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Analysis of the Determinants of the Quality of Human Resources Project Management in Improving the Performance of Multi-Project Construction Time

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ABSTRACT:
Delays in construction project completion remain a major issue, particularly in multi-construction project environments characterized by limited resources and allocation conflicts. These conditions require high-quality project management human resources (HR) to ensure optimal project time performance. This study aims to analyze the effect of project management HR quality on time performance in multi-construction projects by examining five key dimensions: competence, loyalty, discipline, and integrity, with work motivation as a mediating variable. This study adopts a quantitative approach using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method with SmartPLS 4 software. Data were collected through questionnaire surveys involving respondents engaged in three construction projects managed simultaneously. In addition, Importance Performance Analysis (IPA) was applied to identify practical priority indicators for improvement. The results indicate that the research model demonstrates very strong predictive capability, with coefficients of determination (R^2) of 0.933 for time performance and 0.874 for work motivation. All HR quality variables have a positive and significant effect on project time performance, with the dominant influence order being discipline, competence, work motivation, loyalty, and integrity. Work motivation is proven to act as a mediating variable that strengthens the influence of HR quality on time performance. The IPA results identify four priority improvement indicators: technical competence, discipline in standard operating procedures and working hours, accuracy in project time control, and social motivation along with work environment support. This study concludes that improving the quality of project management HR implementation—particularly in the aspects of discipline and competence supported by work motivation—is a key factor in achieving effective time performance control in multi-construction projects.

Keywords: Project Management, Human Resource Quality, Time Performance, Multi-Construction Projects, Work Motivation

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INTRODUCTION

The construction industry is a strategic sector that plays an important role in infrastructure development and economic growth, but it is still faced with the classic problem of delayed project completion. Time performance is one of the main indicators of the success of a construction project because delays not only lead to increased costs and potential quality degradation but also affect the contractor's reputation and the sustainability of relationships with project owners. This issue becomes increasingly complex in a multi-project construction environment, where one organization must manage multiple projects simultaneously with the same resource constraints. As a result, the risk of allocation conflicts and decreased time performance becomes even higher (Redwan & Isradi, 2025; Subagyo & Isradi, 2025).

The success of construction projects in general is measured through the achievement of the triple constraints, which include cost, quality, and time (Kerzner, 2009; PMBOK, 2017). In a multi-project context, project management becomes more complex due to interdependence among projects, internal competition for resources, and intensive cross-project coordination needs. Subagyo and Isradi (2025) emphasized that the failure of multi-project management is generally not caused by technical weaknesses alone but by limited managerial capabilities and suboptimal human resource management.

This indicates that the managerial dimension plays a crucial role in maintaining project time performance.

A number of studies show that the problem of construction project delays does not only stem from technical factors but also from the quality of decision-making and the behavior of human resources involved in the project (Amin et al., 2025; Arain & Pheng, 2006). Redwan and Isradi (2025) stated that the effectiveness of project HR management has a direct relationship with the time performance and productivity of construction projects. Thus, project management HR functions not only as a technical implementer but also as a key controller in planning, coordination, and strategic decision-making that determine project timing success, especially in a multi-project environment characterized by stress and complexity.

The quality of project management human resources in this study is represented by four main dimensions: competence, loyalty, discipline, and integrity. Competence reflects a combination of knowledge, skills, attitudes, and experiences that enable individuals to carry out project tasks effectively (Boyatzis, 2008; Spencer & Spencer, 2008). Subagyo and Isradi (2025) emphasized that the competence of project managers significantly contributes to the timeliness of project completion. Loyalty relates to an individual's commitment to the organization and the project, playing a role in maintaining the stability of the project team and the consistency of performance (Amin et al., 2025; Meyer & Allen, 1991). Discipline reflects adherence to rules, procedures, and work schedules, which directly affect the effectiveness of project time control (Hasibuan, 2003; Rivai, 2018). Meanwhile, integrity forms the foundation of trust and accountability in project implementation, which, according to Redwan and Isradi (2025), contributes to the sustainability of project organizational performance.

