

ANALYSIS OF CRITICAL FACTORS INFLUENCING PROJECT PERFORMANCE IN CONSTRUCTION PROJECTS AT CV ADHI CITRA HARYO SETO



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Abstract

Construction projects often face challenges in meeting cost, time, and quality targets. This study aims to analyze: the effect of top management support as a critical factor on project performance, the effect of project team competence as a critical factor on project performance, the effect of green project practices as a critical factor on project performance, and the mediating role of project management effectiveness in these relationships. The research was conducted at CV Adhi Citra Haryo Seto, which managed seven projects during 2023–2025, involving 103 project personnel as respondents. Data were collected using questionnaires and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4. The findings indicate that project performance at CV Adhi Citra Haryo Seto improves when top management provides consistent support, project teams demonstrate adequate competencies, and green project practices are effectively implemented. These three factors are reinforced through project management effectiveness, where well-prepared planning, structured coordination, and responsive control serve as the bridge that translates leadership support, team capabilities, and green project practices into tangible achievements in cost, time, quality, and project sustainability.

Keywords: Critical Factors, Project Performance

INTRODUCTION

The construction industry plays a pivotal role in driving economic growth and accelerating national infrastructure development. However, construction projects frequently face classical challenges such as delays, cost overruns, and deviations in quality. According to the *Project Management Institute* (PMI, 2021) in its *Pulse of the Profession: Beyond Agility* report, only 55% of global projects are completed on time and within budget. The report highlights weak planning, ineffective coordination, and poor project management practices as primary causes of project underperformance. Similarly, Klynveld Peat Marwick Goerdeler (KPMG, 2023) emphasizes that the leadership and decision-making capacity of top management are critical determinants of project resilience and overall performance.

Project team competence also remains a central issue in the construction sector. PMI (2021) forecasts a global demand for 25 million additional project management professionals by 2030, underscoring a widening gap between the availability and the necessity of competent human resources. In Indonesia, similar challenges persist, as construction projects often struggle to maintain consistent quality and productivity due to limited managerial capabilities and inadequate coordination. According to KPMG (2023), the increasing complexity of projects, supply chain disruptions, and rising material costs have amplified the need for technically skilled and adaptive project teams capable of addressing uncertainty and operational risks efficiently.

In recent years, *Green Project Practices* (GPP) have gained global attention as an essential component of sustainable development in the construction industry. The *United Nations Environment Programme* (UNEP, 2022) reports that the construction sector contributes approximately 37% of global CO₂ emissions, emphasizing the urgent need for environmentally responsible construction practices. In Indonesia, however, the adoption of GPP remains limited. Implementation is often restricted to large-scale government projects, while small and medium private construction projects rarely integrate sustainability principles systematically. The lack of awareness, insufficient regulatory support, and limited availability of eco-friendly resources hinder the mainstream application of GPP, making it a crucial area for further empirical investigation.

Another critical determinant of project success lies in *project management effectiveness*. PMI (2021) notes that organizations with mature project management systems save up to 13% of total investment costs through efficiency and reduced deviations. Nevertheless, KPMG (2023) found that only 25% of organizations report high project management maturity, and fewer than half utilize predictive analytics in project planning. This indicates that many firms still operate reactively rather than proactively, lacking robust systems for planning, monitoring, and control, resulting in recurring cost overruns and schedule deviations.

CV Adhi Citra Haryo Seto, a medium-scale construction company based in Indonesia, faces similar challenges in managing multiple simultaneous projects. While top management plays a significant role in early-stage project planning, operational authority is largely delegated to field teams during execution. This delegation often leads to delays in decision-making, especially in cross-functional matters such as emergency procurement or technical revisions. In addition, discrepancies between planned and actual work volumes, as reflected in S-curves, suggest that project team competence and management coordination require improvement. Although several eco-friendly initiatives, such as waste segregation

and material reuse have been introduced, their implementation remains inconsistent and unsystematic.

