Optimizing Human Resource Allocation in Construction Projects in Indonesia: A Comprehensive Analysis of Influencing Factors

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Abstract. The Indonesian construction sector, driven by population density and infrastructure demands, rebounded from a second-quarter 2020 contraction due to COVID-19, completing projects worth Rp1,311.4 trillion in 2020. Human resource (HR) allocation is critical in this labour-intensive industry, as it impacts project efficiency. This study explores factors influencing HR selection and allocation in construction projects, addressing the challenges of HR shortages or excess. A well-planned HR allocation strategy is essential for a successful project completion. This study delves into the relationships between HR factors, cost, and time performance, emphasizing the importance of effective HR management. It introduces hypotheses for investigation and proposes a comprehensive framework for assessing the impacts of HR, cost, and company-related factors on project performance. This research utilized qualitative analysis methodologies and expert validation to refine the instrument for a nuanced understanding of HR dynamics in construction projects. This study aims to obtain expert-validated factors that influence labour selection in construction projects to improve project performance.

1 Introduction

The construction sector in Indonesia has experienced rapid growth in response to increasing demand for infrastructure and facilities, driven by the dense population and the need for improved amenities. Despite facing a contraction in the second quarter of 2020 due to the COVID-19 pandemic, which imposed restrictions on various societal activities, the construction sector rebounded in 2020, completing projects worth Rp1,311.4 trillion. As the COVID-19 situation gradually improved and came under control, the construction sector showed signs of recovery in the second quarter of 2021, an increase of 4.42%. Positive growth persisted from July to September 2021 [1].

In the execution of construction projects, which are typically one-time endeavours with short durations, the process involves transforming project resources into a tangible outcome, such as a building, within the specified constraints of time, cost, and quality by Waluyo [2]. Syah [3], the availability and influence of human resources (HR) are crucial factors in construction projects that impact their successful completion. It is common for projects to experience either an excess or shortage of HR and such conditions significantly affect project efficiency. According to the International Labor Organization, the construction industry is recognized for its labour-intensive nature compared to other sectors in the global economy by Ernst et al. [4]. Mawdesley [5] stated, that labour plays a vital role in enhancing HR productivity. HR allocation planning is a key factor influencing the completion of construction projects, according to Dabirian [6], and the strategic placement of HR according to predetermined roles is essential in construction projects [2]. A well-planned HR allocation strategy is crucial for project success [6].

Construction projects have dynamic changes, and one of these dynamic changes is the recruitment and turnover of HR, according to Lyneis [7]. Given the numerous changes in HR, ineffective planning can lead to HR shortages in a construction project [6][8]. HR shortages can result in a reduction in project progress and may even lead to temporary delays by Dabirian [6]. As a consequence of such delays, there is an accumulation of excess HR in specific work areas, communication challenges, reduced productivity, HR wastage, and escalation of costs by Dabirian [6]. Therefore, the estimation of the HR is crucial, along with thorough planning and implementation of various HR recruitment policies. This approach presents managerial opportunities where effective HR allocation can be optimized to achieve a significant improvement in project performance, according to Dabirian [6]. This study aims to find factors influencing the selection of HR in construction projects to improve project performance, which is time and cost project.

2 Literature Review

For the success of a project, various considerations must be taken into account in the planning and management aspects, such as labour, safety, health, construction delays, architectural and engineering design, material
availability and quality, client needs, and financial or economic constraints by Othman [9]. HR allocation can be considered a primary process in labour management in construction projects by e Silva [10]. The selection and recruitment of human resources have a primary function within human resources in a project by Farashah [11].

Policies related to the recruitment of new employees, particularly for short-term recruitment, may lead to a reduction in skills, experience (work habits), and an increase in errors that can result in turnover by Xavier, A [8], Eden et al [12], and Wang [13]. Generally, recruitment can be determined based on the labour needed and the project workflow, including time and remaining tasks by Park [14]. Performance needs and turnover can vary over different time intervals during project implementation. Typically, the demand for project labour is higher at the beginning, leading to an increased recruitment rate. Conversely, labour needs tend to decrease as the project progresses by Lyneis [7]. Human resource recruitment usually involves a specified duration within the employment contract. In construction project contracts, time intervals such as weekly, bi-weekly, tri-weekly, and monthly are commonly used. Inaccurate labour allocation can adversely impact project timeline performance by Lee [15].

To achieve the desired project performance, it is essential to recruit labour that aligns with the specific project timeline, ensuring that the human resource matches the designated tasks and project requirements. Additionally, maintaining skilled and familiar project personnel is crucial. Prioritizing skilled labour over non-skilled labour is considered a high priority. Effective management of the human resource is necessary to enhance project performance by Trammell [16]. Therefore, the implementation of various human resource recruitment policies is required to determine the most effective approach and subsequently assess the impact of their implementation on project performance by Dabirian [6].