In addition to HR quality, work motivation is viewed as a psychological factor that plays an important role in encouraging individuals to work optimally, especially in multi-project environments with high workloads. Amin et al. (2025) stated that work motivation functions as a driving mechanism that can strengthen the relationship between HR quality and project performance. High motivation encourages greater intensity, perseverance, and individual responsibility in achieving project time targets (Gurmu & Ongkowijoyo, 2020; Robbins & Judge, 2019). In this study, project time performance is defined as the level of achievement of project completion according to the planned schedule, reflecting the effectiveness of time control in construction implementation (Ervianto, 2023; PMBOK, 2017).

Although various studies have discussed the influence of HR quality on project performance, most still focus on single projects or only partially review HR aspects. In practice, contractors in Indonesia often manage several projects with different characteristics and locations simultaneously, leading to problems such as limited competent human resources, decreased motivation due to simultaneous workloads, and inadequate discipline in project time control (Redwan & Isradi, 2025; Subagyo & Isradi, 2025). Empirical studies that comprehensively integrate HR quality, work motivation, and time performance in the context of multi-construction projects remain relatively limited.

Based on these conditions, this study develops an empirical model integrating the quality of project management human resources—competence, loyalty, discipline, and integrity—as well as work motivation as a mediating variable in explaining time performance in multi-construction projects. Using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach and supported by Importance Performance Analysis (IPA), this study not only examines causal relationships among variables but also identifies applicable improvement priority recommendations. The urgency of this research lies in the need for an evidence-based HR management framework capable of improving project time performance in an increasingly competitive multi-project construction environment.

RESEARCH METHODS

This study aims to empirically analyze the influence of the quality of human resource (HR) project management on time performance in a multi-project construction environment, considering the role of work motivation as a mediating variable. To achieve this goal, this study examines the causal relationships between the variables of competence, loyalty, discipline, and integrity on project time performance, and evaluates how work motivation strengthens the influence of HR quality. In addition,

this study aims to identify applicable priority indicators for improvement to enhance time performance in the implementation of multi-construction projects.

This study uses a quantitative approach with an explanatory research design, which aims to explain the cause-and-effect relationships between research variables through hypothesis testing (Hair et al., 2019). The research was carried out in 2025 across three construction projects managed simultaneously: the Driving Range project in Jakarta, the factory construction project in Serang–Banten, and the villa construction project in Bali. The research population includes all project management personnel directly involved in managing the three projects. The sampling technique employed purposive sampling, with the criteria that respondents have experience and direct responsibility for project time control. This approach is considered appropriate for project management research emphasizing the role-based understanding and competencies of respondents (Sekaran & Bougie, 2011).

The research procedure began with a literature review to identify relevant variables, indicators, and conceptual relationships. Furthermore, research instruments in the form of questionnaires—based on theoretically validated indicators—were developed. The next stage involved expert validation to ensure the suitability of the indicators within the context of multi-project construction. After the instrument was declared valid, data were collected through the distribution of questionnaires to selected respondents. The collected data were then analyzed using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method, followed by Importance Performance Analysis (IPA) to formulate applicable improvement priorities.

The research instrument consisted of a structured questionnaire developed to measure variables related to project management HR quality, work motivation, and project time performance. HR quality variables were measured through four main constructs—competence, loyalty, discipline, and integrity—each represented by several literature-based indicators in human resource and project management (Covey & Merrill, 2006; Meyer & Allen, 1991; Rivai, 2018; Spencer & Spencer, 2008). Work motivation was measured based on needs theory and work motivation theory, while project time performance was measured through indicators of project completion accuracy, milestone achievement, and time use efficiency (Ervianto, 2023; PMBOK, 2017).

All indicators were measured using a five-level Likert scale, ranging from "strongly disagree" to "strongly agree," which is commonly used in organizational behavior and project management research because it can quantitatively capture respondents' perceptions (Hair et al., 2019). Before the main analysis, the instrument was tested for validity and reliability through an evaluation of the outer model in SEM-PLS, including convergent validity, discriminant validity, and construct reliability tests. This approach ensures that the research instrument can accurately and consistently measure latent constructs.

