Effect of project planning practices on project performance in Rwanda: A case of Kigali Infrastructure Project implemented by NPD Ltd.

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ABSTRACT

Project planning plays a critical role in improving project performance by ensuring the effective management of scope, schedule, and resources throughout the project lifecycle. However, delays, cost overruns, and implementation challenges continue to affect infrastructure projects in Rwanda, necessitating an assessment of project planning practices. This study examined the effect of project planning on the performance of the Kigali Infrastructure Project implemented by NPD Ltd. This study used descriptive and correlational research design with quantitative and qualitative approach. The study population was 294 including managerial staff, field officers and stakeholders of NPD Ltd. The Slovin's formula was used to determine the appropriate sample size. This was due to the fact that it provided a straightforward approach for calculating the specific number of participants required for the study. This calculation compared to the formula gives a representative sample of 170 for the study. This study used simple random sampling. In this sampling method, every individual in the population has an equal chance of being selected. The research relied on documentation, interviews, and questionnaires to collect data. The content validity of the questionnaires was evaluated through the Content Validity Index. The study instrument's dependability was evaluated by calculating Cronbach's alpha. The researcher used SPSS version 29 to calculate percentages, means, correlations, and regression. The model summary indicates the R value of .886 indicates a very strong correlation between the combined predictors and project performance. The findings revealed that scope planning, schedule planning, and resource planning had positive and statistically significant effects on project performance. The regression model explained 78.6% of the variation in project performance ($R^2 = 0.786$), with schedule planning exerting the greatest influence. The study concludes that effective project planning significantly enhances project performance through improved coordination, timely implementation, and efficient utilization of project resources. The study recommends that NPD Ltd prioritize the implementation of automated project management software to strengthen real-time scope and schedule monitoring, invest in continuous training on advanced scheduling techniques, conduct stakeholder validation during scope planning, and establish a resource forecasting unit to improve project planning and overall project performance.

Keywords: Kigali Infrastructure Project, Project Performance, Project Planning Practices, Resource Planning, Schedule Planning, Scope Planning

I. INTRODUCTION

Around the world, project planning increasingly shapes overall project performance, as outcomes depend on how well institutional structures, coordination mechanisms, and contextual dynamics are managed. In the United States, infrastructure projects frequently experience performance setbacks due to fragmented stakeholder engagement and weak scheduling practices. These shortcomings often originate in early planning phases, where unclear task sequencing and insufficient resource allocation cause execution inconsistencies and deviations from expected performance standards (Alzahrani & Emsley, 2013).

These global and regional performance challenges mirror experiences in Rwanda, where local development projects highlight the role of planning in shaping delivery outcomes. The PRISM project in Rulindo District encountered performance constraints linked to difficulty aligning community expectations with technical planning processes, particularly when communication systems and risk planning mechanisms lacked adaptability (Uwera & Dushimimana, 2025).

Isimwe and Dushimimana (2025) emphasize that performance strengthens significantly when planning integrates cross-sector collaboration and flexible engagement strategies. This is particularly important in projects requiring coordination across multiple governmental levels. The TREPA project in Eastern Province further demonstrates how data-driven planning influences project performance. Baseline surveys and monitoring systems enhanced sequencing, budgeting, and resource allocation, although gaps in documentation and inconsistent agency

coordination reduced performance reliability across districts (Nkusi & Gachiri, 2025). TREPA's experience reinforces PRISM findings that strong institutional integration and evidence-based planning are critical for sustaining performance in complex implementation settings (Molobela & Uwizeyimana, 2023). This is especially important in areas with limited infrastructure and evolving stakeholder demands.

Rwanda's technical infrastructure projects have also reported performance challenges arising from planning deficiencies. The Frequency Spectrum Management and Monitoring System project experienced delays and budget adjustments due to unclear role assignments and insufficiently detailed planning documentation across operational departments (Oyier & Tumuti, 2025). The Ministry of Environment in 2023 outlined the national green infrastructure strategy, emphasizing integrated planning frameworks and institutional learning as essential tools for strengthening performance outcomes (Mohamud, 2024). These components are critical for ensuring accountability and efficiency across decentralized systems that depend heavily on technical coordination and structured planning.

Despite Rwanda's strategic emphasis on development, project performance across sectors continues to be undermined by persistent planning deficiencies. In public institutions, the Frequency Spectrum Management and Monitoring System project experienced delays and budget re allocations due to poor planning. Molobela and Uwizeyimana (2023) found that holding setting objectives, targets and key performance indicators, coordination of activities and mobilization of resources to a constant zero, project performance would be at 0.45. This quantifies the direct impact of planning gaps, with performance effectiveness dropping below 50% in the absence of structured planning inputs.