1. Relationship between HR Factors and Time Performance. In this study, Dabirian [6] highlighted the impact of human resource factors on enhancing time performance in construction projects. HR factors such as HR motivation, training, productivity, HR allocation, HR needs, and HR recruitment play a crucial role. The findings indicate that a stable HR with minimal turnover reduces project costs. Moreover, the implementation of bi-weekly reports on HR allocation demonstrated that utilizing a bi-weekly schedule can expedite project completion at a lower cost than anticipated.

2. Relationship between Cost Factors and Time Performance. Dabirian [6] emphasized that cost factors, such as unit material costs, unit equipment costs, and cash flow, can influence time performance. The quality of materials and equipment used in the project is crucial for adhering to the planned schedule. If materials and equipment meet standard requirements, project tasks can proceed according to the predetermined timetable. Conversely, using non-standard materials and equipment may necessitate rework, leading to extended project timelines beyond the initially planned schedule by Ford [17].

3. Relationship between Company Factors and Time Performance. According to Park [14] and Norhidayah [18], company factors, such as HR management, organizational strategy, and organizational culture, influence time performance. Effective HR management, where employees work according to their capabilities and skills, contributes to the smooth progress of projects, ensuring that project tasks are completed as scheduled. Organizational strategy influences the selection of personnel based on their abilities and expertise in their respective roles. Organizational culture, characterized by effective communication among employees, further enhances HR management. Therefore, when organizational strategy and culture are successfully implemented, HR aligns with the project's objective of timely project completion.

4. Relationship between HR Factors and Cost Performance. According to Dabirian [6], HR needs and turnover affect cost performance. HR needs tend to increase as the project progresses. In a project, effective HR allocation requires productive employees with skills and expertise aligned with their roles. Therefore, recruiting and turnover are undertaken to achieve this, contributing to increased costs within the project.

5. Relationship between Cost Factors and Cost Performance. According to Dabirian [6], cost factors such as unit material costs, unit equipment costs, and cash flow can impact cost performance. The materials and equipment used in the project must adhere to project standards. Non-compliance may necessitate rework, incurring additional costs to rectify the situation and potentially leading to cost overruns.

6. Relationship between Company Factors and Cost Performance. According to [14] and [18], organizational strategy analyzes the financial aspects of project materials and HR to ensure the successful implementation of projects. If materials do not meet standards, there may be a need for material reshipment, leading to increased project costs. Additionally, ineffective HR management in personnel selection may require recruiting personnel based on their abilities, incurring additional costs in the selection process.

3 Hypotheses

Based on the literature review conducted, several hypotheses can be derived from this study:


4 Methodology

The flowchart of this research is shown in Fig. 1.

![Flowchart of this research](Image)

4.1 Literature Review and Expert Validation

In this research, data will be collected through a literature review of relevant journals and previous studies on the topic. The primary objective of the literature review is to identify variables and indicators that will be utilized in this study. Once these variables and indicators are identified, a questionnaire will be developed as the instrument for the first stage.

This questionnaire will serve as the tool for data collection in the first stage, involving the validation of content and the construction of the research variables and indicators. In this phase, the questionnaire will be presented to experts for their assessment. The experts, each holding at least a bachelor's degree and possessing a minimum of 10 years of relevant experience, will total three individuals as known as P1, P2, and P3.

The feedback and validation results from the expert panel will be integral to refining and validating the research variables and indicators. This validated instrument will then be employed in subsequent stages of data collection. The insights and expertise of the panel of experts are critical for ensuring the robustness and reliability of the research instrument and, consequently, the validity of the study's findings. Table 1 shows the variables of this research:

<table>
<thead>
<tr>
<th>Variable(s)</th>
<th>Indicators</th>
<th>References</th>
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<tbody>
<tr>
<td>Cost</td>
<td>Unit Material Cost</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Unit Equipment Cost</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Safety Cost</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Owner Financing</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Cash Flow</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>HR Productivity</td>
<td>[6, 19-20]</td>
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<tr>
<td></td>
<td>HR Wages</td>
<td>[6]</td>
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<td></td>
<td>Motivation HR</td>
<td>[6]</td>
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<td></td>
<td>Labor Allocation</td>
<td>[6]</td>
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<tr>
<td></td>
<td>HR Training</td>
<td>[6, 19-21]</td>
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<tr>
<td></td>
<td>HR need</td>
<td>[6]</td>
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<tr>
<td></td>
<td>HR Recruitment</td>
<td>[6, 20]</td>
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<tr>
<td></td>
<td>HR Turnover</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>HR Management</td>
<td>[14, 19, 21]</td>
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<tr>
<td></td>
<td>Quality Assessment</td>
<td>[19,21]</td>
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<tr>
<td></td>
<td>Organization Strategy</td>
<td>[18]</td>
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<tr>
<td></td>
<td>Organization Culture</td>
<td>[18]</td>
</tr>
<tr>
<td></td>
<td>Completion Rate</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Rework</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Work Accepted</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Work Area</td>
<td>[6]</td>
</tr>
<tr>
<td>Company/ Construction Projects</td>
<td>The project is not delayed and is completed on schedule as planned.</td>
<td>[6, 10, 15]</td>
</tr>
<tr>
<td>Time Performance</td>
<td>No Cost overrun</td>
<td>[6, 10]</td>
</tr>
<tr>
<td>Cost Performance</td>
<td></td>
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</tr>
</tbody>
</table>