The main data analysis was carried out using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with the help of SmartPLS 4 software. The SEM-PLS method was chosen because it is suitable for research involving complex models, relatively limited sample sizes, and does not require strict data normality (Hair et al., 2019). The analysis included the evaluation of the outer model to test the validity and reliability of the instrument, as well as the evaluation of the inner model to test causal relationships between variables, the coefficient of determination (R^2), effect size (f^2), and path significance.

In addition to SEM-PLS, this study uses Importance Performance Analysis (IPA) to identify practical improvement priority indicators. The IPA compares the importance and performance levels of each indicator, then plots them into a four-quadrant Cartesian diagram (Martilla & James, 1977). This approach allows statistical analysis results to be translated into concrete managerial recommendations, ensuring that the research contributes not only theoretically but also practically to HR management in multi-construction projects.

RESULTS AND DISCUSSION

Respondent characteristics, such as age, gender, education level, job title, and tenure in the construction industry, provide a general demographic profile of the study participants. This background information is critical for contextualizing the potential influence of respondent attributes on perceptions of HR implementation quality and project schedule performance.

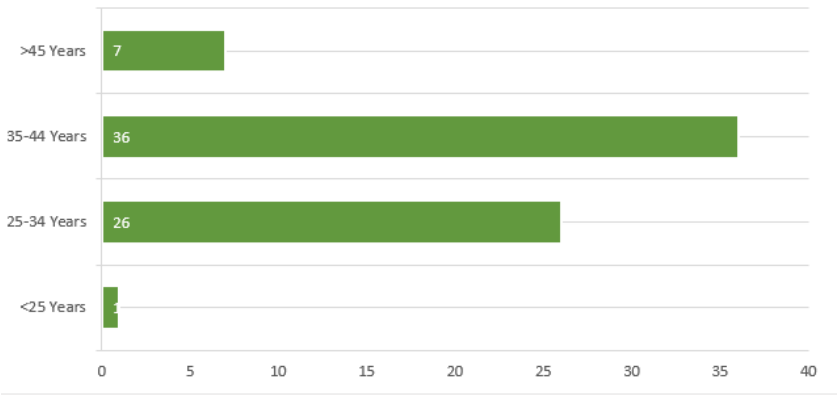

Figure 1 - Age Distribution of Respondents
Source: Researcher's Analysis (2025)

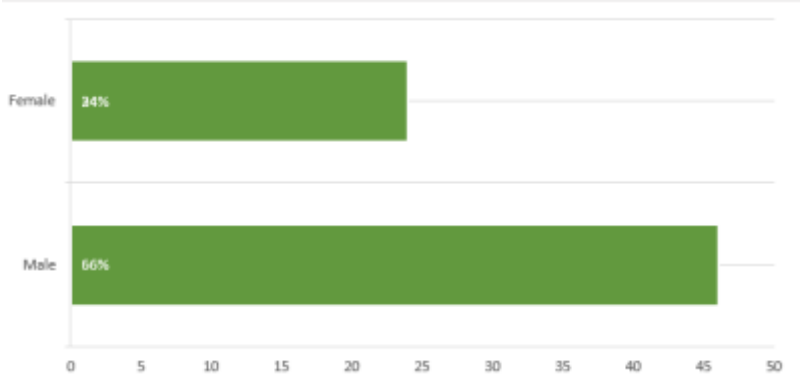

Figure 2 – Respondents' gender
Source: Researcher (2025)

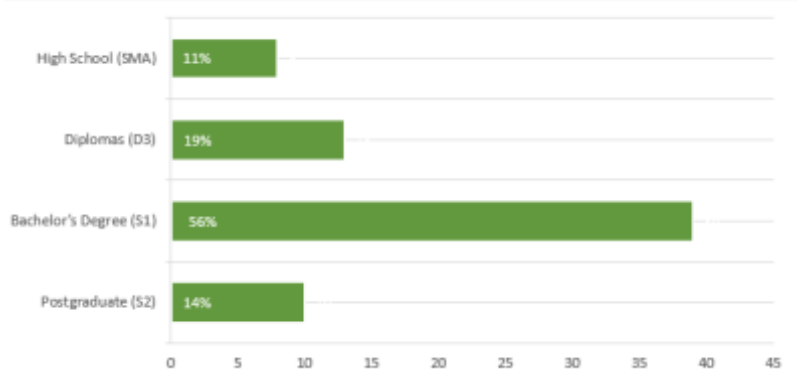

Figure 3 – Respondents' Educational Attainment
Source: Researcher (2025).

