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ENHANCING CONSTRUCTION PROJECT MANAGEMENT: INTEGRATING PMBOK AND ISO 21500 IN BANDA ACEH

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ABSTRACT

This research investigates the integration of PMBOK (Project Management Body of Knowledge) principles and ISO 21500 standards in construction project management, specifically within the Post-Disaster Building Construction Project for the District Court Office in Banda Aceh. The study addresses two main issues: the application of PMBOK and ISO 21500-based construction project management and identifying key indicators that prioritize effective implementation. Using a saturated sampling technique with 18 respondents, 10 variables, and 45 indicators, this study aims to map the project management process and prioritize indicators aligned with these standards. Descriptive analysis shows the project has implemented PMBOK and ISO 21500 principles with varying success across indicators. Processes like project diagram creation, planning, closure, stakeholder identification, cost estimation, and quality planning achieve the highest averages (around 4.39), indicating effective implementation. Priority indicators include project chart creation, project management planning, project closure, stakeholder identification, cost estimation, and quality planning.

However, areas such as Work Breakdown Structure (WBS), scheduling, risk analysis, supplier selection, and administrative closure received the lowest average values (3.50). This research highlights effective implementation of PMBOK and ISO 21500 standards, identifying priority areas for improving construction project management practices in similar post-disaster contexts and emphasizing areas requiring further development.

Keywords: Project Management, Construction Project, PMBOK, ISO 21500, Post-Disaster Construction

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Introduction

In the era of globalization, the development of the construction industry is advancing rapidly, encompassing technological advancements, project capacities, and the required financial resources absorbed by these projects (Rani, 2016). The development of construction services in Indonesia is marked by numerous large-scale projects constructed by both the government and private sectors. This fact presents opportunities and challenges for the business community, particularly in the construction services sector (Rani, 2021).

The research findings by (Dimyati & Nurjaman, 2014) state that management is the process of planning, organizing, directing, and controlling the efforts of organization members and the utilization of other organizational resources to achieve the predetermined goals of the organization. Construction projects are efforts aimed at achieving a result in the form of buildings or infrastructure (Chasanah & Sulistyowati, 2017).

Therefore, for the smooth progress of a project, management is needed to oversee the project from inception to completion, namely project management. The field of project management is growing and evolving due to the needs of the modern industry to coordinate and control various increasingly complex activities (Unegbu, et al., 2022). Project management has unique characteristics, where the management work time is limited by predetermined schedules. Rapidly changing conditions demand that every project stakeholder be able to anticipate circumstances and devise necessary actions. This can be achieved through mature planning concepts based on data, information, capabilities, and experience (Laksana & Huda, 2019).

In the context of construction projects, identifying the importance level of implementing project management based on the Project Management Body of Knowledge (PMBOK) and the International Standardization for Organization (ISO) 21500 is crucial (Rehacek, 2014). PMBOK is a guide published by the Project Management Institute (PMI), containing generally accepted principles, processes, and best practices in project management (Project Management Institute, 2017). PMBOK provides a comprehensive framework for managing projects from planning to completion. ISO 21500, on the other hand, is an international standard issued (ISO 21500, 2021). This standard provides general guidance in project management that can be applied to various types of projects and industries, including construction projects.

One of the construction projects currently underway in Banda Aceh is the Post-Disaster District Court Office Building Development Project, which is one of the projects under the auspices of the Central Government through the Supreme Court, using funding from the National Revenue and Expenditure Budget (APBN). This project is implemented in stages starting from September 9, 2022. The project is built to improve the quality of the district court building after the tsunami disaster that hit Banda Aceh in 2004.

The problem addressed in this research is how to implement construction project management based on PMBOK and ISO 21500, as well as which indicators are prioritized in the implementation of construction project management based on PMBOK and ISO 21500 in the Post-Disaster District Court Office Building Development Project in Banda Aceh. This study aims to identify the process of implementing project management and determine the priority indicators of implementing construction project management based on PMBOK and ISO 21500 in the Post-Disaster District Court Office Building Development Project in Banda Aceh.

In the context of construction projects in Banda Aceh's construction sector, the integration of PMBOK and ISO 21500 principles offers a robust foundation for effective project management practices. Through the alignment of project objectives, resources, and timelines with established guidelines, construction stakeholders can optimize project outcomes, ensuring timely completion, cost efficiency, and quality assurance. This integrated approach enables organizations to navigate complexities inherent in construction projects, fostering greater project success and stakeholder satisfaction.

