



Influence of Project Planning Practices on Performances of Road Construction Project: A case of Muhanga-Nyange Road Construction Project, Muhanga District, Rwanda

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Abstract: This study examined the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. Specifically, the study examined how project scope planning influences project performance. The study adopted a descriptive and explanatory research design. The target population consisted of 349 respondents, and a sample size of 186 respondents was determined using Yamane’s formula. Purposive and simple random sampling techniques were employed to select respondents. Data were collected using structured questionnaires and semi-structured interviews and analyzed using SPSS Version 27. Descriptive statistics, Pearson correlation analysis, and simple linear regression analysis were used to examine the relationship and influence of project scope planning on project performance. The findings revealed that project scope planning was effectively implemented, particularly through clear definition of project objectives and deliverables, communication of project scope, management of scope changes, beneficiary involvement, and implementation of activities according to the approved scope. Correlation analysis indicated a strong positive and statistically significant relationship between project scope planning and project performance ($r = .735$, $p < .001$). Regression analysis further demonstrated that project scope planning significantly predicted project performance and explained 54.0% of the variation in project performance. The study concluded that effective project scope planning is an important factor influencing the performance of the Muhanga–Nyange Road Construction Project. The study recommends that project managers and engineers strengthen scope definition, stakeholder consultation, and formal scope-change control procedures to minimize unnecessary variations, delays, and additional project costs.

Keywords: Project Scope Planning, Project Performance, Road Construction Project, Scope Management, Muhanga–Nyange Road Construction Project, Rwanda

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1. Introduction

Project planning has become one of the most important management practices for achieving successful project implementation across the world (PMI, 2025). It refers to the systematic process of defining project objectives,

determining project scope, identifying activities, allocating resources, estimating costs, scheduling tasks, assessing potential risks, and establishing mechanisms for monitoring and controlling project activities before implementation begins. Through effective planning, project managers are able to coordinate resources efficiently, minimize uncertainties, and improve

communication among stakeholders, thereby increasing the likelihood of project success. Modern infrastructure projects, particularly road construction projects, have become increasingly complex due to technological advancements, environmental concerns, regulatory requirements, and growing stakeholder expectations. Consequently, governments, development agencies, and private organizations have recognized project planning as a strategic management function that enhances project performance by ensuring projects are completed within the planned scope, budget, time, and quality standards (Kerzner, 2022).

In developed countries such as the United States, Canada, and Australia, project planning has evolved into an advanced management discipline supported by digital technologies, standardized planning frameworks, and strong institutional governance (Too and Weaver, 2023). Large-scale infrastructure projects are planned using sophisticated project management software, Building Information Modeling (BIM), Geographic Information Systems (GIS), Artificial Intelligence (AI), and risk management tools that enable project managers to make accurate forecasts before project implementation begins. These countries also emphasize comprehensive resource planning, stakeholder engagement, environmental assessment, and continuous monitoring throughout the project life cycle. As a result, many public infrastructure projects are completed with improved efficiency, higher quality standards, and greater accountability. Governments in developed economies continue investing heavily in strengthening project planning capabilities because effective planning minimizes project delays, controls costs, and improves service delivery (PMI, 2025).

Across Europe, project planning plays a central role in supporting sustainable infrastructure development and enhancing the performance of public investment projects (Winch, 2023). European countries such as Germany, France, the Netherlands, Sweden, and the United Kingdom have established comprehensive planning systems that emphasize sustainability, stakeholder participation, environmental protection, and long-term infrastructure resilience. Road construction projects are planned using integrated project management approaches that combine technical planning with environmental impact assessments, procurement planning, financial management, and risk mitigation strategies. The European Union has also developed policies that encourage member states to strengthen project planning in order to improve infrastructure quality and ensure efficient utilization of public resources. Furthermore, digital transformation initiatives have enabled many European construction projects to adopt Building Information Modeling (BIM) and digital project monitoring systems that improve coordination among project stakeholders (European Commission, 2024).