In the TREPA project, designed to enhance climate resilience in Eastern Province, planning inconsistencies disrupted implementation. Nkusi and Gachiri (2025) reported that only 61% of district-level implementing partners submitted baseline data on time, and 43% of planned activities were rescheduled due to poor coordination between planning and execution teams. These figures reflect systemic weaknesses in documentation and inter-agency alignment.

The PRISM project in Rulindo District also faced planning-related setbacks. Uwera and Dushimimana (2025) found that 68% of community respondents indicated that project activities did not reflect local priorities due to poor stakeholder engagement during planning. This disconnects between technical planning and community needs led to scope drift and reduced impact.

The construction industry in Rwanda faces persistent challenges including cost overruns, with 72% of construction projects in Kigali City exceeding their budgets. Factors contributing to these overruns include poor communication, undefined project scope, and inadequate risk management practices (Gakwaya & Irechukwu, 2022). Delays in project schedules remain a critical problem, as 68% of public construction projects experience schedule disruptions. These delays are attributed to material shortages, changes in project scope, and ineffective coordination among project participants (Ntombela & Okoro, 2023).

Several studies document performance failures linked to poor coordination, weak stakeholder engagement, and delayed execution, yet few directly examine how project planning practices can resolve these issues. Investigating the effect of project planning on performance of Kigali Infrastructure Project implemented by NPD Ltd offered targeted, evidence-based solutions to improve delivery outcomes and institutional accountability.

1.1 Research Objectives

i. To determine the effect of scope planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.
ii. To assess the effect of schedule planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.
iii. To investigate the effect of resource planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.

II. LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Stakeholder Theory

Stakeholder Theory, originally introduced by Edward Freeman in 1984, emphasizes that organizations should account for the interests and well-being of all stakeholders, rather than focusing solely on shareholders. Stakeholders encompass any individuals or groups affected by a company's actions, including employees, customers, suppliers, government bodies, and the broader community. This theory challenges the traditional view of shareholder dominance by proposing that organizations achieve long-term sustainability and ethical success by addressing the needs of all stakeholders. Companies that actively engage and satisfy stakeholders tend to generate greater value and achieve lasting success (Alshukri *et al.*, 2024).

Under Stakeholder Theory, organizations are encouraged to maintain open, ongoing communication with their stakeholders. This involves identifying and understanding stakeholders' expectations, needs, and concerns, and incorporating this feedback into decision-making processes. Such inclusive engagement fosters a sense of respect and appreciation, often resulting in increased stakeholder trust and support. Particularly in the workplace, involving employees in key decisions can enhance job satisfaction, motivation, and overall productivity, thereby boosting organizational performance (Kerzner, 2022).

The theory also promotes the integration of ethical practices and social responsibility into organizational strategies. Companies are expected to go beyond profitability and consider their social and environmental impact. This broader perspective on value creation ensures long-term societal and ecological well-being. Ethical behavior not only supports sustainability but also enhances a company's reputation. Businesses that act responsibly are more likely to gain public trust, attract loyal customers, and retain top talent, all of which contribute to a competitive edge in the marketplace (Silva, 2025).

The study used Stakeholder Theory to examine how stakeholders practice in scope planning can contribute to project performance through standardized processes, defined deliverables, and procedural clarity. This framework supports the analysis of planning discipline in infrastructure projects and its influence on execution quality and stakeholder coordination in Rwanda.

2.1.2 Goal-Setting Theory

Goal-Setting Theory is the framework that explains performance outcomes through the establishment of specific, measurable, and time-bound objectives. It posits that clearly defined goals enhance task focus, persistence, and strategic planning, thereby improving individual and organizational performance (Locke & Latham, 1990). In project planning, the theory provides a basis for understanding how scope and schedule clarity influence execution and accountability.

The theory was developed in 1968 through the work of Edwin Locke, who demonstrated that specific goals lead to higher performance than vague or easy goals. In 1990, Locke and Gary Latham formalized the theory in their publication A Theory of Goal Setting and Task Performance, identifying five core principles: clarity, challenge, commitment, feedback, and task complexity. These principles established goal-setting as a cognitive mechanism that translates intention into action (Locke & Latham, 1990).