Materials and Methods

Related work

Construction projects involve temporary activities aimed at constructing facilities or infrastructure within a specified timeframe, budget allocation, and with defined objectives (Faraji, et al., 2022). The planning stage within a project is pivotal for its success as it dictates the allocation of resources, time, and desired quality (Pratami, et al., 2015). Understanding the intricacies of project management methodologies becomes imperative to ensure these endeavors meet their intended goals effectively and efficiently (Khilmi & Huda, 2019).

Project management encompasses a set of tools, processes, and competent human resources engaged in activities related to efficiently utilizing resources to complete projects effectively and on time (Project Management Institute, 2017). Effective project management involves the systematic application of knowledge, skills, tools, and techniques to project activities, ensuring the fulfillment of project requirements (Project Management Institute, 2021). This includes the integration of various project management knowledge areas, as outlined by international standards like PMBOK and ISO 21500, to streamline processes and enhance project outcomes (ISO 21500, 2021).

Moreover, PMBOK and ISO 21500 provide comprehensive coverage of project management knowledge areas, encompassing integration, stakeholder management, scope definition, resource allocation, time management, cost estimation, risk assessment, quality assurance, procurement, and communication (Rehacek, 2014). Both PMBOK and ISO 21500 serve as comprehensive guides for project management, offering frameworks, best practices, and standardized terminology. While PMBOK specifically focuses on project management practices, ISO 21500 provides general guidelines applicable to diverse project types across different industries and sectors (ISO 21500, 2021).

PMBOK, which stands for Project Management Body of Knowledge, is a guide developed by the Project Management Institute that provides a framework and best practices in project management (Project Management Institute, 2021). It describes the knowledge and skills required in project management and offers guidance on relevant processes, practices, and terminology (Nguyen, 2020). PMBOK is regularly updated and serves as a standard terminology and guideline for project management, published in 1983 by PMI (Simonaitis, et al., 2023; Pertiwi, 2017). Understanding the key knowledge areas outlined in both PMBOK and ISO 21500 is essential for project managers to effectively plan, execute, and monitor

construction projects (Rehacek, 2014). These knowledge areas provide a structured approach to managing various aspects of a project, ensuring alignment with organizational goals and industry standards (Atencio, et al., 2024).

ISO 21500 is an international standard issued by the International Organization for Standardization (ISO) that regulates project management. It provides general guidelines applicable to various types of projects in different sectors and industries, assisting organizations in developing a consistent and effective approach to managing their projects (Lima, et al., 2021). The integration of PMBOK and ISO 21500 principles offers a comprehensive framework for project management in the construction sector, enhancing the efficiency and effectiveness of project delivery. By combining the strengths of both standards, project managers can address diverse project needs while adhering to internationally recognized best practices.

The results of research indicate that management is the ability to obtain results by achieving goals with a group of people. For this reason, management can function as follows: planning, organizing, implementing, and controlling. The success of construction implementation management includes implementation time according to the contract (on time), costs according to plan even though not the same, and being able to fulfill user wishes according to plan and satisfying all parties involved (Chasanah & Sulistyowati, 2017).

Research has found that project management competency standards based on ISO 21500 are highly important when applied to the Mawar Sharon Church Project in Surabaya City. For this project, priority areas based on ISO 21500 are focused on project communication management (Laksana & Huda, 2019).

Furthermore, research into the importance of the process group in project management for medium-sized contractors in Surabaya revealed an average score of 64.99%, exceeding the standard value of 60%. This finding underscores the significance of "Process Group" project management based on PMBOK for medium-sized contractors in Surabaya. The priority within this project group process is the monitoring and controlling process, which achieved a score of 68.88%. Frequency analysis also shows that 24 process indicators are categorized into quadrants I and II, underscoring the importance of these aspects in project management (Khilmi & Huda, 2019).

Methodology

The methodology is crucial in research, guiding the selection process for samples. It underscores the significance of various sampling techniques for distinguishing between population and sample, aiding researchers in making informed decisions (Rani & Arlianti, 2024). Understanding the distinction between population and sample is essential; the population represents the broader group defined by researchers, while the sample is a subset selected for study and inference (Sugiyono, 2021).

Data collection methods, including questionnaires, play a pivotal role in gathering information and are defined as written sets of questions provided to respondents (Sugiyono, 2021). Additionally, the Likert scale is instrumental in measuring attitudes, opinions, and perceptions by assigning scores to respondents' answers, ranging from strongly disagree to strongly agree (Rani & Arlianti, 2024).

