



Influence of Project Management Practices on Construction Project Performance in Rwanda: A Case of the Muhanga–Nyange Road Project

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Abstract: This study examined the influence of project management practices on construction project performance in Rwanda, using the Muhanga–Nyange Road Construction Project as a case. It assessed the effects of project planning, execution, monitoring and control, and closure on performance, guided by Project Management Theory, Systems Theory, Contingency Theory and the Resource-Based View. A quantitative, explanatory, cross-sectional case study design was adopted. A census of all 120 project stakeholders (project management team, contractor/implementing partner staff, technical personnel/consultants and client representatives) yielded 120 usable questionnaires (100% response rate). A structured five-point Likert questionnaire (Cronbach's alpha = .857 to .913) was used, and data were analyzed in IBM SPSS Version 27 using descriptive statistics, Pearson correlation and multiple linear regression. Planning ($\beta = .254, p = .035$), execution ($\beta = .290, p = .015$), monitoring and control ($\beta = .185, p = .009$) and closure ($\beta = .175, p = .010$) each had a positive and statistically significant effect on performance, and together explained 69.4% of its variance ($R^2 = .694, F(4, 115) = 65.36, p < .001$). Execution was the strongest predictor. The study concludes that performance improves when management practices are applied effectively across the whole project life cycle. It recommends that the Rwanda Transport Development Agency and other infrastructure stakeholders institutionalize standardized project management frameworks covering all four phases, strengthen contractor supervision, progress reporting and stakeholder feedback at closure, and invest in project management capacity.

Keywords: planning, execution, monitoring, closure, performance, infrastructure, Rwanda

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1. Introduction

Road networks play a crucial role in enhancing regional integration, facilitating trade, and boosting overall economic expansion. Yet infrastructure projects chronically underperform. Flyvbjerg et al. (2003) found that roughly 90% of large-scale infrastructure projects incur cost overruns, with

road projects average about 20% above budget and rail projects much more. Moreover, recent evidence shows that overruns and delays remain widespread, frequently traced to weak planning, inadequate risk management, and poor coordination (Abdelalim, 2024). Much of this evidence, however, comes from settings with strong institutions and mature project management systems, which limits how far it

can be applied where institutional capacity, regulatory enforcement and technology differ.

In sub-Saharan Africa, cost overruns and schedule delays are similarly pervasive and erode the economic returns on scarce public funds (Amoatey et al., 2017; Gbahabo & Ajuwon, 2017; Kikwasi, 2021). African studies tend to be diagnostic: they list the causes of delay and escalation but rarely test how specific management practices influence performance (Omoregie & Radford, 2006). Furthermore, they often combine financial, technological and managerial factors so that the contribution of each practice is obscured. The East African Community (EAC) has invested heavily in road corridors to deepen integration, yet the same implementation problems persist and are attributed to fragmented stakeholder environments, institutional weaknesses and limited project management capacity. Regional research remains largely descriptive and seldom links management practices to measurable performance using quantitative models.

1.1 Statement of the Problem

Infrastructure development is central to Rwanda's ambition of reaching middle-income status, and, because the country is landlocked, efficient roads are essential for lowering transport costs and connecting producers to regional and global markets. Despite sustained investment, public construction projects in Rwanda continue to report delays, cost escalation and coordination inefficiencies (Sibomana, 2018; Umurangamirwa & Bazimya, 2025). These persistent inefficiencies diminish expected socioeconomic returns, raising critical concerns regarding the efficacy of project delivery systems. Existing literature has examined project management practices, risk management and financial management in relation to performance (Habimana, 2019; Nkiranuye et al., 2024; Uwizeyimana, 2021). However, most studies concentrate on identifying causes of failure rather than estimating how particular practices across the project life cycle influence performance. Few use regression techniques to compare the relative effects of those practices, so decision-makers lack evidence on which practices to prioritize. This leaves a critical methodological gap in understanding the causal mechanisms linking management practices to project success.

This void is particularly evident in major national initiatives such as the Muhanga-Nyange Road development project, which is critical for bolstering regional connectivity. Although successful delivery depends on disciplined lifecycle management, rigorous empirical data connecting specific project management methodologies to measurable performance metrics in this context remains scarce (PMI, 2021; Kikwasi, 2021). To address this critical research

vacuum, this study employs a quantitative, regression-based methodology to evaluate the direct impact of project management practices on construction project performance in Rwanda, utilizing the Muhanga-Nyange Road project as an empirical case study.