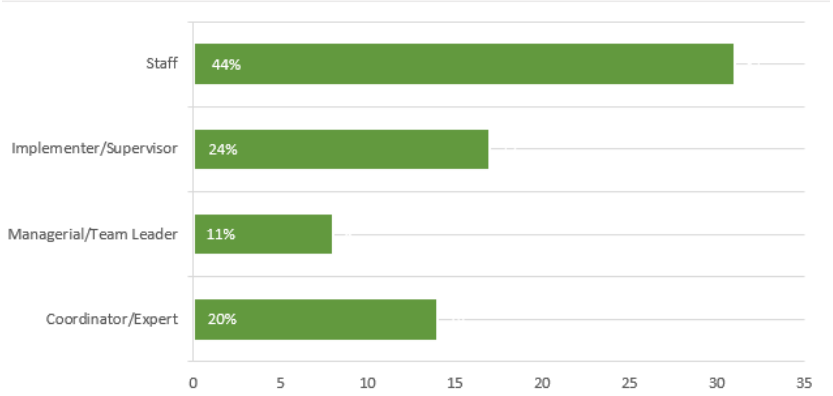

Figure 4 – Respondent Positions
Source: Researcher (2025)

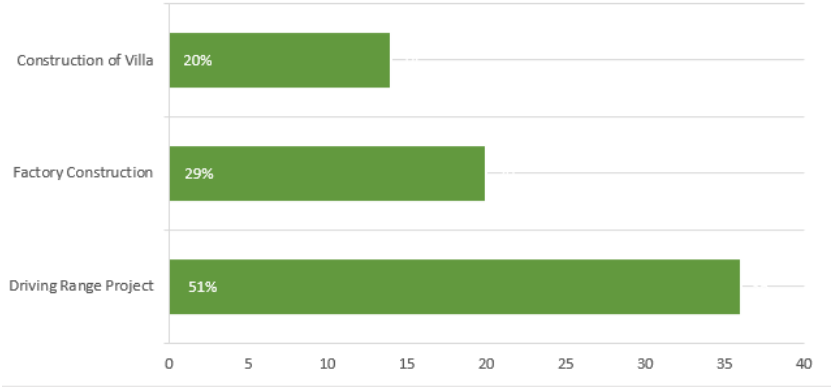

Figure 5 – Distribution of Respondents by Project Location
Source: Researcher (2025)

The data processing results from 70 respondents in this study indicate a diverse distribution of characteristics across both demographic and professional dimensions. Regarding gender, most respondents were male (66%), with the remaining 34% being female, reflecting the prevalent male representation in the construction sector. In terms of age, the largest proportion of respondents fell within the 26–35 age group (37%), followed by the 36–45 age group (51%), while those under 25 and over 45 constituted 1% and 10%, respectively. This suggests that most respondents are actively engaged in their careers and possess considerable field experience. Concerning education, a bachelor's degree (S1) was the most common qualification (56%), followed by diplomas (D3) at 19%, postgraduate degrees (S2) at 14%, and high school diplomas (SMA) at 11%, suggesting that many project management personnel possess relevant academic backgrounds in civil engineering. In terms of professional roles, the respondents comprised 20% project managers, 11% coordinators, 44% project administration staff, and 25% field supervisors, indicating a balanced representation across project management levels. Finally, regarding project location, 51% of respondents were from the Driving Range project in Jakarta, 29% from the factory construction project in Serang, Banten, and 20% from the villa construction project in Bali. This distribution ensures that the data collected reflect the actual conditions of construction project implementation across various regions and operational contexts.

Research Question 1

The results of the descriptive analysis showed that all variables of human resource quality—competence, loyalty, discipline, and integrity—had an average value that was in the high category in all three research projects. However, the indicators of discipline and competence show more significant

performance variations between projects, especially in the aspects of compliance with SOPs, work timeliness, and technical competence in schedule control.