These circumstances underline the necessity of enhancing project management effectiveness as a mediating mechanism that links critical success factors namely *top management support*, *project team competence*, and *green project practices* to overall project performance. Prior studies, such as those by Alawag et al. (2025), Zhang and Li (2024), and Yusof and Osmadi (2019), have individually examined these factors but have not yet integrated them into a single, comprehensive mediation model. Furthermore, inconsistencies in previous findings regarding the direct influence of these critical factors on project performance highlight the importance of exploring their indirect effects through project management effectiveness.

Therefore, this study aims to construct and empirically test an integrated model that analyzes the influence of *top management support*, *project team competence*, and *green project practices* on *project performance*, with *project management effectiveness* as a mediating variable. This research provides both theoretical and practical contributions by offering new insights into how managerial, human resource, and sustainability factors interact to enhance construction project performance within Indonesia's private sector context.

REVIEW OF LITERATURE

Project performance has emerged as a central topic in construction management research, reflecting the extent to which a project achieves its objectives in terms of cost, time, quality, and sustainability. Over the past decade, scholars have shifted from viewing project performance as a purely technical output to a more comprehensive managerial construct that integrates leadership commitment, team competence, and sustainable practices. This multidimensional approach aligns with the *Resource-Based View (RBV)* proposed by Barney (1991), which emphasizes that superior performance results from the effective utilization of valuable, rare, and inimitable internal resources such as leadership capability, human competence, and managerial systems.

Among the various internal resources, top management support has consistently been identified as one of the most influential determinants of project performance. According to Abal-Seqan et al. (2023), strong managerial commitment provides strategic direction, ensures the availability of organizational resources, and fosters a supportive environment for project execution. Similarly, Alawag et al. (2025) demonstrated that continuous top management involvement enhances the effectiveness of project management processes, leading to improved performance outcomes. Conversely, Sicotte and Delerue (2021) noted that symbolic or inconsistent managerial engagement often reduces project responsiveness and weakens team coordination. These findings underline that top management support functions not merely as administrative oversight but as a strategic enabler that aligns organizational vision with operational performance.

Beyond leadership commitment, project team competence plays an essential role in determining performance outcomes. As outlined by Boyatzis (1982) and Spencer and Spencer (1993), competence encompasses both observable skills and underlying personal attributes that contribute to effective job performance. In construction projects, competence extends to technical proficiency, teamwork, and managerial ability to handle uncertainty and

interdependence. Akinshipe et al. (2022) classified team competence into *personality traits* such as communication, emotional intelligence, and adaptability and *managerial traits*, including leadership and decision-making. Supporting this, Zhang and Li (2024) found that highly competent teams foster stronger communication and coordination, thereby enhancing overall project performance. This aligns with *Competency-Based Theory*, which emphasizes that human capability is a strategic resource that directly contributes to organizational success.

Parallel to managerial and human factors, *Green Project Practices (GPP)* have become increasingly relevant in enhancing project performance through sustainability-driven management. According to the *United Nations Environment Programme (UNEP, 2022)*, the construction sector contributes approximately 37% of global CO₂ emissions, underscoring the need for environmentally responsible practices. Yusof and Osmadi (2019) and Shan et al. (2020) found that the adoption of GPP such as waste management, material reuse, and energy efficiency significantly improves both environmental and financial project performance. However, Orfanos et al. (2024) observed that the effectiveness of these practices diminishes when they are not embedded within organizational policies and management structures. In Indonesia, GPP implementation remains limited, particularly among private medium-scale contractors, due to low awareness, insufficient regulation, and lack of incentives (Susanto & Sujana, 2023). Consequently, the integration of green practices into project management systems remains a challenge and an opportunity for improving project performance.

Project management effectiveness serves as the internal mechanism that translates these critical factors into measurable performance outcomes. Bhatti and Nazir (2024) defined project management effectiveness as the efficiency and coherence of managerial processes planning, executing, and controlling that link organizational inputs to project results. Al-Balawneh and Tarabieh (2024) further established that effective project management mediates the relationship between managerial inputs, such as risk and knowledge management, and project success. Shah, Bhatti, and Ahmed (2023) emphasized that organizations with strong project management systems achieve superior cost control, timely delivery, and adaptability. The *Hybrid Project Management* approach proposed by Lalmi et al. (2020) further strengthens this perspective, combining structured planning with adaptive flexibility to manage complex and dynamic construction environments more effectively.