The Muhanga-Nyange Road Project offers a timely setting for addressing this gap. The project involves the rehabilitation and widening of a key transit corridor linking Muhanga District in the Southern Province with Nyange Sector in Ngororero District (Rwanda Transport Development Agency [RTDA], 2024). Like many road projects, it faces demanding terrain, weather-related disruption and the need for coordinated stakeholder engagement. This makes it a suitable case for examining how management practices affect performance in a real implementation context.

The general objective of this study was to analyze the influence of project management practices on construction project performance in the Muhanga-Nyange Road Project.

1.2 Objectives of the Study

1.2.1 General Objective

The general objective of this study is to analyze the influence of project management practices on construction project performance in Rwanda, with a specific focus on the Muhanga-Nyange Road construction project.

1.2.2 Specific Objectives

1. To assess the influence of project planning on the performance of the Muhanga-Nyange road construction project.
2. To examine the influence of project execution on the performance of the Muhanga-Nyange road construction project.
3. To evaluate the influence of project monitoring and control on the performance of the Muhanga-Nyange road construction project.
4. To evaluate the influence of project closure on the performance of the Muhanga-Nyange road construction project.

1.3 Research Hypotheses

To guide the empirical investigation, the following null hypotheses are formulated:

- **H₀₁:** Project planning does not have a significant influence on the performance of the Muhanga-Nyange road construction project.

- **H₀₂:** Project execution does not have a significant influence on the performance of the Muhanga-Nyange road construction project.
- **H₀₃:** Project monitoring and control do not have a significant influence on the performance of the Muhanga-Nyange road construction project.
- **H₀₄:** Project closure does not have a significant influence on the performance of the Muhanga-Nyange road construction project.

The study findings contribute context-specific, regression-based evidence to the project management literature and offer practical guidance for the Rwanda Transport Development Agency (RTDA), contractors and consultants on where to strengthen management capability.

2. Literature Review

2.1 Conceptual Review

Project management is the systematic application of knowledge, skills, tools and techniques to project activities in order to meet project requirements (Project Management Institute [PMI], 2021). It spans the project life cycle, from initiation through planning, execution, monitoring and control, and closure. In construction, where activities are technically complex, many stakeholders are involved and financial exposure is high, these practices provide the framework for coordinating contractors, allocating resources and ensuring compliance with specifications (Kerzner, 2017). This study conceptualizes project management through four practices, summarized in Table 1.

Table 1: Study Variables and Indicators

Variable	Role	Indicators
Project planning (PPP)	Independent	Scheduling, budgeting, resource allocation, risk identification and mitigation, definition of objectives and scope
Project execution (PEP)	Independent	Coordination of activities, team leadership, communication, contractor supervision, resource utilization
Project monitoring and control (PMCP)	Independent	Progress tracking, quality inspections, corrective action, performance reporting, alignment with objectives
Project closure (PCP)	Independent	Post-project evaluation, lessons learned, formal handover, stakeholder feedback, contractual and administrative completion
Construction project performance (CPP)	Dependent	Time, cost, quality, achievement of objectives, stakeholder satisfaction

Note. Indicators correspond to the questionnaire items used in this study.

Project planning defines objectives, schedules, budgets, resource needs and risks before implementation begins, giving the team a roadmap that reduces uncertainty and improves coordination (PMI, 2021). Project execution is the phase in which the approved plan is turned into physical outputs through team management, contractor supervision, stakeholder communication and the deployment of resources. Monitoring and control tracks actual progress against the plan, identifies deviations and triggers corrective action; in construction it includes progress reporting, site inspections, quality assessment and financial tracking. Project closure covers formal acceptance of deliverables, contractual and administrative completion, post-project evaluation and the documentation of lessons learned, which supports organizational learning (Kerzner, 2017).

Construction project performance is the extent to which a project achieves its objectives within the constraints of time, cost and quality (Turner, 2016). Time performance concerns completion within the planned schedule, cost performance concerns expenditure within the approved budget, and quality performance concerns conformity with technical specifications. Because the traditional triple constraint is an incomplete measure of success (Atkinson, 1999; Müller & Turner, 2007), this study also considers achievement of intended objectives and stakeholder satisfaction.