Data collection in this research involves the distribution of questionnaires to contractor personnel involved in the Post-Disaster District Court Office Building Development Project in Banda Aceh. The sampling technique used is saturation sampling and involves 18 respondents related to the discussion of the process of implementing project management based on PMBOK and ISO 21500 in project management implementation, which serve as guidelines for implementing project management in this research.

Research variables, based on PMBOK and ISO 21500 standards, gauge 10 project management aspects: project integration management (X1), project stakeholder management (X2), project scope management (X3), project resource management (X4), project time management (X5), project cost management (X6), project risk management (X7), project quality management (X8), project procurement management (X9), and project communication management (X10), along with 45 indicators. Data analysis in this research uses descriptive analysis, which is available in IBM SPSS Statistics version 24 software.

Results

Respondent characteristics

The respondents in this study are contractor personnel involved in the implementation of the Post-Disaster District Court Office Building Development Project in Banda Aceh, with a total of 18 respondents.

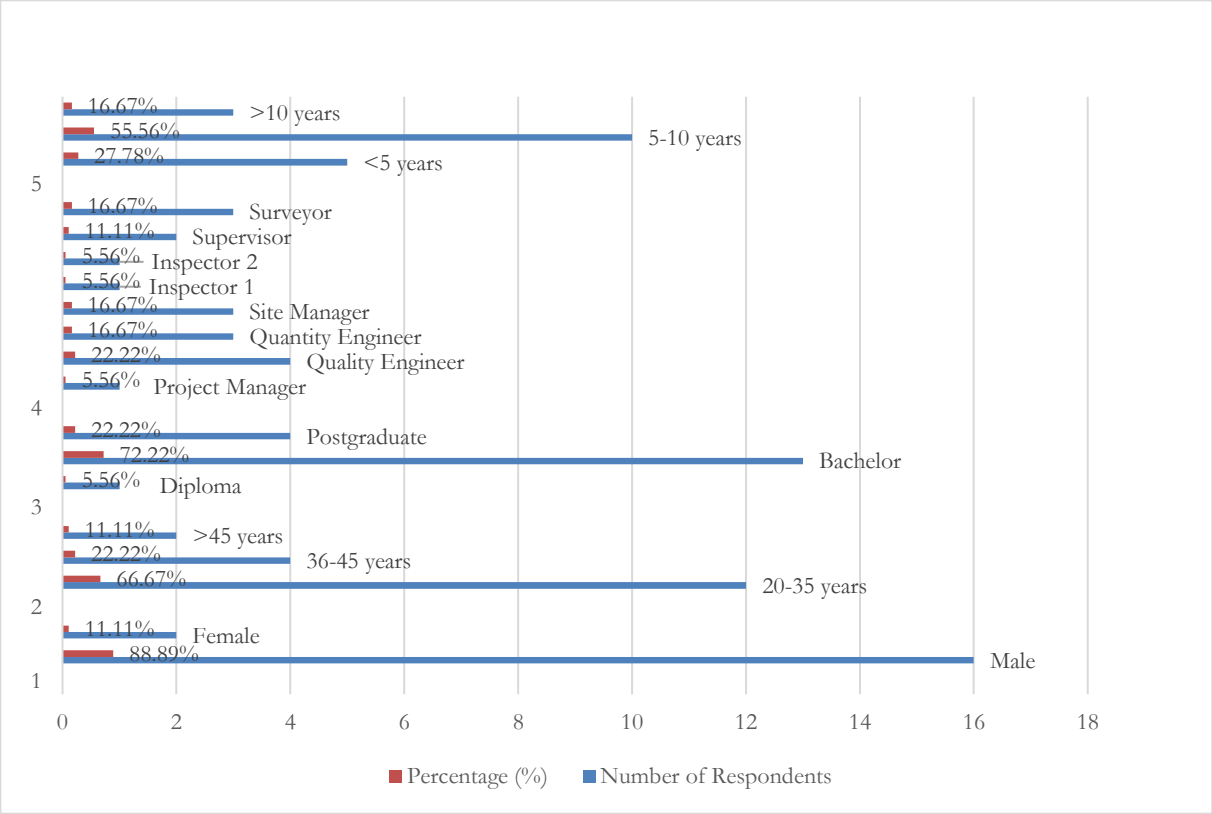

Figure 1. Respondent characteristics

The characteristics of the respondents can be grouped based on their gender, age, education, position, and length of employment, as presented in Figure 1. This figure provides insights into the demographic and professional profiles of the respondents, offering valuable information for understanding the composition of the sample in the study context.