The evaluation of project performance has evolved from the traditional *Iron Triangle* comprising cost, time, and quality (Atkinson, 1999) to a broader multidimensional assessment that includes stakeholder satisfaction, innovation, and sustainability (Charles et al., 2021). Moshood et al. (2024) have highlighted that environmental efficiency, waste reduction, and stakeholder engagement contribute significantly to improved performance outcomes. This holistic perspective reflects that project performance today is not only about meeting contractual targets but also about achieving operational excellence and long-term sustainability.

Although previous studies have examined the influence of top management support, team competence, and green project practices on project performance, the empirical evidence remains inconsistent. Some studies confirmed significant direct relationships (Fareed et al., 2023; Zhang & Li, 2024), while others reported weak or indirect effects when managerial systems were underdeveloped (Orfanos et al., 2024). These discrepancies suggest that the relationship between critical success factors and project performance may not be purely

direct but mediated by the organization's ability to manage its internal processes effectively. Therefore, this study addresses the existing research gap by developing an integrated model that examines the influence of top management support, project team competence, and green project practices on project performance through the mediating role of project management effectiveness, particularly within the Indonesian medium-scale construction context.

RESEARCH METHOD

This study employs a quantitative explanatory approach to analyze the causal relationships among the studied variables: top management support, project team competence, and green project practices as independent variables; project management effectiveness as a mediating variable; and project performance as the dependent variable. The research aims to empirically validate how internal organizational factors influence project performance within the construction industry context.

The study was conducted at CV Adhi Citra Haryo Seto, a construction company based in East Java, Indonesia, which managed seven ongoing projects during the 2023–2025 period. The population comprised 103 project personnel, including managerial and operational staff directly involved in project execution. Given the relatively small and accessible population, the study employed a census sampling technique, ensuring that all relevant personnel were included as respondents. This method enhances the representativeness and comprehensiveness of the collected data.

Primary data were obtained through a structured questionnaire using a five-point Likert scale, ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The questionnaire was developed based on established measurement indicators from previous studies. Top management support indicators were adapted from Danial and Misnan (2020), emphasizing organizational resource provision, structural effectiveness, and communication clarity. Project team competence indicators followed Akinshipe et al. (2022) and Oh dan Choi (2020), focusing on technical skills, teamwork, and professionalism. Green project practices were measured using indicators from Onubi (2021), including material reuse, energy efficiency, and waste management. Project management effectiveness items were adopted from Al-Balawneh and Tarabieh (2024), reflecting project planning, coordination, and implementation efficiency. Project performance indicators were derived from Moshood et al (2024), capturing both traditional aspects (cost, time, and quality) and sustainable outcomes.

Instrument validity and reliability were verified prior to hypothesis testing. All indicators demonstrated satisfactory loading factors (>0.70) and composite reliability (>0.80). Discriminant validity was assessed using the Fornell–Larcker criterion, confirming that each construct met the required standard.

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software. This technique was selected because it is suitable for small-to-medium sample sizes and capable of testing complex mediating relationships. The analysis was conducted in two stages: assessment of the measurement model (outer model) and the structural model (inner model). Model fit and explanatory power were examined using the R^2 values, while the path coefficients and t-statistics (generated through bootstrapping with 5,000 resamples) were used to test the significance of each hypothesis.

The analytical process followed ethical standards by ensuring confidentiality and voluntary participation. This methodological design enables robust empirical testing of how

internal managerial and sustainability factors interact to enhance project performance within Indonesian construction firms.