Over time, Goal-Setting Theory evolved to incorporate organizational and team-level dynamics. Recent studies have examined how goal alignment across stakeholders influences project outcomes, especially in complex environments. In infrastructure and development projects, goal-setting is used to structure planning documents, performance indicators, and monitoring frameworks. Contemporary applications of Goal-Setting Theory emphasize its integration with agile and adaptive planning models. Scholars have explored how iterative goal refinement and real-time feedback loops enhance responsiveness in dynamic project environments (Kiprotich & Muturi, 2023).

The study used the Goal-Setting Theory to analyze how schedule planning contributes to project performance through measurable objectives, task clarity, and time-bound milestones. This theory supports the investigation of planning structures that enhance execution focus and accountability across infrastructure projects implemented within Rwanda's national development frameworks.

2.1.3 Theory of Change (ToC)

Theory of Change (ToC) was formally introduced in 1995, primarily through the work of Carol Weiss, a leading scholar in program evaluation (Weiss, 2018). In her influential 1995 publications, Weiss argued that many development and social programs struggled because they lacked a clear articulation of the causal logic explaining how interventions were expected to lead to outcomes. She emphasized that effective evaluation must begin with explicit assumptions about desired change, intermediary steps, and necessary preconditions. This shift laid the intellectual foundation for the modern Theory of Change framework, positioning it as a tool for strengthening planning, learning, and accountability (Mueller-Saegebrecht & Walter, 2025).

In the same year, the Aspen Institute Roundtable on Community Change (1995) expanded the concept by developing practical guidelines to help organizations map the pathways that connect inputs, activities, and long-term impacts (Vasudevan & Kumar, 2025). Their work transformed ToC into an applied methodology that could be used beyond academic evaluation settings, particularly in complex community initiatives requiring cross-sector coordination Chapman *et al*., 2023). Development agencies and foundations quickly recognized its value in clarifying strategic intent, defining measurable indicators, and exposing underlying assumptions that could influence program success.

Theory of Change has become a standard approach within international development, humanitarian programming, governance reforms, and project management. Institutions such as UNICEF, UNDP, DFID/FCDO, the World Bank, USAID, and major NGOs have adopted ToC to support evidence-based planning and adaptive implementation. Modern scholarship highlights its strength in revealing the causal pathways that drive project

performance, ensuring that interventions are aligned with contextual realities and institutional capacities. Today, ToC is recognized as a key framework for enhancing strategic coherence, improving monitoring systems, and reinforcing the long-term effectiveness of development initiatives (Turner *et al.*, 2021).

Theory of Change was relevant to the performance of the Kigali Infrastructure Project implemented by NPD Ltd because it clarifies how specific activities are expected to lead to measurable results across planning, implementation, and delivery stages.

2.2 Empirical Review

The empirical review summarizes previous studies related to each specific objective and shows how earlier findings connect with the present study.

2.2.1 Effect of Scope Planning on Performance of Kigali Infrastructure Project Implemented by NPD Ltd.

Kiiza and Muiruri (2022) conducted a study titled Influence of Project Planning Process on Performance of Food Sustainable Initiative Project in Rwanda. The general objective was to assess how project planning affects performance, with a specific focus on scope definition. The study employed a descriptive survey design and targeted a population of 86 respondents, including six technical staff and 80 beneficiaries. Stratified and non-probability sampling techniques were used to select participants. Data were collected using structured questionnaires and analyzed with Statistical Package for Social Sciences version 20. The study showed that 83% of respondents agreed that changes in scope planning significantly influenced project completion, with a mean score of 3.9767 and standard deviation of 0.34220. Researcher recommended the use of Work Breakdown Structures and early stakeholder consultations to improve scope clarity and enhance project performance.

Rukundo and Mudakemwa (2022) conducted the impact of Project Planning Practices on Abadahigwa Project Funded by BDF Performance in Musanze District (2017–2019). The study assessed how planning practices influence project performance, with scope planning as a specific variable. A descriptive survey design was adopted, targeting a population of 120 project stakeholders. A sample of 92 respondents was selected using stratified sampling. Data were collected through structured questionnaires and analyzed using Statistical Package for Social Sciences version 25. Findings revealed that scope planning had a statistically significant positive effect on project performance, with a correlation coefficient of $r = 0.579$ and $p < 0.05$. The study recommended integrating scope planning with budgeting and risk management to enhance implementation efficiency and sustainability, particularly in development projects operating under constrained environments.