2.2 Theoretical Review

Project Management Theory. The PMBOK tradition treats project management as a set of structured processes applied across the life cycle and holds that disciplined application of

those processes improves outcomes (PMI, 2021). It directly informs the selection of the four independent variables in this study: planning, execution, monitoring and control, and closure.

Systems Theory. Systems Theory, which grew out of general systems thinking and has been applied to projects by Kerzner (2017), views a project as an interconnected system in which no component can be understood in isolation. Planning supplies the inputs, execution is the transformation process, monitoring and control provide feedback, and closure evaluates outputs. A weakness in one phase, such as poor resource planning, can therefore cascade into delays and cost increases in later phases.

Contingency Theory. Contingency Theory holds that no single management approach is best; effectiveness depends on the project's setting (Huemann & Turner, 2024). For a rural road project in Rwanda, this implies that planning, execution, monitoring and closure practices should be adapted to local resource availability, contractor capacity and stakeholder conditions rather than applied mechanically.

Resource-Based View (RBV). The RBV argues that performance depends on the ability to acquire and effectively use valuable resources (Barney, 1991). In construction, resources include skilled personnel, equipment, finance, information and managerial capability. Planning determines how resources are allocated, execution deploys them, monitoring keeps their use efficient, and closure captures knowledge for future projects.

Taken together, the four perspectives complement one another: the PMBOK tradition explains the importance of structured processes, Systems Theory the interdependence among phases, Contingency Theory the need for contextual adaptation, and RBV the central role of resource capability.

2.3 Empirical Review

Project planning and performance. Evidence from developed economies associates detailed scheduling, accurate budgeting, resource allocation and proactive risk planning with completion on time, within budget and to specification (Kerzner, 2017). In developing economies, planning principles are recognized but unevenly applied because of limited technical skills, funding constraints and weak infrastructure, and studies of budgeting and cost estimation in South Africa and Asia point to the same pattern of inadequate preparation leading to overruns (Aigbavboa & Thwala, 2017; Mat Marsono & Khalid, 2018). In Rwanda, Sibomana (2018) reported inadequate scheduling, insufficient budgeting and little risk anticipation in public infrastructure projects, contributing to delays and cost

escalation, while Nkiranuye et al. (2024) examined risk management as an indicator of performance among large Rwandan construction firms. Few studies, however, test the effect of planning on road project performance statistically.

Project execution and performance. Studies in developing economies identify poor team management, weak contractor oversight and fragmented communication as important contributors to delay and cost overrun (Enshassi et al., 2020; Mubarak et al., 2021; Wanjari & Dobariya, 2023). Reviews of stakeholder management in developing-country projects similarly link coordination and communication during implementation to project success (Osei-Kyei et al., 2021). Consistent with Systems Theory, shortcomings at the execution stage can undermine even well-prepared plans. In Rwanda, Sibomana (2018) attributed delays and overruns in public projects partly to poor activity coordination, limited contractor oversight and restricted stakeholder communication, yet quantitative evidence on how execution practices affect large road projects remains sparse.

Project monitoring and control and performance. Research in developed settings shows that regular performance tracking, progress reporting, quality inspections and prompt corrective action reduce cost overruns, schedule delays and quality defects (Kerzner, 2017). In developing countries, monitoring is often undermined by inconsistent reporting, limited use of monitoring tools and weak feedback mechanisms (Al-Safwani et al., 2022; Kissi et al., 2023; Mahamid, 2020). Monitoring acts as the feedback loop of the project system, keeping actual performance aligned with plans. For Rwanda, Sibomana (2018) noted insufficient progress tracking, delayed reporting and ineffective corrective measures in public projects, but few studies have estimated the effect of monitoring and control on road project performance.

Project closure and performance. Formal closure, including post-project evaluation, lessons-learned documentation and structured handover, is associated with organizational learning and better performance in subsequent projects (Too & Weaver, 2023). In developing economies, closure is often implemented poorly, with weak documentation, limited evaluation and inadequate stakeholder handover (Musawir et al., 2022). Sibomana (2018) similarly observed that many Rwandan public projects lack rigorous post-project reviews and fail to capture lessons learned. Evidence that evaluation-focused closure improves performance is limited.