Table 1 - Bootstrapping Test Results (Direct Effect)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Information
X1. -> Y.	0,113	0,108	0,097	1,170	0,121	Insignificant (Unproven)
X1. -> Z.	0,410	0,387	0,096	4,252	0,000	Significant (Proven)
X2. -> Y.	0,243	0,232	0,123	1,978	0,024	Significant (Proven)
X2. -> Z.	0,403	0,422	0,180	2,232	0,013	Significant (Proven)
X3. -> Y.	0,260	0,262	0,137	1,891	0,029	Significant (Proven)
X3. -> Z.	-0,454	-0,351	0,291	1,564	0,059	Insignificant (Unproven)
X4. -> Y.	0,406	0,414	0,154	2,641	0,004	Significant (Proven)
X4. -> Z.	0,593	0,492	0,263	2,257	0,012	Significant (Proven)
Z. -> Y.	-0,021	-0,016	0,093	0,227	0,410	Insignificant (Unproven)

Source: Processed Researcher, 2025

Based on the results of the track test, competence (X1) had no significant effect on time performance (Y). These findings indicate that the respondents' level of competence has not directly determined the achievement of time performance. However, competence shows a significant effect on motivation, suggesting that it plays a greater role in enhancing individuals' internal drive rather than directly influencing time performance. Furthermore, loyalty (X2) was shown to have a significant effect on time performance (Y). This indicates that individuals with high levels of loyalty tend to be more committed to completing work within the target time. In addition, loyalty also has a significant effect on motivation, confirming that a sense of attachment and loyalty to the organization can encourage individual work morale. The test results also showed that discipline (X3) had a significant effect on time performance (Y), meaning that compliance with work rules and schedules contributes positively to performance punctuality. However, discipline did not have a significant effect on motivation (Z). The negative coefficient direction suggests that rigid discipline may not necessarily enhance individuals' intrinsic motivation. Meanwhile, integrity (X4) was found to be the most influential variable affecting time performance (Y) and also had a significant effect on motivation. These findings reveal that honesty, value consistency, and personal responsibility play crucial roles in driving both motivation and time performance achievement. The results of the analysis further showed that motivation (Z) had no significant effect on time performance (Y). This suggests that the respondents' motivation is not strong enough to directly translate into time performance, implying that behavioral factors such as loyalty, discipline, and integrity are more dominant in determining the timeliness of job completion.

Overall, the results of this study confirm that time performance is more strongly influenced by behavioral factors and personal values (loyalty, discipline, and integrity) than by psychological factors such as motivation. Furthermore, motivation has not been proven to be an effective intervening variable in the relationship between the independent variables and time performance. Therefore, improving time performance is more effectively achieved by strengthening the values of integrity, work discipline, and organizational loyalty.

Table 2 - Test Results Bootstrapping (Indirect Effect)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Information
X3. -> Z. -> Y.	0,010	0,008	0,043	0,224	0,411	Insignificant (Unproven)
X4. -> Z. -> Y.	-0,013	-0,013	0,052	0,239	0,405	Insignificant (Unproven)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Information
X1. -> Z. -> Y.	-0,009	-0,008	0,039	0,225	0,411	Insignificant (Unproven)
X2. -> Z. -> Y.	-0,009	-0,002	0,042	0,205	0,419	Insignificant (Unproven)

(Source: Researcher's Processed Results, 2025)

In the discipline → motivation → time performance path, the value of the influence coefficient is indirect. These findings suggest that although discipline has a direct effect on time performance, these effects are not channeled through motivation. Thus, discipline functions more as a work behavior control mechanism that has a direct impact on punctuality, rather than through an increase in individual psychological drive. Furthermore, the integrity → motivation → time performance pathways also did not show significant indirect influences. Although integrity has been shown to improve motivation and time performance directly, these results indicate that motivation is not the primary mediator in the relationship. In other words, the value of integrity is more influential when it is manifested directly in responsible work behavior that is consistent with the target time. In the relationship between competence → motivation → time performance, the coefficient of influence is indirect. These results confirm that improving competence is indeed able to increase motivation, but this motivation has not been able to translate significantly into the achievement of time performance. This indicates the possibility that competencies require the support of the work system, supervision, or organizational culture to have a real impact on time performance. Similarly, the loyalty → motivation → time performance pathways show insignificant indirect influences. These findings indicate that loyalty has a more direct impact on time performance through commitment and compliance with the organization, rather than through increased work motivation as an intermediate variable.