Mwangi and Yusuf (2022) examined the project Scope Management and Successful Implementation of Infrastructural Health Program in Nairobi County. The study assessed how scope management influences the implementation of health infrastructure projects, with specific attention to scope definition and stakeholder involvement. A descriptive survey design was used, targeting a population of 150 project staff and health administrators. A sample of 108 respondents was selected using stratified sampling. Data were collected through structured questionnaires and analyzed using SPSS. Findings showed that scope clarity and stakeholder validation significantly improved project timelines and reduced implementation errors. It recommended the use of scope management plans and stakeholder workshops to ensure alignment between project goals and execution strategies, especially in public health infrastructure projects where clarity is essential for compliance and delivery.

Iribagiza and Kirabo (2024) investigated the influence of Project Planning on Performance of Housing Construction Projects in Rwanda. A descriptive survey design was used, targeting a population of 180 professionals involved in housing construction projects across Kigali. A sample of 150 respondents was selected using purposive sampling. Data were collected through structured questionnaires and analyzed using SPSS. Findings revealed that scope planning had a strong positive effect on project performance, with a correlation coefficient of $r = 0.712$ and significance level $p < 0.05$. The research recommended the use of formal scope management plans, stakeholder validation processes, and integration of scope planning with budgeting and scheduling to enhance project outcomes.

2.2.2 Effect of Schedule Planning on Performance of Kigali Infrastructure Project Implemented by NPD Ltd.

Umuhoza and Wabala (2025) evaluated the effect of Schedule Planning on Project Performance: A Case of Kigali Infrastructure Project, with specific objectives focusing on task definition, dependency mapping, and resource scheduling. The study adopted a descriptive survey design and targeted a population of 314 engineers and project staff. Data were collected using structured questionnaires and analyzed using SPSS. Findings revealed that task definition ($\beta = 0.266$), dependency mapping ($\beta = 0.213$), and resource scheduling ($\beta = 0.548$) had statistically significant positive effects on project performance. Poor communication was found to negatively affect performance ($\beta = -0.136$). The study concluded that effective schedule planning improves coordination, reduces delays, and enhances delivery timelines. It recommended strengthening task clarity, improving communication channels, and integrating scheduling tools such as Gantt charts and milestone tracking systems to enhance project execution.

Gitau *et al.* (2018) examined the influence of Project Management Practices on Performance of Projects in Rwanda: A Case of NALEP Project in Kicukiro District. A descriptive survey design was used, targeting a population of 150 project employees. A sample of 150 respondents was selected using census sampling. Data were collected via structured questionnaires and analyzed using SPSS. Findings showed that schedule planning significantly influenced project implementation, with communication ($\beta = 0.739$) and monitoring contributing to performance. The findings indicated that poor scheduling leads to missed deadlines and budget overruns. It recommended enhancing integrated communication plans, allocating sufficient funds for scheduling activities, and training project managers in time management techniques to improve project delivery and accountability.

Suresh and Annamalai (2024) conducted a study titled Impact of Schedule Management Plan on Project Management Effectivenes. The general objective was to assess how schedule planning affects project execution, with specific attention to activity sequencing and milestone tracking. The study adopted a descriptive survey design and targeted a population of 150 project staff involved in public infrastructure projects. A sample size of 110 respondents was selected using purposive sampling. Data were collected through structured questionnaires and analyzed using SPSS. Findings indicated projects with well-defined schedules and milestone tracking systems had higher completion rates and fewer delays. The regression coefficient for schedule planning was $\beta = 0.684$, indicating a strong positive relationship with project effectiveness. It recommended the adoption of scheduling tools such as Gantt charts and critical path methods, along with regular schedule reviews to maintain alignment with project goals.

Umulisa and Irechukwu (2023) conducted a study titled Influence of Project Planning on Performance of Housing Construction Projects in Rwanda. A descriptive survey design was adopted, targeting a population of 200 construction professionals across Kigali. A sample of 150 respondents was selected using purposive sampling. Data were collected through structured questionnaires and analyzed using SPSS. The study showed that schedule planning had a strong positive effect on project performance, with a correlation coefficient of $r = 0.712$ and significance level $p < 0.05$. So, the use of milestone tracking tools, progress reviews, and integration of schedule planning with resource allocation improves delivery timelines and reduce implementation risks.