Conceptual Framework and Research Gap

The study's framework hypothesizes that each of the four project management practices has a direct effect on

construction project performance, measured through time, cost, quality, achievement of objectives and stakeholder satisfaction. The framework draws on the PMBOK tradition and Systems Theory for structured, interdependent processes, on Contingency Theory for the role of context, and on RBV for the role of resources.

The literature reveals three gaps. First, the theories above have been applied mainly in developed or general project settings, with little testing on Rwandan road projects. Second, regional and Rwandan studies are largely descriptive and rarely estimate the effect of individual practices on performance. Third, evidence on whether closure practices influence performance is limited. This study addresses these gaps through a regression-based analysis of a single, significant Rwandan road project.

3. Methodology

3.1 Research Design

The study adopted quantitative, explanatory, cross-sectional case study design. An explanatory design suits the aim of

establishing the direction and magnitude of relationships between the independent variables (planning, execution, monitoring and control, closure) and the dependent variable (construction project performance) and of testing hypotheses (Creswell & Creswell, 2018; Hair et al., 2019). Data were collected at one point in time from stakeholders of a single project, which limits conclusions about change over time but is appropriate for examining relationships within a defined project context (Bryman & Bell, 2015; Saunders et al., 2019). The individual stakeholder was the unit of analysis.

3.2 Population and Sampling

The target population comprised the 120 stakeholders directly involved in planning, executing, monitoring and evaluating the Muhanga–Nyange Road Project (Table 2). Because the population was small and accessible, a census was conducted, which removes sampling error and ensures that the differing perspectives of managers, contractors, technical staff and client representatives are all captured (Kothari, 2004; Saunders et al., 2019).

Table 2: Population Distribution

Category	Population (N)
Project management team	45
Contractor/implementing partner	22
Technical personnel/consultants	28
Client/stakeholder representatives	25
Total	120

3.3 Instrument and Measurement

Primary data were collected with a structured questionnaire aligned with the conceptual framework. Each construct was measured with five items on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), giving 25 items across the four independent variables and the dependent variable. Planning items addressed scheduling, budgeting, resource allocation, risk planning and clarity of scope; execution items addressed coordination, leadership, communication, contractor supervision and resource use; monitoring and control items addressed progress tracking, quality inspections, corrective action, objective alignment and performance reporting; closure items addressed post-project evaluation, lessons learned, formal handover, stakeholder feedback and completion of contractual, financial and administrative obligations; and performance items addressed time, cost, quality, achievement of objectives and stakeholder

satisfaction. Where available, secondary project documents such as progress reports and financial records were consulted to corroborate respondents' perceptions (Bryman & Bell, 2015; Sekaran & Bougie, 2016).

3.3.1 Validity and Reliability

Content validity was established by aligning each item with established project management literature (Kerzner, 2017; PMI, 2021) and by expert review from senior engineers and project management academics, who assessed the relevance, clarity and coverage of the items. The questionnaire was pretested with stakeholders who were not part of the main study. Internal consistency was assessed with Cronbach's alpha, with values of .70 or higher considered acceptable (Hair et al., 2019). As shown in Table 3, all constructs exceeded this threshold, and the overall instrument achieved an alpha of .924.

Table 3: Reliability Test Results

Construct	Number of items	Cronbach's alpha	Interpretation
Project planning	5	.873	Good
Project execution	5	.889	Good
Project monitoring and control	5	.901	Excellent
Project closure	5	.857	Good
Construction project performance	5	.913	Excellent

Source: Pilot survey (2026).

3.4 Data Analysis

Questionnaires were checked for completeness, and responses were coded 1 to 5. Data were analyzed in IBM SPSS Version 27. Descriptive statistics (frequencies, means and standard deviations) summarized respondents' profiles and perceptions; Pearson correlation examined the strength and direction of associations; and multiple linear regression tested the hypotheses at the 5% significance level (Field, 2018; Hair et al., 2019). The model was specified as:

$$CPP = \beta_0 + \beta_1PPP + \beta_2PEP + \beta_3PMCP + \beta_4PCP + \varepsilon$$

where CPP is construction project performance; PPP, PEP, PMCP and PCP are project planning, execution, monitoring and control, and closure practices respectively; β_0 is the intercept; β_1 to β_4 are regression coefficients; and ε is the error term. Regression assumptions were checked through variance inflation factors, the Breusch–Pagan test, the Shapiro–Wilk test, the Ramsey RESET test, the Durbin–Watson statistic, Cook's distance and leverage values.