4.2 Qualitative Analysis

Qualitative analysis is a research approach that systematically explores and interprets complex phenomena through a holistic and in-depth examination of non-numerical data. This method employs various data collection techniques, such as interviews, observations, and document analysis, to uncover underlying patterns, themes, and meanings within a given context. It is characterized by its emphasis on understanding the subjective experiences, perspectives, and social processes that shape human behaviour.

Qualitative analysis is widely employed in disciplines such as sociology, psychology, anthropology, and education, providing nuanced insights and a rich understanding of intricate phenomena that quantitative methods alone may not capture. The rigorous application of qualitative analysis methodologies contributes to the advancement of knowledge, theory development, and a deeper comprehension of the intricacies inherent in diverse social and cultural settings by Denzin [22].
5 Result and Discussion

In a structured interview with three experts (P1, P2, P3), it is highlighted that the construction sector is undergoing positive growth. P1, P2, and P3 state that the number of construction projects has increased, leading to intensified competition. P1 emphasizes the growing competitiveness, resulting in increased demand for larger resources. P2 and P3 add that the construction projects of the National Capital Region (IKN) contribute to the current upsurge in project numbers. With the rising number of construction projects and fierce competition, the need for resources has also increased. Adjusting the workforce size according to the dominant project tasks, recognizing the importance of competent and adaptable labour in ensuring smooth project execution. This corresponds with the findings of Dabirian [6] and Nguyen [23], highlighting the significance of competent labour in project success. According to P2, effective communication is crucial for maintaining relationships among workers, overcoming individual issues, ensuring mutual agreement, and optimizing staff performance. Additionally, performance assessments, both individual and group, are essential for improving workforce performance. Quality workforce assessments based on the Key Performance Index (KPI) are vital for acquiring competent personnel, and ensuring optimal project performance. This echoes Pournader [21], suggesting that quality assessments guide workforce selection, prioritizing and HR management deemed crucial. This study highlights the consequences of HR cost management are considered crucial factors in workforce allocation planning and supporting optimal company performance. Overall, understanding the importance of costs in workforce selection can vary among project stakeholders and companies. However, awareness of the costs needed to ensure workforce quality and efficient management by the HC department can play a crucial role in project and company success.

6 Conclusion and Implications

In conclusion, this study underscores the resilience and growth of the Indonesian construction sector amid challenges, attributing success to escalating infrastructure demands. Human resource (HR) allocation is a critical factor that influences project efficiency and success. The labour-intensive nature of the industry amplifies the importance of strategic HR management and allocation planning. This study highlights the consequences of HR shortages or excesses, emphasizing the need for accurate estimation, thorough planning, and implementation of effective HR recruitment policies.

Key considerations in project planning, such as labour, safety, health, design, material quality, and financial constraints, underscore the primary role of HR allocation in labour management. Effective recruitment aligns with project timelines and objectives, with skilled labour prioritization and HR management deemed crucial. This study explores the relationships between HR factors and time performance, revealing the impact of stable HR and the potential benefits of a bi-weekly allocation schedule in reducing project costs.

The influence of cost factors on time and cost performance is examined, emphasizing the importance of adhering to project standards to avoid rework and cost overruns. Organizational strategy, HR management, and organizational culture are identified as critical company
factors impacting time performance. This study integrates qualitative analysis and incorporates expert insights that highlight positive sector growth, workforce augmentation needs, and active recruitment and training programs by construction companies.

Implications for practitioners and researchers include recognizing the managerial opportunities to optimize HR allocation to improve project performance. The findings underscore the need to align workforce size with project tasks, effective communication, and performance assessments to enhance workforce productivity. The positive impact of significant costs on selecting quality personnel and the vital role of the Human Capital (HC) department in managing funds for workforce competence are crucial.

This study contributes a nuanced understanding of HR dynamics in the Indonesian construction sector, offering actionable insights for project managers and researchers. The implications extend to informed decision-making in HR allocation, recruitment policies, and overall project planning, enhancing the sector's efficiency and long-term success.

References