2.2.3 Effect of Resource Planning on Performance of Kigali Infrastructure Project Implemented by NPD Ltd.

Andinda and Dushimimana (2023) conducted a study titled Effect of Resource Planning Practices on Project Performance: Case of Kigali International Airport Upgrade Rwanda. The study assessed how human, financial, and material resource planning influence project performance. A descriptive survey design was adopted, targeting a population of 82 project staff from the Rwanda Civil Aviation Authority. Census sampling was used due to the manageable population size. Data were collected using structured questionnaires and analyzed using SPSS. Human resource planning improved team coordination and training outcomes, financial planning enhanced budget control and forecasting accuracy, and material planning ensured timely procurement and reduced delays. Integrating resource planning significantly contributed to project success. Early incorporation of resource planning into project initiation phases, use of planning software for resource tracking, and continuous training of project managers in resource allocation and coordination should be considered.

Umulisa *et al*. (2023) investigated the effect of Project Resource Planning Practices on Project Performance of Agaseke Project in Kigali Rwanda. A cross-sectional survey design was used, targeting a population of 3,800 project beneficiaries. A sample of 120 respondents was selected using stratified random sampling. Data were collected through structured questionnaires and analyzed using SPSS. Findings indicated that financial planning and timely resource allocation significantly improved service delivery and implementation efficiency. Human resource planning enhanced team productivity, while time resource planning reduced delays. The study concluded that resource planning is a critical determinant of project success. The study recommended that, capacity building for project teams, stakeholder engagement in resource allocation decisions, and integration of resource planning into monitoring and evaluation frameworks should be emphasized.

Kanyago *et al.* (2017) evaluated the Project Resource Management and Performance of Construction Project in Rwanda. The general objective was to assess how resource planning affects construction project performance, with specific focus on human and material resource coordination. A descriptive survey design was used, targeting a population of 120 construction staff. A sample of 100 respondents was selected using stratified sampling. Data were collected through structured questionnaires and analyzed using SPSS. Findings highlighted that effective resource planning significantly improved project delivery, with human resource coordination contributing to team efficiency and material planning reducing procurement delays. The study concluded that resource planning is essential for maintaining timelines and quality standards. It recommended integrating resource planning into project initiation phases, training managers in resource forecasting and allocation, and using digital tools to monitor resource utilization throughout the project lifecycle.

Aradukunda and Sikubwabo (2024) examined the influence of Financial Resources Management on Project Performance in Public Institutions, with specific focus on budgeting, forecasting, and expenditure tracking. A

descriptive survey design was used, targeting a population of 150 staff members across Kigali City's public institutions. A sample of 100 respondents was selected using stratified sampling. Data were collected using structured questionnaires and analyzed with SPSS. Findings indicated that financial planning practices such as budget accuracy, timely disbursement, and expenditure tracking significantly improved project delivery and accountability. It recommended institutionalizing financial planning frameworks, training staff in budget control and forecasting techniques, and integrating financial planning with performance monitoring systems.

III. METHODOLOGY

3.1 Research Design

The study adopted descriptive and correlational research designs using mixed methods. The descriptive design was used to describe respondents' perceptions of project planning practices, while the correlational design examined the relationship between scope planning, schedule planning, resource planning, and project performance. Quantitative data were analyzed to determine the magnitude of these relationships, whereas qualitative data complemented the quantitative findings through respondents' views.

3.2 Study Area

The study was conducted at the Kigali Infrastructure Project implemented by NPD Ltd in Kigali, Rwanda. The project was selected because of its strategic role in infrastructure development and its reliance on effective project planning practices to achieve successful project performance.

3.3 Target Population

The target population comprised 294 respondents, including 35 managerial staff, 188 field officers of NPD Ltd, and 71 stakeholder representatives involved in the implementation of the Kigali Infrastructure Project.

3.4 Sampling and Sample Size

A sample of 170 respondents was determined using Slovin's formula. Simple random sampling was employed to select respondents, ensuring that each member of the target population had an equal chance of participation and minimizing selection bias.

3.5 Data Collection Instruments and Procedure

Primary data were collected using structured questionnaires and interview guides, while documentary review was used to obtain secondary information. The questionnaire consisted of five-point Likert scale items and was administered to the selected respondents, whereas interviews were conducted with managerial staff to obtain qualitative insights.

3.6 Validity and Reliability

The research supervisor verified the questionnaire items before distribution, and the Content Validity Index was 0.8. Reliability was tested using Cronbach's Alpha, and all variables were above the 0.70 threshold, with resource planning at 0.832, project performance at 0.829, scope planning at 0.821, and schedule planning at 0.818.