Figure 1 presents the characteristics of the respondents involved in the study, providing insights into their demographic and professional profiles. The table reveals various attributes, including gender, age, education level, position, and length of employment. The gender distribution shows that the majority of respondents are male, comprising 88.89% of the total, while females represent a smaller proportion at 11.11%. Regarding age, a significant portion of respondents, accounting for 66.67%, fall within the age range of 20-35 years. Furthermore, 22.22% of respondents are between 36-45 years old, and 11.11% are over 45 years old.

In terms of education, the majority hold a Bachelor's degree (S1), constituting 72.22% of the total, followed by 22.22% with a Master's degree (S2) and 5.56% with a Diploma 3 (D3) qualification. The table also outlines the diverse positions held by the respondents in their organizations, ranging from Project Manager and Quality Engineering to Quantity Surveyor, Site Manager, Inspector, Supervisor, and Surveyor. Additionally, it categorizes respondents based on their length of employment, showing that 55.56% have been employed for 5-10 years, 27.78% for less than 5 years, and 16.67% for over 10 years. Overall, Figure 1 provides comprehensive insights into the composition of the sample, enhancing the understanding of the respondent characteristics within the study context.

Implementation of Construction Project Management Based on PMBOK and ISO 21500

This subsection outlines the implementation of construction project management principles based on PMBOK and ISO 21500 guidelines. Through descriptive analysis, practical steps in accordance with international standards are elaborated to achieve project objectives effectively. The table below shows the average values of key indicators such as project chart creation, project management planning, project closure, stakeholder identification, cost estimation, and quality planning, visualizing the success rate and primary focus of project management implementation in the project. The results of the descriptive analysis test are presented in Table 1 as follows.

Table 1. Descriptive analysis

Variable		Indicator	Mean
Project integration management	X1.1	Project chart creation	4.39
	X1.2	Project management planning	4.39
	X1.3	Directing and managing project work execution	3.89
	X1.4	Monitoring and controlling project work execution	4.28
	X1.5	Implementing integrated change control	4.28
	X1.6	Project closure	4.39
Project stakeholder management	X2.1	Stakeholder identification	4.39
	X2.2	Planning stakeholder management	4.06
	X2.3	Controlling stakeholder agreements	3.78
Project scope management	X3.1	Planning project scope management	4.11
	X3.2	Gathering requirements for project scope management	4.06

	X3.3	Defining project scope	4.00
	X3.4	Creating the Work Breakdown Structure (WBS)	3.50
	X3.5	Validating project scope	4.06
	X3.6	Controlling project scope	4.00
Project resource management	X4.1	Organizational planning	4.11
	X4.2	Acquiring project team	4.06
	X4.3	Developing project team	4.00
Project time management	X5.1	Defining activities	4.11
	X5.2	Sequencing activities	4.06
	X5.3	Estimating activity duration	4.00
	X5.4	Scheduling	3.50
	X5.5	Controlling schedule changes	4.06
Project cost management	X6.1	Cost estimation	4.39
	X6.2	Determining budget	4.06
	X6.3	Controlling costs	3.78
Project risk management	X7.1	Planning risk management	4.11
	X7.2	Identifying risks	4.06
	X7.3	Qualitative risk analysis	4.00
	X7.4	Quantitative risk analysis	3.50
	X7.5	Planning risk responses	4.11
	X7.6	Monitoring and controlling risks	4.06
Project quality management	X8.1	Planning quality	4.39
	X8.2	Performing quality assurance	4.06
	X8.3	Performing quality control	3.78
Project procurement management	X9.1	Planning procurement management	4.17
	X9.2	Procurement request plan	4.06
	X9.3	Procurement request	4.00
	X9.4	Supplier selection	3.50
	X9.5	Contract administration	4.06
	X9.6	Contract closure	4.00
Project communication management	X10.1	Planning communication	4.11
	X10.2	Information distribution	4.06
	X10.3	Performance reporting	4.00
	X10.4	Administrative closure	3.50

The above table provides insights into the average values of key indicators, illustrating the success level and main focus of project management implementation in the project, based on PMBOK and ISO 21500 guidelines. This table presents the results of the descriptive analysis test for various project management indicators based on PMBOK and ISO 21500. It shows the sample size, minimum and maximum values, and the mean for each indicator.