Asian countries have experienced rapid economic growth accompanied by massive investments in transport infrastructure, making project planning an essential factor for successful project implementation (Zhang and Luo, 2023). Countries such as China, Japan, Singapore, South Korea, and India have invested extensively in road networks, railways, bridges, airports, and smart city infrastructure to support industrialization and economic competitiveness. The success of many of these projects has largely depended on effective planning processes involving feasibility studies, financial planning, resource allocation, technological innovation, and proactive risk management. In countries like Singapore and Japan, project planning is supported by advanced engineering technologies, digital construction management systems, and continuous monitoring mechanisms that improve project performance. However, some developing Asian countries continue experiencing project implementation challenges associated with inadequate planning, changing project scope, financial constraints, and delays in decision-making (Asian Development Bank, 2024).

Road transport remains the dominant mode of transportation in Sub-Saharan Africa, accounting for more than 80% of passenger and freight movement across the region (Amoatey and Hayibor, 2023). Consequently, governments and development partners have continued investing heavily in road construction projects to improve regional connectivity, facilitate trade, reduce transport costs, and stimulate socio-economic development. Despite these investments, many road construction projects continue to experience significant implementation challenges, including delays, budget overruns, poor workmanship, contract variations, and abandoned projects. Several studies attribute these problems to weaknesses in project planning, particularly inadequate scope definition, ineffective resource allocation, poor risk management, and insufficient stakeholder involvement during the planning stage. As construction projects become increasingly complex, comprehensive project planning has become essential for ensuring that available resources are utilized efficiently while minimizing implementation uncertainties (African Development Bank Group, 2024).

Within East Africa, governments have prioritized infrastructure development under regional integration initiatives aimed at facilitating trade, improving mobility, and enhancing economic competitiveness (EAC, 2024). Countries including Kenya, Tanzania, Uganda, Rwanda, Burundi, and South Sudan continue investing substantially in national highways, regional transport corridors, bridges, and urban road networks. Nevertheless, numerous road construction projects across the region continue to experience delays, escalating project costs, design modifications, and quality deficiencies that affect project performance. Studies conducted within East Africa

indicate that these implementation challenges are largely associated with inadequate project scope planning, inefficient resource planning, poor coordination among stakeholders, and ineffective project risk planning. Furthermore, changing project requirements, delayed financing, land acquisition challenges, and unforeseen environmental risks often reduce project efficiency when not adequately anticipated during the planning stage (Ndunda & Kihara, 2022).

In Rwanda, infrastructure development has become one of the government's major priorities under Vision 2050 and the National Strategy for Transformation (NST2: 2024–2029), with road construction projects playing a significant role in promoting economic growth, improving access to markets, facilitating public service delivery, and strengthening regional connectivity. The Government of Rwanda has invested substantially in upgrading national and district road networks to support industrialization, agriculture, tourism, and trade. Despite these achievements, some road construction projects continue to experience implementation challenges related to project delays, cost escalation, scope adjustments, inadequate resource utilization, and unforeseen project risks. These challenges demonstrate that while financial investment is important, the effectiveness of project planning remains equally critical in determining project performance. According to the Ministry of Infrastructure (2024), strengthening project planning practices remains a strategic priority for improving infrastructure delivery and achieving sustainable national development. Similarly, Rwanda Transport Development Agency (RTDA, 2024) emphasizes that comprehensive planning contributes significantly to improving the timely completion, quality, and sustainability of road construction projects throughout the country.

Against this background, the Muhanga–Nyange Road Construction Project represents one of the important infrastructure investments intended to improve transport connectivity, facilitate the movement of people and goods, enhance access to markets and public services, and promote socio-economic development within Muhanga District and surrounding areas. However, like many infrastructure projects implemented in developing countries, its performance depends not only on the availability of financial resources but also on the effectiveness of project planning undertaken before and during implementation. Specifically, project scope planning, project resource planning, and project risk planning are expected to influence project performance through improved schedule adherence, cost control, construction quality, and stakeholder satisfaction. Although previous studies have examined various determinants of project success in different countries, limited empirical evidence exists regarding how these

specific dimensions of project planning influence the performance of district road construction projects in Rwanda. emphasize that effective planning remains one of the strongest foundations for achieving successful infrastructure project performance across diverse implementation environments (RTDA, 2024).