3.6 Data Analysis

The data were analyzed using SPSS version 29. Descriptive statistics were used to present frequencies, percentages, means, and standard deviations, while correlation and multiple regression analysis were used to test the relationship and effect of the independent variables on project performance.

3.7 Ethical Consideration

The researcher respected ethical requirements by protecting respondents' identities, seeking informed consent, explaining the study purpose, and using the collected information only for academic research.

IV. FINDINGS & DISCUSSION

This section presents the findings of the study based on field data. A total of 170 questionnaires were distributed to staff and stakeholders of NPD Ltd involved in Kigali Infrastructure Project; 165 were filled and returned, representing a response rate of 97.1%, while 5 questionnaires, equal to 2.9%, were unreturned or incomplete.

Table 1

Response Rate

	Distributed	Filled and Retuned	Unreturned and incomplete
Questionnaire	170	165	5
Percent	100	97.1	2.9

Based on the data presented in Table 1, a total of 170 questionnaires were distributed to staff and stakeholders of NPD Ltd involved in Kigali Infrastructure Project. Out of these, 165 questionnaires were successfully filled and returned, representing a significant response rate of 97.1%. Conversely, only 2.9% of the instruments remained unreturned or incomplete, which indicates a very high level of participation. This robust response rate provides a reliable foundation for the subsequent data analysis and interpretation within this study.

Table 2

Correlations Analysis

		Scope Planning	Schedule Planning	Resource Planning	Project performance
Scope Planning	Pearson Correlation	1	.562**	.704**	.704**
	Sig. (2-tailed)		0	0	0
	N	165	165	165	165
Schedule Planning	Pearson Correlation	.562**	1	.608**	.811**
	Sig. (2-tailed)	0		0	0
	N	165	165	165	165
Resource Planning	Pearson Correlation	.704**	.608**	1	.753**
	Sig. (2-tailed)	0	0		0
	N	165	165	165	165
Project performance	Pearson Correlation	.704**	.811**	.753**	1
	Sig. (2-tailed)	0	0	0	
	N	165	165	165	165

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 presents the Pearson correlation coefficients between the study variables. The results indicate that all dimensions of project planning were positively and significantly associated with project performance ($p < 0.001$). Scope planning exhibited a strong positive correlation with project performance ($r = 0.704$), indicating that clearly defining project objectives, deliverables, and stakeholder requirements is associated with improved project performance. This finding is consistent with Kiiza and Muiruri (2022), who reported that effective project planning enhances project implementation by improving clarity and reducing implementation challenges. Similarly, Mwangi and Yusuf (2022) established that effective scope management contributes to successful implementation of infrastructure projects through proper definition and control of project scope.

Schedule planning recorded the strongest positive relationship with project performance ($r = 0.811$), suggesting that effective scheduling, sequencing of activities, and adherence to project timelines substantially improve project performance. This finding corroborates the work of Gitau et al. (2018), who found that effective schedule control enhances project implementation through improved monitoring and timely completion of project activities. Likewise, Umuhoza and Wabala (2025) concluded that project scheduling significantly influences the performance of infrastructure projects by improving coordination and reducing implementation delays.

Resource planning was also positively and significantly correlated with project performance ($r = 0.753$), implying that effective planning and allocation of financial, human, and material resources contribute to successful project implementation. The finding supports Andinda and Dushimimana (2023), who established that effective resource planning significantly improves project performance through efficient utilization of project resources. Similarly, Umulisa et al. (2015) reported that proper resource planning enhances project implementation by ensuring the timely availability and efficient utilization of project resources.

Table 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.886[a]	0.786	0.782	0.1926	1.751

a. Predictors: (Constant), Resource Planning, Schedule Planning, Scope Planning

b. Dependent Variable: Project performance

Table 3 provides the model summary, where the R value of .886 indicates a very strong correlation between the combined predictors and project performance. The R Square value of .786 suggests that 78.6% of the variance in project performance is explained by scope, schedule, and resource planning. The Adjusted R Square of .782 accounts for the number of predictors in the model, remaining very high. The Durbin-Watson statistic of 1.751 falls within the acceptable range (1.5 to 2.5), indicating that there is no autocorrelation in the residuals. This confirms that the model is statistically robust for predicting performance at NPD Ltd.

