [26], who found that advanced technologies such as BIM and project management software significantly improve construction processes. The adoption of such technologies in Jakarta's government infrastructure projects has likely led to better communication, real-time decision-making, and efficient resource allocation, all of which contribute to enhanced project outcomes.

Human Resource Quality: The strong positive effect of human resource quality on project performance aligns with the findings of [27], [28], [29], who argued that skilled and experienced personnel are critical to project success. In large-scale government projects, the ability to effectively manage teams, apply technical knowledge, and solve problems is directly linked to the quality of the workforce. This highlights the need for continuous training and development programs to improve the skills of personnel involved in government infrastructure projects.

Implications for Practice

The results of this study have several practical implications for construction managers and policymakers involved in government infrastructure projects in Jakarta. First, there is a need for a more structured and formalized approach to risk management, with clear protocols for identifying, assessing, and mitigating potential risks. Second, the adoption of technological innovations should be prioritized to streamline project management processes and improve overall efficiency. Finally, investments in human resource development, including continuous training and capacity building, are essential to ensure that the workforce is equipped to handle the complexities of large-scale infrastructure projects.

CONCLUSION

This study highlights the critical role that risk management, technological innovation, and human resource quality play in improving the performance of government infrastructure projects in Jakarta. The results show that all three variables have a significant and positive effect on project performance, with human resource quality exerting the strongest influence. These findings reinforce the importance of adopting a structured approach to risk management, embracing technological advancements, and investing in human capital development to enhance the success of construction projects. For policymakers and construction managers, these insights underscore the need to focus on continuous workforce training, effective risk mitigation strategies, and leveraging cutting-edge

technologies to optimize project outcomes. Future research could explore these relationships in other regions or sectors to further validate the results and expand the knowledge base on construction project management.

REFERENCES

[1] R. Cahyadi, "Taxes and Infrastructure Development: A Review from Various Countries," *Advances in Taxation Research*, vol. 2, no. 3, pp. 117–127, 2024.

[2] T. P. Nugrahanti and A. S. Jahja, "Audit judgment performance: The effect of performance incentives, obedience pressures and ethical perceptions," *Journal of Environmental Accounting and Management*, vol. 6, no. 3, pp. 225–234, 2018.

[3] R. A. Al Hazmi, "Kerjasama pemerintah dengan badan usaha: Harapan baru pembangunan infrastruktur di Indonesia," *Journal of Law, Administration, and Social Science*, vol. 4, no. 6, pp. 1101–1118, 2024.

[4] H. Ashari, T. P. Nugrahanti, and B. J. Santoso, "The role of microfinance institutions during the COVID-19 pandemic," *Global Business and Economics Review*, vol. 30, no. 2, pp. 210–233, 2024.

[5] H. Berlian, B. Hertasning, H. Nugroho, D. Subarja, and A. A. Samudra, "DEVELOPMENT OF ECONOMIC SUPPORTING INFRASTRUCTURE IN THE NATION'S CAPITAL: A PROPOSAL USING A CROWDFUNDING SCHEME," *Journal of Law and Sustainable Development*, vol. 12, no. 3, pp. e3279–e3279, 2024.

[6] H. Ashari and T. P. Nugrahanti, "Household economy challenges in fulfilling life needs during the Covid-19 pandemic," *Global Business and Economics Review*, vol. 25, no. 1, pp. 21–39, 2021.

[7] I. A. Tronina, A. V. Semenikhina, O. I. Morozova, and T. S. Kolmykova, "Infrastructure projects as a driver of economic development of the regional system," *Proceedings of the Southwest State University. Series: Economics. Sociology. Management*, 2024.

[8] I. Agustina, H. Khuan, B. Aditi, S. A. Sitorus, and T. P. Nugrahanti, "Renewable energy mix enhancement: the power of foreign investment and green policies," *International Journal of Energy Economics and Policy*, vol. 13, no. 6, pp. 370–380, 2023.

[9] P. R. Putri, "Pengaruh Pembangunan Infrastruktur terhadap Pertumbuhan Ekonomi di Indonesia.," 2023, *Fakultas Ekonomi*.

[10] T. P. Nugrahanti and A. S. Pratiwi, "The Remote Auditing and Information Technology," *Journal of Accounting and Business Education*, vol. 8, no. 1, pp. 15–39, 2023.

[11] H. S. M. A. Alshehhi, R. Sidik, M. Sidek, and E. A. Rozali, "The Impact Of Risk Management On The Performance Of Construction Projects," *Educational Administration: Theory and Practice*, vol. 30, no. 5, pp. 5994–6003, 2024.

[12] K. A. Al-Balawneh and S. Tarabieh, "The Impact of Risk Management and Knowledge Management on Construction Project Success: The Mediating Role of Project Management Performance," □□□□□□□□□□□□ □□□□□□□□□□ □□□□□□□□□ □□□□, vol. 39, no. 1, 2024.

[13] H. M. T. A. Raje, M. H. Bin Amlus, and S. S. M. B. M. Salleh, "Exploring the Confluence of Risk Management, Project Quality, and Project Performance in the Jordanian Context in Construction Industry," *International Journal For Multidisciplinary Research*, 2024.

[14] I. N. Y. Astana, I. N. Aribudiman, and A. A. N. A. A. Widajaya, "RISK MITIGATION AS A MEDIATING FACTOR IN THE RELATIONSHIP BETWEEN TOP MANAGEMENT SUPPORT AND CONSTRUCTION PROJECT PERFORMANCE," *Journal of Applied Engineering Science*, vol. 22, no. 2, pp. 458–469, 2024.