Research Hypothesis

Based on the theoretical framework and literature review, this study proposes several hypotheses to examine the causal relationships among top management support, project team competence, green project practices, project management effectiveness, and project performance. Grounded in the *Resource-Based View (RBV)*, *Competency-Based Theory*, and *Process-Based View of Project Success*, the model assumes that managerial commitment, team capability, and sustainability-oriented practices influence project performance both directly and indirectly through effective project management processes. Accordingly, the following hypotheses are formulated:

- H₁: Top Management Support positively influences Project Performance.
- H₂: Project Team Competence positively influences Project Performance.
- H₃: Green Project Practices positively influence Project Performance.
- H₄: Project Management Effectiveness mediates the influence of Top Management Support on Project Performance.
- H₅: Project Management Effectiveness mediates the influence of Project Team Competence on Project Performance.
- H₆: Project Management Effectiveness mediates the influence of Green Project Practices on Project Performance.
- H₇: Project Management Effectiveness positively influences Project Performance.

Research Model

The conceptual model of this study integrates the relationships among the key constructs derived from previous research. It proposes that top management support (X_1), project team competence (X_2), and green project practices (X_3) serve as critical success factors that directly and indirectly affect project performance (Y) through the mediating role of project management effectiveness (M).

This framework illustrates that leadership support provides strategic and resource-based foundations; team competence enables technical and managerial capability; and green project practices strengthen sustainability-oriented performance. Project management effectiveness acts as the central mechanism that transforms these inputs into measurable performance outcomes.

The research model is presented in **Figure 1** below.