Table 4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.887	3	7.296	196.7	.000[b]
	Residual	5.972	161	0.037		
	Total	27.859	164			

a. Dependent Variable: Project performance

b. Predictors: (Constant), Resource Planning, Schedule Planning, Scope Planning

The ANOVA results in Table 4 test the overall significance of the regression model. The F-statistic is 196.696 with a significance (Sig.) value of .000, which is less than the threshold of 0.05. This means that the regression model is a significant predictor of performance of Kigali Infrastructure Project. Therefore, the combination of scope, schedule, and resource planning significantly improves the ability to predict project performance. The results statistically reject the possibility that the relationship between the variables occurred by chance.

Table 5

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.125	0.176		0.708	0.48		
	Scope Planning	0.193	0.049	0.208	3.933	0	0.476	2.101
	Schedule Planning	0.543	0.05	0.517	10.93	0	0.595	1.681
	Resource Planning	0.238	0.045	0.292	5.297	0	0.439	2.28
a. Dependent Variable: Project performance								

Table 5 presents the regression coefficients for the effect of scope planning, schedule planning, and resource planning on project performance. The findings indicate that all three project planning dimensions have positive and statistically significant effects on the performance of the Kigali Infrastructure Project implemented by NPD Ltd. The variance inflation factor (VIF) values range from 1.681 to 2.280, which are below the recommended threshold of 10, indicating that multicollinearity was not a concern and that each predictor made a distinct contribution to project performance.

Regarding the first objective, the findings revealed that scope planning has a positive and statistically significant effect on project performance ($\beta = 0.208$, $p < 0.001$). This implies that improving scope definition, stakeholder requirement identification, and project deliverable specification enhances project implementation and overall performance. The finding is consistent with Mwangi and Yusuf (2022), who reported that effective project scope management significantly improves the successful implementation of infrastructure projects by minimizing scope changes and enhancing project control. Similarly, Kiiza and Muiruri (2022) established that comprehensive project planning contributes significantly to project performance by improving implementation efficiency and reducing project uncertainties. The findings are further supported by Rukundo et al. (2022), who concluded that well-defined project planning practices improve project performance through effective scope management and stakeholder coordination.

With respect to the second objective, schedule planning was found to have the strongest positive effect on project performance ($\beta = 0.517$, $p < 0.001$), indicating that effective scheduling is the most influential predictor of project success. The findings suggest that proper activity sequencing, milestone monitoring, and adherence to project timelines substantially improve project implementation. These findings corroborate those of Gitau et al. (2018), who found that project schedule control significantly enhances project implementation through improved coordination and timely completion of project activities. Likewise, Umuhoza and Wabala (2025) reported that effective project scheduling improves infrastructure project performance by strengthening activity coordination and reducing implementation delays. The findings also agree with Suresh and Annamalai (2024), who demonstrated that effective schedule management significantly contributes to project success through systematic planning and monitoring of project activities.

The third objective established that resource planning has a positive and statistically significant effect on project performance ($\beta = 0.292$, $p < 0.001$). This implies that effective planning and allocation of financial, human, technological, and material resources improve project execution and delivery. The findings support those of Andinda and Dushimimana (2023), who found that resource planning practices significantly influence project performance through efficient utilization of project resources. Similarly, Umulisa et al. (2015) established that effective resource planning enhances project implementation by ensuring the timely availability and efficient allocation of resources. The findings further concur with Aradukunda and Sikubwabo (2024), who reported that effective financial resource management significantly improves project performance by promoting efficient resource utilization and minimizing implementation constraints.

Generally, the regression results demonstrate that project planning practices significantly influence project performance, with schedule planning exerting the greatest effect, followed by resource planning and scope planning. The findings therefore confirm that strengthening project planning practices is fundamental to improving the performance of infrastructure projects implemented by NPD Ltd.

Based on the regression coefficients, the estimated multiple regression model is expressed as:

$$Y = 0.125 + 0.193X_1 + 0.543X_2 + 0.238X_3 + \varepsilon$$

Where:

Y = Project Performance
$\mathbf{X_1}$ = Scope Planning
$\mathbf{X_2}$ = Schedule Planning
$\mathbf{X_3}$ = Resource Planning
$\boldsymbol{\varepsilon}$ = Error term

The regression equation indicates that, holding other factors constant, a one-unit improvement in scope planning, schedule planning, and resource planning increases project performance by 0.193, 0.543, and 0.238 units, respectively. Among the three predictors, schedule planning contributes the greatest improvement to project performance.