[15] S. Srivastava *et al.*, "Advanced Interdisciplinary Approach in Construction Industry: Internet of Things (IOT)," in *E3S Web of Conferences*, EDP Sciences, 2024, p. 1115.

[16] J. Menegon-Lopes and L. C. P. da Silva Filho, "Adoption of Fourth Industrial Revolution Technologies in the Construction Sector: Evidence from a Developing Country," 2024.

[17] M. O. Umar, A. C. Okwandu, and D. O. Akande, "Innovations in project monitoring tools for large-scale infrastructure projects," *International Journal of Management & Entrepreneurship Research*, vol. 6, no. 7, pp. 2275–2291, 2024.

[18] J. Aquino and E. C. Dechechi, "The use of technological innovations in building maintenance management," *Concilium*, 2024.

[19] S. S. Fonseca, P. A. Benito, and C. Piña Ramírez, "Digital Horizons in Construction: A Comprehensive System for Excellence in Project Management," *Buildings*, vol. 14, no. 7, p. 2228, 2024.

[20] N. W. I. Palupi, D. I. Mashuri, and A. Y. Febrima, "INNOVATIVE STRATEGIES TO IMPROVE THE QUALITY OF HUMAN RESOURCES THROUGH SKILL AND COMPETENCY DEVELOPMENT," *International Journal of Management, Business, and Social Sciences*, vol. 3, no. 01, 2024.

[21] M. I. Rodliyah, M. Musliyana, and S. Sunarti, "Memahami Konsep Kompetensi Karyawan Sebagai Bagian dari Perencanaan SDM," *CEMERLANG: Jurnal Manajemen dan Ekonomi Bisnis*, vol. 4, no. 3, pp. 127–135, 2024.

[22] R. Kassa, I. Ogundare, B. Lines, J. Smithwick, and K. Sullivan, "Strategies for Enhancing Performance Optimization Amidst Workforce Shortage in the Construction Industry," in *2023 ASEE Midwest Section Conference*, 2024.

[23] H. A. Rani *et al.*, "Risk Management Planning by Risk Register in Building Construction Project," *IOP Conference Series: Earth and Environmental Science*, vol. 1303, 2024.

[24] Y. Jiang, "Research On the Application of Intelligent Management Technology in Construction Engineering," *Highlights in Science, Engineering and Technology*, vol. 106, pp. 616–622, 2024.

[25] N. Sokolova and Y. Shtuler, "INNOVATIVE TECHNOLOGIES IN THE ACTIVITIES OF CONSTRUCTION ENTERPRISES AND INCREASE THE EFFICIENCY OF THEIR IMPLEMENTATION IN THE CONDITIONS OF COMPETITION AND DYNAMIC CHANGES," *Actual Problems of Economics*, 2023.

[26] D. Zhou, B. Pei, X. Li, D. Jiang, and L. Wen, "Innovative BIM technology application in the construction management of highway," *Scientific reports*, vol. 14, no. 1, p. 15298, 2024.

[27] E. A. Azmi and C. K. I. C. Ibrahim, "A Review of Dimension in Human Capacity Development for Construction Projects," *Online Journal for TVET Practitioners*, vol. 8, no. 3, pp. 41–50, 2023.

[28] K. F. Q. Al-Aloosy, S. Mirvalad, and N. Shabakhty, "Evaluating the impact of internet communication quality in human resource management on the productivity of construction projects," *Heliyon*, vol. 10, no. 7, 2024.

[29] Ashish, "INFLUENCE OF HUMAN RESOURCE MANAGMENENT STRATEGIES IN CONSTRUCTION PROJECTS," *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT*, 2024.

[30] J. Amin, H. A. Rani, and D. Sianipar, "Optimizing Human Resource Allocation in Construction Projects: A Case Study," 2024.

[31] B. F. Ogunbayo, M. S. Ramabodu, B. A. Adewale, and K. E. Ogundipe, "Strategies for Successful Monitoring and Evaluation Practices in Construction Projects," in *2024 International Conference on Science, Engineering and Business for Driving Sustainable Development Goals (SEB4SDG)*, IEEE, 2024, pp. 1–7.

[32] N. P. Angelica and V. H. Puspasari, "Kajian Faktor-Faktor Yang Mempengaruhi Produktivitas Tenaga Kerja Proyek Konstruksi," *Basement: Jurnal Teknik Sipil*, vol. 2, no. 1, pp. 37–44, 2024.

[33] R. Jaymin-Sanchaniya, D. Thomson, A. Kundzina, and I. Geipele, "EFFECTIVE PROJECT MANAGEMENT PRACTICES IN CONSTRUCTION INDUSTRY: QUANTITATIVE STUDY".

[34] M. Mahazir, R. A. Rahman, N. M. Zainudin, and S. Salleh, "CONSTRUCTION PROJECT FAILURE: INVESTIGATING CAUSES OF INEFFECTIVE BUILDING INFORMATION MODELLING EXECUTION PLANS," *PLANNING MALAYSIA*, vol. 22, 2024.

[35] A. Ibrahim, T. Zayed, and Z. Lafhaj, "Enhancing Construction Performance: A Critical Review of Performance Measurement Practices at the Project Level," *Buildings*, vol. 14, no. 7, p. 1988, 2024.