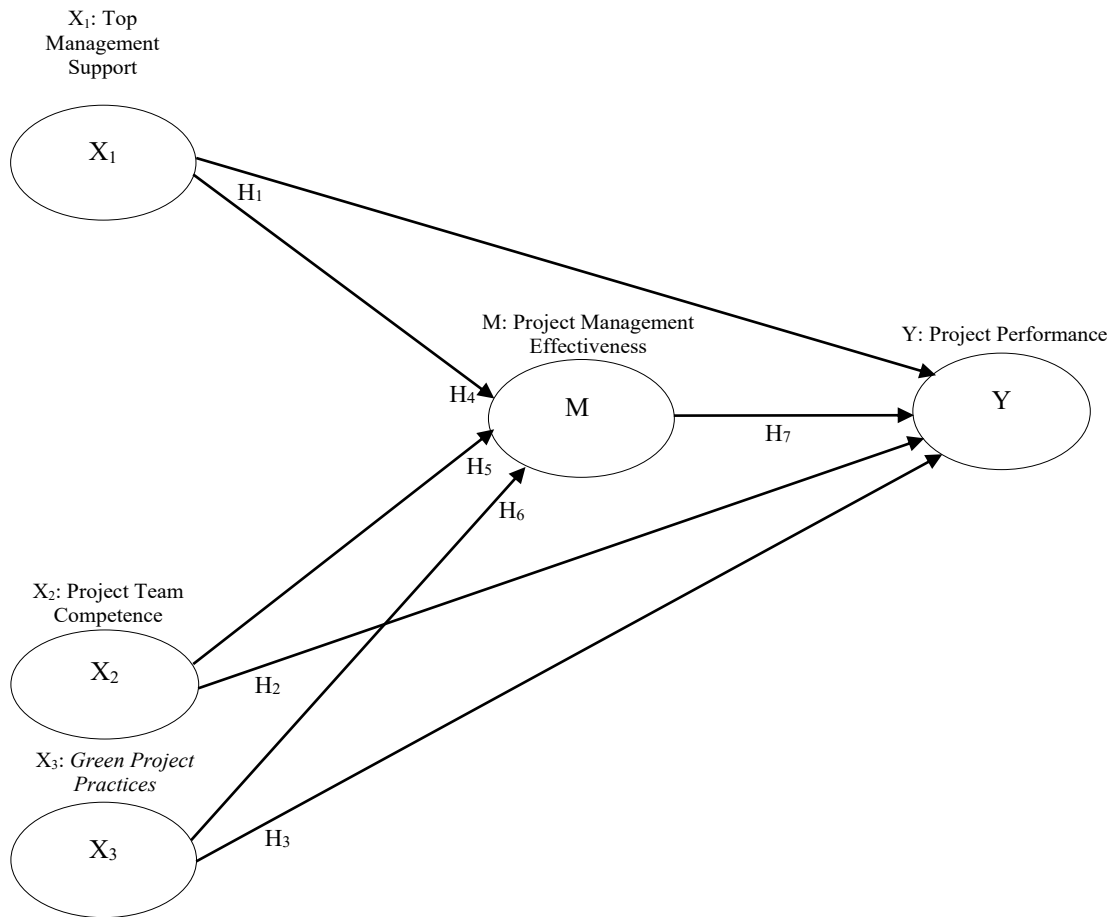


Figure 1.
Conceptual Research Model

The model illustrates that top management support provides strategic guidance, organizational commitment, and adequate resources that enhance managerial processes and decision-making quality. Project team competence ensures that operational activities are executed efficiently through the integration of technical skills, coordination, and professionalism. Meanwhile, green project practices introduce sustainability-driven approaches such as material reuse, energy efficiency, and effective waste management, which contribute to cost savings and long-term project value.

Project management effectiveness functions as a central mediating construct that integrates these factors into a coherent system of planning, coordination, and control. Through effective project management, the influence of leadership support, team competence, and sustainability practices can be optimized to achieve superior project performance. Consequently, this framework positions project management effectiveness as the key mechanism through which internal organizational resources are converted into measurable performance outcomes in construction projects.

RESULTS AND DISCUSSION

The following are the results of data analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. The analysis consists of the evaluation of the measurement model, the coefficient of determination (R^2), and the testing of direct and indirect (mediating) effects between variables. The results are presented in the following tables.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) shows the ability of independent variables in explaining the variance of dependent variables. The results of the analysis are presented in Table 1.

Table 1.
Coefficient of Determination (R^2)

	R^2 Value
Project Management Effectiveness	0.311
Project Performance	0.489

Source: Processed Data (SmartPLS 4, 2025)

The R^2 value for Project Management Effectiveness of 0.311 indicates that Top Management Support, Project Team Competence, and Green Project Practices collectively explain 31.1% of the variance in project management effectiveness. Meanwhile, the Project Performance R^2 value of 0.489 means that the three independent variables and the mediating variable together explain 48.9% of the variance in project performance. These results show that the model has moderate explanatory power and is adequate for further analysis.

Path Coefficient and Hypothesis Testing (Direct Effects)

The path coefficient test aims to determine the direction and magnitude of the influence between variables. The testing was performed through bootstrapping with 5,000 subsamples, and the results are summarized in Table 2.

Table 2.
Hypothesis Testing (Direct Effects)

Path Relationship	Path Coefficient	t-Statistic	p-Value	Result
Top Management Support → Project Performance	0.307	4.243	0.000	Significant
Project Team Competence → Project Performance	0.237	2.699	0.007	Significant
Green Project Practices → Project Performance	0.258	3.458	0.001	Significant
Project Management Effectiveness → Project Performance	0.315	3.548	0.000	Significant

Source: Processed Data (SmartPLS 4, 2025)

The results show that all four hypotheses have positive and significant effects ($p < 0.05$), indicating that all hypothesized relationships in the model are supported statistically.

Indirect Effects (Mediation Test)

The mediation test was conducted to determine whether Project Management Effectiveness acts as a mediating variable in the relationship between Top Management Support, Project Team Competence, and Green Project Practices toward Project Performance. The results of the bootstrapping test for indirect effects are presented in Table 3.

Table 3.
Indirect Effects through Project Management Effectiveness

Indirect Relationship	Path Coefficient	t-Statistic	p-Value	Result
Top Management Support → Project Management Effectiveness → Project Performance	0.103	2.763	0.006	Significant
Project Team Competence → Project Management Effectiveness → Project Performance	0.103	2.839	0.005	Significant
Green Project Practices → Project Management Effectiveness → Project Performance	0.093	2.290	0.022	Significant

Source: Processed Data (SmartPLS 4, 2025)

The results show that all indirect effects are statistically significant ($p < 0.05$), which means Project Management Effectiveness successfully mediates the influence of the three independent variables on Project Performance.