Overall, the results of the indirect influence test reinforce the finding that motivation did not play a role as a mediating variable, either partially or fully, in this study model. Thus, the relationship between independent variables and time performance is dominated by a direct-only effect. This shows that improving time performance is more effective through strengthening aspects of work behavior and personal values (discipline, loyalty, and integrity), rather than through a purely motivational approach.

Research Question 2

The results of the internal evaluation of the SEM-PLS model showed that the model has a very strong predictive ability, with a determination coefficient value (R^2) of 0.933 for the time performance variable and 0.874 for work motivation (Table 3).

Table 3 - Determination Coefficient (R^2) Test Results

	R-square	R-square adjusted	Remarks
Y.	0,933	0,927	Strong
Z.	0,874	0,867	Strong

Source: Researcher's Processed Results, 2025

Table 3 confirms that time performance is more influenced by behavioral factors and personal values (loyalty, discipline, and integrity) than by psychological factors such as motivation. In addition, motivation has not been proven to be an effective intervening variable in the relationship between independent variables and time performance, so improving time performance is more appropriate through strengthening the values of integrity, work discipline, and loyalty to the organization. The order of dominant influences on time performance is discipline, competence, work motivation, loyalty, and integrity.

Research Question 3

The third objective of the study is to build a modeling of the implementation of human resource quality in multi-construction projects. The modeling results show that work motivation acts as a partial mediating variable that strengthens the influence of HR quality on time performance, as shown by the results of significant indirect effects (Table 2) The resulting structural model (Figure 6) confirms that improving HR quality not only has a direct impact on time performance, but also indirectly through increased work motivation.

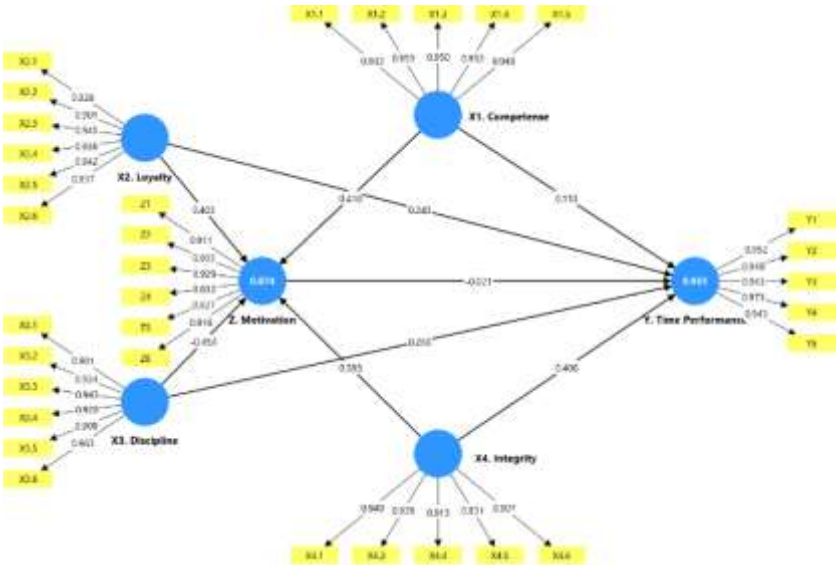

Figure 6 - Output of the SEM-PLS Algorithm model
Source: Processed Researcher (2025)

Research Question 4

The fourth objective of the research is to formulate recommendations for improvements that are applicable. The results of the Importance Performance Analysis (IPA) show that there are four indicators in Quadrant I (main priority), namely human resource technical competence, discipline towards SOPs and working hours, accuracy of project time control, as well as social motivation and support for the work environment (Table 4 and Figure 7). These findings suggest that although these indicators have a high level of importance, their performance is still relatively low and requires immediate managerial attention.