3.5 Ethical Considerations

Participation was voluntary and based on informed consent. Respondents were told the purpose of the study and that they

could withdraw at any time without penalty. No personally identifying information was recorded, responses were coded to protect identity, and results are reported in aggregate form. Completed questionnaires and digital data were stored securely, and only the research team had access to the raw data (Bryman & Bell, 2015; Sekaran & Bougie, 2016).

4. Results and Discussion

4.1 Response Rate and Respondent Profile

All 120 questionnaires distributed were returned and usable, a response rate of 100%. A complete response reduces the risk of non-response bias and supports the representativeness of the findings. Table 4 shows the respondents' profile. Project management team members formed the largest group (37.5%), followed by technical personnel/consultants (23.3%), client representatives (20.9%) and contractor/implementing partner staff (18.3%), so the data reflects managerial, technical, implementation and client perspectives. Just over half of respondents (52.5%) reported one to three years of experience, and 82.5% held a diploma or higher qualification, indicating that most were suitably placed to assess project management practices.

Table 4: Demographic Characteristics of Respondents (N = 120)

Variable	Category	Frequency	Percentage (%)
Role in project	Project management team	45	37.5
	Contractor/implementing partner	22	18.3
	Technical personnel/consultants	28	23.3
	Client/stakeholder representatives	25	20.9
Project experience	Less than 1 year	18	15.0
	1–3 years	63	52.5
	4–6 years	30	25.0
	Above 7 years	9	7.5
Education level	Secondary education	12	10.0
	Diploma	43	35.8
	Bachelor's degree	57	47.5
	Master's degree and above	8	6.7

Source: Field data (2026).

4.2 Descriptive Statistics

Table 5 summarizes respondents' perceptions of each construct. All composite means fall between 3.80 and 3.88 on the five-point scale, meaning that respondents

generally agreed that the practices were applied and that performance was satisfactory. Item standard deviations were below 1.00 throughout, indicating reasonably consistent views.

Table 5: Descriptive Statistics for Study Constructs (N = 120)

Construct	Items	Composite mean	Range of item means	Range of item SDs
Project planning	5	3.88	3.80–3.96	.792–.841
Project execution	5	3.88	3.80–3.96	.792–.841
Project monitoring and control	5	3.86	3.80–3.92	.778–.873
Project closure	5	3.80	3.71–3.88	.665–.841
Construction project performance	5	3.84	3.80–3.91	.797–.974

Scale: 1 = strongly disagree, 5 = strongly agree. Source: Field data (2026).

Within planning, risk identification and mitigation scored highest (M = 3.96, SD = .815) and budgeting lowest (M = 3.80, SD = .819), which may reflect common pressures such as fluctuating material prices, scope changes and delayed disbursement. In execution, contractor supervision scored highest (M = 3.96, SD = .815) and team leadership in facilitating timely completion lowest (M = 3.80, SD = .819). For monitoring and control, ensuring that objectives stayed on track was highest (M = 3.92, SD = .806) and regular preparation and review of performance reports lowest (M =

3.80, SD = .778), pointing to scope for stronger formal reporting. Closure had the lowest composite mean (3.80); documentation of lessons learned scored highest (M = 3.88, SD = .841) while incorporation of stakeholder feedback scored lowest (M = 3.71, SD = .779). Among performance indicators, achievement of intended objectives scored highest (M = 3.91, SD = .974) and compliance with technical and quality standards lowest (M = 3.80, SD = .909), with the largest dispersion appearing for quality and objectives, possibly reflecting differences in respondents' technical roles.

4.3 Correlation Analysis

Table 6 shows that all four practices were positively and significantly correlated with performance at the .01 level. Execution had the strongest correlation (r = .778), followed

by planning (r = .773), closure (r = .770) and monitoring and control (r = .743). Correlations among the practices ranged from .624 to .790, indicating that they tend to move together in practice, yet none exceeded .80, so they remain empirically distinct and suitable for inclusion in one regression model.

Table 6: Pearson Correlations Among Study Variables (N = 120)

Variable	1	2	3	4	5
1. Project planning (PPP)	—				
2. Project execution (PEP)	.790**	—			
3. Monitoring and control (PMCP)	.776**	.773**	—		
4. Project closure (PCP)	.633**	.624**	.780**	—	
5. Construction project performance (CPP)	.773**	.778**	.743**	.770**	—

Note. **p < .01 (2-tailed). Source: Field data (2026).