Priority indicators in project management implementation

This subsection identifies priority indicators in the implementation of project management according to the PMBOK and ISO 21500 guidelines. In the context of descriptive analysis, it provides an overview of key indicators such as project chart creation, project management planning, project closure, stakeholder identification, cost estimation, and quality planning. The table below summarizes the results of descriptive analysis based on priority indicators, showing the average value for each indicator and demonstrating the level of success and main focus in implementing project management in the project. From the descriptive analysis results, it is found that there are 6 priority indicators in the implementation of project management, namely X1.1 (project chart creation), X1.2 (project management planning), X1.6 (project closure), X2.1 (stakeholder identification), X6.1 (cost estimation), and X8.1 (quality planning) with a mean value of 4.39. The results of descriptive analysis for priority indicators in project management applications which have high mean values, indicate the main focus in implementing project management in the examined project.

Discussion

The results of this study provide significant insights into the integration of PMBOK (Project Management Body of Knowledge) and ISO 21500 standards in managing post-disaster construction projects. The study identifies that certain project management indicators, including project chart creation, project planning, stakeholder identification, cost estimation, and quality planning, were effectively implemented, as reflected in their high average scores. These findings align with the working hypothesis that applying established project management frameworks in construction, especially in post-disaster contexts, enhances project outcomes by promoting consistency and quality standards.

Interpretation in Light of Previous Studies

This study's findings align with prior research on project management in construction, supporting that adherence to PMBOK and ISO 21500 frameworks contributes to project success by enhancing structure, cost efficiency, and stakeholder satisfaction (Unegbu et al., 2022). Studies have similarly demonstrated that standard frameworks in project management ensure projects are completed within budget and time constraints, which is critical in resource-sensitive post-disaster projects (Unegbu et al., 2022). Additionally, Laksana and Huda found that, in the context of the Mawar Sharon Church Project, ISO 21500-based communication management played a vital role (Laksana & Huda, 2019). This supports the importance of stakeholder identification and communication management as core factors, consistent with this study's focus on high-priority indicators (Laksana & Huda, 2019).

Broader Context and Implications

The effective integration of PMBOK and ISO 21500 in the Banda Aceh District Court construction project suggests that these frameworks could be broadly applicable to other post-disaster recovery projects. In disaster recovery scenarios, where timely project completion and stakeholder engagement are critical, the structured guidance of PMBOK and ISO 21500 may ensure alignment with recovery goals and stakeholder expectations. Additionally, the prioritization of quality planning and stakeholder management emphasizes the value of high-quality outputs and community satisfaction, which are especially relevant in post-disaster scenarios where reconstruction must meet heightened standards of durability and safety. This approach aligns with sustainable construction goals, supporting a holistic perspective on resilience and long-term project impacts.

Limitations

This study, however, has certain limitations that should be acknowledged. The relatively small sample size of 18 respondents may limit the generalizability of these findings across a broader range of construction projects. Additionally, while the study provides valuable descriptive insights into the implementation of PMBOK and ISO 21500 standards, it does not establish causation between specific project management practices and overall project success. Furthermore, indicators such as Work Breakdown Structure (WBS), scheduling, and risk analysis received lower scores, indicating areas where further investigation and potentially refined methodologies may be needed to enhance project management in similar contexts.

Future Research Directions

Future research could expand upon these findings by investigating the impact of PMBOK and ISO 21500 implementation across diverse construction project types and in various locations. A larger sample size could help validate these results, providing more robust evidence of the frameworks' effectiveness. Additionally, employing advanced analytical methods, such as multivariate or regression analysis, could enable a deeper understanding of how specific project management indicators influence project outcomes. It would also be valuable to examine additional factors, such as environmental and social impacts, to support a broader understanding of project management in post-disaster reconstruction. This could align future research with sustainable development goals and provide a more holistic approach to construction management in disaster-prone regions.

CONCLUSION

This study assessed the integration of PMBOK and ISO 21500 standards within the management of a post-disaster construction project, the District Court Office Building in Banda Aceh. The findings underscore the importance of structured project management frameworks in enhancing project outcomes, particularly in contexts where timely, efficient, and quality-driven execution is essential. High-priority indicators such as project chart creation, project planning, stakeholder identification, cost estimation, and quality planning were effectively implemented, demonstrating the practical benefits of PMBOK and ISO 21500 in achieving these objectives.

However, the study also highlights areas needing further attention, including the Work Breakdown Structure (WBS), scheduling, and risk analysis, suggesting that while these frameworks provide a strong foundation, additional refinements are necessary for comprehensive application. By prioritizing key indicators aligned with PMBOK and ISO 21500, this research offers practical insights for improving project management practices in similar post-disaster reconstruction projects. The findings encourage broader application of these standards to strengthen resilience and promote sustainable, high-quality outcomes in the construction industry. Future studies can expand upon this research to address the identified limitations and further explore the role of standardized frameworks in diverse construction contexts.

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