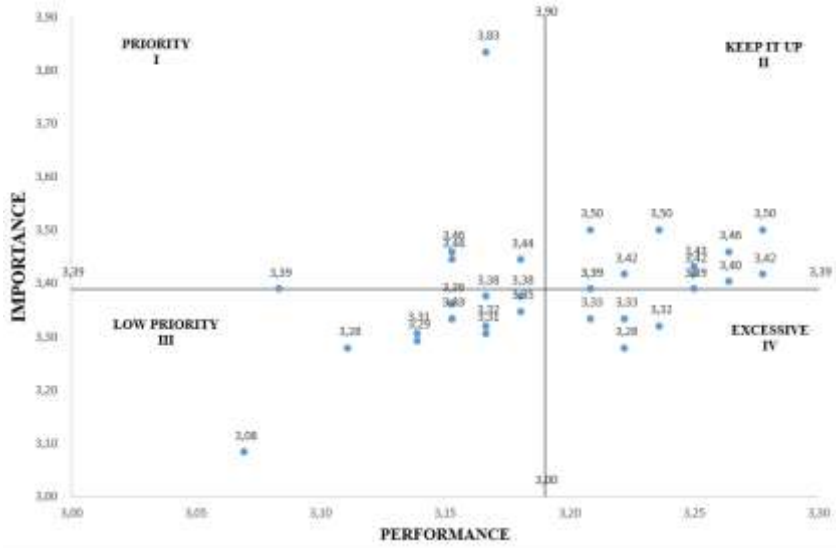

Figure 7 - Diagram Importance Performance Analysis (IPA)
Source: Processed Researcher, 2025

The results of the Importance Performance Analysis (IPA) then showed several indicators that are priorities for improvement, especially discipline towards SOPs and working hours, technical competence, and work environment support for motivation.

Table 4 - Analysis Results IPA

Variable	Indicators	Quadrant I Top Priorities	Quadrant II Maintain Performance	Quadrant III Low Priority	Quadrant IV Excessive
X1.	X1.1	√			
	X1.2		√		
	X1.3		√		
	X1.4		√		
	X1.5		√		
X2.	X2.1		√		
	X2.2			√	
	X2.3			√	
	X2.4		√		
	X2.5			√	
	X2.6				√
X3.	X3.1	√			
	X3.2			√	
	X3.3			√	
	X3.4			√	
	X3.5		√		
	X3.6		√		
X4.	X4.1		√		
	X4.3		√		
	X4.4			√	
	X4.5			√	
	X4.6			√	
Y	Y1			√	
	Y2	√			
	Y3		√		
	Y4			√	
	Y5			√	
Z	Z1			√	
	Z2		√		

Variable	Indicators	Quadrant I Top Priorities	Quadrant II Maintain Performance	Quadrant III Low Priority	Quadrant IV Excessive
	Z3	√			
	Z4				√
	Z5			√	
	Z6			√	

Source: Processed Researcher, 2025

CONCLUSION

Based on the research objectives, this study concludes that the quality of human resource (HR) project management plays a highly significant role in determining time performance in the implementation of multi-construction projects. The dimensions of competence, loyalty, discipline, and integrity have been proven to contribute to the achievement of project time performance, with work motivation acting as a mediating variable that strengthens the relationship. These results confirm that effective HR management is a key prerequisite for successful project time control in a complex and pressure-laden multi-project environment.

Referring to the empirical findings discussed, this study demonstrates that discipline and competence are the dominant factors directly affecting project time performance, while work motivation functions as a leverage mechanism that translates HR quality into actual performance. The high value of the determination coefficient in the structural model indicates that variations in project time performance can be largely explained by the quality of project management HR implementation. These findings reinforce the empirical evidence that the behavioral and managerial aspects of HR are inseparable from the technical success of construction project time control.

Based on these conclusions, this study recommends that construction companies prioritize strengthening discipline and enhancing the competence of project management human resources as the main strategy in multi-project management. In addition, the work motivation system should be designed in an integrated manner to support simultaneous workloads through incentive policies, performance recognition, and a conducive work environment. Theoretically, the findings of this study provide implications for the development of project management studies by positioning HR quality as a strategic capability, while practically, this study offers an evidence-based decision-making framework to improve time performance in multi-construction projects.

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