4.4 Regression Analysis and Hypothesis Testing

The regression model was statistically significant, $F(4, 115) = 65.36$, $p < .001$. The multiple correlation was $R = .833$, and the four practices together explained 69.4% of the variance in performance ($R^2 = .694$; adjusted $R^2 = .680$). The remaining

variance is likely attributable to factors outside the study's scope, such as political and regulatory influences, contractor capacity, procurement efficiency, financing conditions, weather and technology. Diagnostic tests supported the model's adequacy: variance inflation factors ranged from 1.86 to 2.67 (all below 5); the Breusch–Pagan test ($\chi^2 = 5.214$, $p = .266$), Shapiro–Wilk test ($W = .982$, $p = .271$) and Ramsey

RESET test ($F = 1.487$, $p = .232$) were not significant; the Durbin–Watson statistic was 1.94; and maximum Cook's

distance (.184) and leverage (.128) indicated no problematic observations.

Table 7: Multiple Regression Results for Construction Project Performance

Predictor	B	β	t	p
(Constant)	.268		1.027	.307
Project planning (PPP)	.276	.254	2.142	.035
Project execution (PEP)	.293	.290	2.492	.015
Monitoring and control (PMCP)	.175	.185	2.536	.009
Project closure (PCP)	.183	.175	2.507	.010

Note. Dependent variable: construction project performance. $R^2 = .694$; $F(4, 115) = 65.36$, $p < .001$. Source: Field data (2026).

As Table 7 shows, each practice had a positive and statistically significant effect on performance when the others were held constant. Holding the other practices constant, a one-point increase in planning was associated with a .276-point increase in performance, in execution with .293, in monitoring and control with .175 and in closure with .183. All

four null hypotheses (H01 to H04) were therefore rejected at the 5% level (Table 8). Because the predictors are correlated and the standardized coefficients lie close together ($\beta = .175$ to .290), their ranking should be read as indicative rather than definitive.

Table 8: Summary of Hypothesis Tests

Hypothesis	β	p	Decision
H01: Planning has no significant influence on performance	.254	.035	Reject H01
H02: Execution has no significant influence on performance	.290	.015	Reject H02
H03: Monitoring and control have no significant influence on performance	.185	.009	Reject H03
H04: Closure has no significant influence on performance	.175	.010	Reject H04

4.5 Discussion of Findings

Project planning. Planning had a positive and significant influence on performance ($\beta = .254$, $p = .035$), supporting the view that realistic scheduling, budgeting, resource allocation and risk identification provide the baseline against which later activities are coordinated and controlled (Kerzner, 2017; PMI, 2021). Without such a baseline, implementation decisions become reactive, raising the likelihood of delay, cost escalation and scope change. The result is consistent with studies that link weak budgeting and cost estimation to overruns (Aigbavboa & Thwala, 2017; Mat Marsono & Khalid, 2018) and with Rwandan evidence that inadequate scheduling, budgeting and risk anticipation contribute to delay (Sibomana, 2018). The comparatively lower rating for budgeting suggests that cost planning is the planning dimension most exposed to price volatility and funding delays. The finding also aligns with the RBV, since planning

determines how human, financial, material and technical resources are prepared before implementation.

Project execution. Execution had a significant positive influence ($\beta = .290$, $p = .015$) and was the largest of the four standardized effects, although, as noted, the differences among coefficients are small. This agrees with research identifying weak contractor oversight, poor team management and fragmented communication as major sources of delay and overrun in developing countries (Enshassi et al., 2020; Mubarak et al., 2021; Wanjari & Dobariya, 2023) and with evidence that coordination and communication during implementation are central to success (Osei-Kyei et al., 2021). Execution is where plans become physical outputs through the deployment of labor, equipment, materials and leadership, so a sound plan cannot deliver results if supervision, coordination or resource use is weak. This supports the Systems Theory view of execution as the transformation process linking inputs to outputs.

Project monitoring and control. Monitoring and control also had a significant positive effect ($\beta = .185$, $p = .009$), indicating that continuous oversight contributes independently to performance after planning and execution are accounted for. This is consistent with evidence that systematic tracking, reporting and corrective action help keep projects aligned with plans (Al-Safwani et al., 2022; Kissi et al., 2023; Mahamid, 2020). It also fits Systems Theory, in which monitoring is the feedback mechanism that detects deviations early and prevents them from compounding. The relatively low rating for the preparation and review of performance reports indicates that formal reporting is the area where this project could gain most, for example through digital progress-reporting tools and regular performance reviews.