Table 6

Decision on Research Hypotheses

Hypotheses	P value	Decision
$H_0$1: There is no significant effect of scope planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.	$p < 0.05$	Rejected
$H_0$2: There is no significant effect of schedule planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.	$p < 0.05$	Rejected
$H_0$3: There is no significant effect of resource planning on performance of Kigali Infrastructure Project implemented by NPD Ltd.	$p < 0.05$	Rejected

Table 6 presents the hypothesis testing results. Since the significance values for scope planning, schedule planning, and resource planning were all below the 0.05 level of significance, the three null hypotheses were rejected. The findings therefore provide sufficient statistical evidence that scope planning, schedule planning, and resource planning each have a positive and significant effect on the performance of the Kigali Infrastructure Project implemented by NPD Ltd. These findings demonstrate that effective project planning practices are critical determinants of successful project implementation and improved project performance**.**

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Based on the findings, the study concludes that scope planning is a prerequisite for the high performance of infrastructure projects in Rwanda. When project objectives are clearly defined and communicated, it creates a unified direction that reduces technical errors and stakeholder conflicts. The study confirms that scope clarity allows for the creation of accurate work structures, which directly leads to better quality compliance and beneficiary satisfaction. Therefore, the "procedural rigor" in defining project boundaries and deliverables is what protects NPD Ltd from scope creep and budget overruns.

The significant correlation between scope planning and performance underscores the importance of the initial project design phase. The study concludes that stakeholder validation during scope planning is essential for ensuring that the project deliverables remain relevant to the end-users. By thoroughly reviewing requirements before execution, the project team can anticipate technical challenges and allocate the appropriate level of effort. In the context of Kigali's development, scope planning is the primary mechanism for aligning project outputs with the city's strategic infrastructure vision.

The study concludes that schedule planning is the most powerful management tool for driving the performance of the Kigali Infrastructure Project. The high degree of influence found in the regression model proves that time-management discipline is more critical than any other planning factor. Effective scheduling, sequencing, and regular reviews allow the project to remain on track even when faced with unforeseen environmental or logistical hurdles. The study confirms that the use of tools like the Work Breakdown Structure and Gantt charts provides the necessary control to avoid project stagnation.

The high mean scores for regular schedule reviews suggest that time management is a core organizational value at NPD Ltd. The study concludes that the adherence to time-bound milestones is what enables the project to meet its intended timeframe and respect funding cycles. By assigning clear responsibilities for scheduled tasks, the project ensures that individual productivity is high and accountability is maintained. This scheduling discipline is particularly vital in the infrastructure sector, where delays can have cascading financial and social impacts. Therefore, schedule planning remains the most essential predictor of delivery efficiency in Rwandan infrastructure projects.

The study concludes that resource planning is a critical determinant of operational continuity and project performance. The strategic allocation of human, financial, and material assets ensures that the project activities can proceed without the interruptions that typically derail construction. The study confirms that when financial resources are properly forecasted and managed, the project can maintain a steady pace of implementation. Resource planning allows NPD Ltd to leverage its internal capabilities to deliver high-quality works that meet international standards.

The study also concludes that the mobilization of technological and material assets is essential for navigating the complex logistics of urban infrastructure projects. By integrating resource needs into the early planning stages, project managers can ensure that specialized equipment is available for critical path activities. This proactive approach to resource management reduces procurement delays and enhances the overall credibility of the delivery mechanism. The findings validate the Resource-Based View Theory, proving that project success is a result of how well internal competencies are reconfiguration. Ultimately, resource planning is what transforms the project's technical designs into tangible social value for the people of Kigali.

5.2 Recommendations

Based on the study findings, project managers at NPD Ltd should conduct mandatory stakeholder validation workshops during the scope definition phase to further reduce the risk of community-level resistance. In addition, NPD Ltd should prioritize the implementation of automated project management software to enhance real-time scope and schedule tracking across all project sites. To further strengthen schedule planning, the company should invest in continuous training for its engineers on advanced scheduling techniques, such as the Critical Path Method (CPM) and Agile-Waterfall hybrids. Furthermore, NPD Ltd should establish a dedicated resource forecasting unit to better predict fluctuations in construction material prices and ensure more accurate financial resource planning, thereby improving overall project performance.

5.3 Suggestion for Future Researchers

The current study focused on the effect of planning on performance in the infrastructure sector; however, future researchers should explore different dimensions and contexts. A suggested topic for future investigation is: "The Influence of Risk Management Practices on the Sustainability of Road Infrastructure Projects in Rwanda." This suggested research would provide a more nuanced understanding of how external uncertainties impact long-term project viability beyond the implementation phase.

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Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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