The Effect of Top Management Support on Project Performance

The results of the study show that Top Management Support has a positive influence on Project Performance. This indicates that the active involvement of top management in providing strategic direction, supervision, and resource allocation plays a vital role in achieving project objectives. Consistent leadership commitment creates a supportive environment that facilitates effective communication, coordination, and decision-making across all project levels. This finding demonstrates that when top management provides continuous attention and clear guidance, the overall project implementation becomes more efficient, resulting in better outcomes in terms of quality, cost, and time performance.

This result is in line with previous research by Abal-Seqan et al. (2023) and Alawag et al. (2025), who found that top management involvement significantly enhances project success by strengthening organizational coordination and ensuring the availability of required resources. Similarly, Bhatti and Nazir (2024) emphasize that managerial commitment at the executive level improves project control and aligns operational decisions with strategic goals. These findings support the Resource-Based View (RBV) theory, which asserts that leadership and management commitment are valuable organizational resources that contribute to superior performance outcomes.

The Effect of Project Team Competence on Project Performance

The findings of this study reveal that Project Team Competence has a positive influence on Project Performance. This suggests that the presence of skilled, knowledgeable, and experienced team members plays a crucial role in ensuring the success of construction projects. A competent team is able to manage project complexity, coordinate effectively, and adapt to challenges that occur during implementation. Strong communication, collaboration, and problem-solving abilities among team members contribute to higher efficiency and improved quality in project delivery. These results indicate that when project teams possess sufficient competence, the execution of tasks becomes more structured and aligned with project objectives, leading to enhanced performance outcomes.

This result is consistent with the Competency-Based Theory, which emphasizes that individual competence encompassing skills, knowledge, and attitudes is directly related to performance effectiveness (Spencer & Spencer, 1993). The finding also supports the studies by Akinshipe et al. (2022) and Zhang and Li (2024), who found that competent project teams significantly improve communication flow, coordination, and decision-making quality, resulting in better project results. Similarly, Boyatzis (1982) argued that competence enables individuals and teams to translate organizational goals into measurable outcomes, reinforcing the notion that human capability is a strategic resource for achieving project excellence.

The Effect of Green Project Practices on Project Performance

The results of this study indicate that Green Project Practices have a positive influence on Project Performance. This shows that the implementation of environmentally responsible approaches such as material reuse, efficient energy utilization, and effective waste management enhances both operational efficiency and sustainability outcomes in construction projects. The application of green principles encourages more disciplined planning, better resource management, and reduced environmental impact, all of which contribute to improved performance in terms of quality, cost, and time achievement. The results imply that when project stakeholders consistently integrate environmental considerations into project execution, the overall project performance becomes more sustainable and competitive.

This finding is in line with research conducted by Yusof and Osmadi (2019) and Shan et al. (2020), who found that sustainable practices significantly improve project outcomes by promoting efficiency and reducing resource wastage. Similarly, Orfanos et al. (2024) highlighted that the adoption of green construction practices enhances productivity and project governance when supported by organizational policies. These results are consistent with the Resource-Based View (RBV), which positions sustainability-oriented practices as valuable and rare organizational resources that contribute to long-term performance and competitive advantage.

The Mediating Effect of Project Management Effectiveness on the Relationship Between Top Management Support and Project Performance

The findings of this study reveal that Top Management Support has a positive influence on Project Management Effectiveness. This means that the direct involvement of top management in planning, supervision, and decision-making processes strengthens the overall management performance of construction projects. Strong leadership commitment ensures the availability of adequate resources, enhances coordination between departments, and facilitates timely responses to challenges that arise during project implementation. The

results suggest that when top management provides continuous oversight and strategic guidance, project management activities become more organized, responsive, and aligned with corporate objectives.

This finding is consistent with the study of Bhatti and Nazir (2024), who emphasized that managerial commitment from top leaders improves process control, monitoring, and decision accuracy in project execution. Similarly, Al-Balawneh and Tarabieh (2024) found that top management involvement is crucial in ensuring that project processes are effectively coordinated and that performance objectives are achieved. These results support the Process-Based View of Project Success, which explains that effective leadership at the strategic level contributes directly to the optimization of project management processes and the achievement of superior performance outcomes.