Project closure. Closure had a significant positive effect ($\beta = .175$, $p = .010$). Although its coefficient was the smallest, the result challenges the notion that closure is merely an administrative formality and supports the view that post-project evaluation, lessons-learned documentation, stakeholder feedback and formal handover contribute to accountability and organizational learning (Musawir et al., 2022; Too & Weaver, 2023). The lower rating for incorporating stakeholder feedback suggests that engagement at the close-out stage deserves greater attention. In public infrastructure, weak closure can leave unresolved contractual issues, incomplete documentation and lost institutional knowledge, reducing the long-term value of the investment.

Integrated effect. That all four practices remained significant in the same model shows that none is a mere proxy for another; each adds explanatory power after the others are controlled. This supports Project Management Theory and Systems Theory, which treat planning, execution, monitoring and control, and closure as interdependent parts of one management system, and it is consistent with Contingency Theory and the RBV in highlighting the importance of fitting practices to the project's context and resources. The study extends earlier, mostly descriptive Rwandan research by quantifying the combined and individual effects of the four practices on the performance of a road project.

5. Conclusions and Recommendations

5.1 Conclusions by Objective

Project planning significantly improves the performance of the Muhanga–Nyange Road Project. Comprehensive planning improves preparedness, reduces uncertainty and supports efficient resource allocation, so projects with strong

planning are more likely to meet time, cost and quality targets. *Recommendation:* RTDA and contractors should strengthen front-end planning by preparing realistic schedules, budgets that include contingency for price fluctuations and delayed disbursement, and documented risk registers before implementation begins.

Project execution significantly improves performance and had the largest standardized effect, although the differences among the four effects were small. Effective coordination, communication, leadership, contractor supervision and resource utilization are the mechanisms through which plans become completed infrastructure. *Recommendation:* Project managers and supervising consultants should reinforce contractor supervision, set clear communication protocols among stakeholders and strengthen site-level leadership so that implementation bottlenecks are resolved promptly.

Monitoring and control significantly improve performance by enabling early detection of deviations and timely corrective action, which limits the accumulation of delays, cost overruns and quality defects. *Recommendation:* Project teams should institutionalize regular progress and performance reporting, consistent quality inspections and defined corrective-action procedures, supported by digital project management tools.

Project closure significantly improves performance, which shows that success extends beyond physical completion of works. Post-project evaluation, documentation of lessons learned, stakeholder feedback and formal handover strengthen accountability and institutional memory. *Recommendation:* RTDA and implementing partners should adopt a standard closure framework that includes structured post-project reviews, a lessons-learned register, mechanisms for incorporating stakeholder feedback and formal handover procedures.

5.2 Recommendations

Construction project performance is substantially a management outcome. Planning, execution, monitoring and control, and closure operate as complementary and mutually reinforcing processes that together explained 69.4% of the variance in performance, so sustainable improvement in Rwanda's construction sector requires strengthening the entire project management life cycle rather than isolated functions.

Beyond the objective-specific recommendations above, the Rwanda Transport Development Agency should institutionalize an integrated project management framework across all road projects. Policymakers should require standardized project management practices and include

measurable project management performance indicators in national construction guidelines alongside engineering and financial compliance requirements. Contractors and consulting firms should invest in continuous professional development in planning, execution, monitoring, risk management and stakeholder communication, and universities and professional bodies should strengthen training in modern project management methods, digital construction management and project governance.

5.3 Limitations and Directions for Further Research

The study examined a single road project at one point in time and relied on stakeholders' perceptions from one questionnaire, so the findings cannot be generalized to all infrastructure projects and may be affected by common-method bias. In addition, several closure and performance items were worded prospectively, so the scores partly reflect expectations rather than realized outcomes, and the predictors were strongly correlated. Future studies should use longitudinal designs, compare several road or other infrastructure projects, combine perceptual data with objective schedule and cost indicators, and test additional variables such as organizational culture, leadership style, project governance, digital technologies, stakeholder engagement and risk management. Mixed-methods studies could also explain the organizational processes through which these practices influence outcomes.

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