The Mediating Effect of Project Management Effectiveness on the Relationship Between Project Team Competence and Project Performance

The results of this study indicate that Project Team Competence has a positive influence on Project Management Effectiveness. This finding shows that the presence of capable, skilled, and experienced team members contributes greatly to the success of project management activities. A competent project team can carry out project planning, coordination, and execution efficiently, ensuring that tasks are completed according to schedule and quality standards. Effective communication, collaboration, and problem-solving among team members also help in managing challenges that arise during the project lifecycle. These results demonstrate that when project teams possess the necessary technical and managerial competence, the overall effectiveness of project management increases significantly.

This finding supports the Competency-Based Theory, which asserts that the competence of individuals and teams comprising skills, knowledge, and attitudes is a key determinant of performance and management effectiveness (Spencer & Spencer, 1993). Similar findings were reported by Akinshipe et al. (2022), who stated that a competent project team enhances decision-making, coordination, and control within project management processes. Likewise, Zhang and Li (2024) found that the technical and interpersonal competence of project personnel significantly improves managerial outcomes and strengthens project team synergy. These results highlight that human competence is not only a performance driver but also an enabler of effective project management execution.

The Mediating Effect of Project Management Effectiveness on the Relationship Between Green Project Practices and Project Performance

The findings of this study show that Green Project Practices have a positive influence on Project Management Effectiveness. This means that the implementation of environmentally friendly and sustainability-oriented principles in construction projects contributes to more effective project management processes. The application of practices such as waste reduction, efficient material use, and energy conservation leads to better planning, monitoring, and coordination of project activities. These results indicate that when green practices are embedded in daily operations, project management becomes more structured, efficient, and responsive to both organizational and environmental goals.

This finding is consistent with the research conducted by Yusof and Osmadi (2019), who found that integrating sustainability practices improves coordination and process control within project management systems. Similarly, Orfanos et al. (2024) emphasized that the

adoption of green construction practices, supported by management commitment, enhances managerial discipline and operational performance. The results also align with the Resource-Based View (RBV), which suggests that sustainability practices represent valuable and unique organizational resources that can strengthen management systems and improve long-term project outcomes.

The Effect of Project Management Effectiveness on Project Performance

The results of this study demonstrate that Project Management Effectiveness has a positive influence on Project Performance. This shows that the more effective the management of a project covering aspects of planning, coordination, supervision, and control the higher the level of performance that can be achieved. Effective project management ensures that resources are utilized optimally, communication runs smoothly, and activities are completed in accordance with schedules and quality standards. These findings imply that well-managed projects are more capable of achieving success in terms of cost efficiency, timely delivery, and overall quality achievement.

This result is in line with the study of Bhatti and Nazir (2024), who stated that effective project management processes directly contribute to improving project outcomes. Likewise, Al-Balawneh and Tarabieh (2024) found that management effectiveness strengthens the connection between organizational strategy and implementation, ensuring that objectives are achieved efficiently. These findings support the Process-Based View of Project Success, which explains that the effectiveness of managerial processes determines the extent to which project performance goals are realized. It confirms that effective management serves as the core mechanism that integrates leadership, human resources, and sustainability factors to achieve superior project performance.

CONCLUSION

This study aimed to analyze the influence of Top Management Support, Project Team Competence, and Green Project Practices on Project Performance, with Project Management Effectiveness serving as a mediating variable. The research was conducted within the context of construction projects managed by CV Adhi Citra Haryo Seto.

The findings indicate that all proposed hypotheses are supported. Top Management Support, Project Team Competence, and Green Project Practices each have a positive influence on Project Management Effectiveness and Project Performance, both directly and indirectly. This shows that the combination of strong leadership commitment, competent human resources, and sustainable project practices is crucial for improving management quality and achieving optimal project outcomes. Moreover, Project Management Effectiveness plays a significant mediating role, acting as a key mechanism that translates managerial support, team competence, and sustainability initiatives into measurable project success.

Overall, this study reinforces that project success is not only determined by technical aspects but also by the organization's ability to integrate strategic leadership, human competence, and environmental responsibility into effective management processes. The synergy of these internal factors ensures better coordination, stronger control, and sustainable performance improvement in construction projects.

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