1.2 Statement of Problem

Road construction projects are essential for promoting economic growth, improving accessibility, and supporting social development. However, many road projects worldwide continue to experience delays, cost overruns, poor quality, and failure to achieve their intended objectives due to inadequate project planning, ineffective resource allocation, and poor risk management. These challenges reduce the benefits expected from infrastructure investments and affect overall project performance. According to the Project Management Institute (2025), ineffective planning remains one of the leading causes of project failure across the construction sector, while the World Bank (2024) reports that weak planning contributes significantly to poor infrastructure delivery in developing countries.

Several empirical studies have examined factors influencing the performance of construction projects. Amoatey and Hayibor (2023) found that project governance and stakeholder collaboration significantly improved construction project performance in Ghana. Ndunda and Kihara (2022) reported that project monitoring and resource management positively influenced road construction project performance in Kenya. Zhang and Luo (2023) established that digital construction technologies enhanced project efficiency in China. Mugambi and Waiganjo (2024) concluded that leadership competencies significantly influenced project implementation success in public infrastructure projects in Kenya, while Uwizeyimana and Nkundabanyanga (2023) found that procurement management practices improved project performance in Rwanda's public construction sector. Although these studies provide valuable evidence, they primarily focused on governance, procurement, leadership, technology, monitoring, and resource management, with limited emphasis on the influence of project scope planning, project resource planning, and project risk planning, particularly in the context of road construction projects in Rwanda.

Despite the Government of Rwanda's continued investment in road infrastructure under Vision 2050 and the National Strategy for Transformation (NST2), some road construction projects continue to experience delays, increasing costs, and implementation challenges associated with inadequate planning practices. Furthermore, limited

empirical evidence exists regarding how project scope planning, project resource planning, and project risk planning influence the performance of district road construction projects such as the Muhanga–Nyange Road Construction Project. Therefore, this study seeks to examine the influence of project planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda, with the aim of generating evidence that can improve project planning practices and enhance the successful implementation of future road construction projects.

This study sought to achieve the following research objective:

To examine the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda

2.1 Literature Review

This section presents a comprehensive review of existing literature related to the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. The review is organized to provide theoretical, conceptual, and empirical insights into the study variables. It examines global, regional, and local studies to identify trends, outcomes, and research gaps, providing a foundation for understanding how Project Planning Practices Influence Performances of Road Construction Project

2.1.1 Project Planning Practices and performance of Road Construction Project

Project planning is a systematic management process through which project objectives, activities, resources, schedules, budgets, and implementation strategies are identified and organized before project execution begins (Project Management Institute [PMI], 2025). It is one of the most important phases of the project life cycle because it establishes the foundation upon which all project activities are implemented and monitored. During this stage, project managers define project deliverables, allocate responsibilities, estimate costs, prepare work schedules, identify required resources, and establish mechanisms for monitoring and controlling project activities. Effective project planning also facilitates communication among project stakeholders by ensuring that everyone clearly understands project objectives, roles, responsibilities, and expected outcomes. In infrastructure projects such as road construction, comprehensive planning minimizes uncertainties, enhances coordination among project participants, and improves decision-making throughout project implementation. Consequently, organizations that invest adequate time and resources in project planning are more likely to complete projects

successfully within the planned scope, budget, quality standards, and schedule (Kerzner, 2022).

Project planning has evolved significantly over the past decades due to technological advancement, increasing project complexity, and growing stakeholder expectations. Modern project planning integrates digital technologies such as Building Information Modeling (BIM), Geographic Information Systems (GIS), Artificial Intelligence (AI), and project management software to improve forecasting, scheduling, budgeting, and resource allocation (Too & Weaver, 2023). These technologies enable project managers to simulate project scenarios, identify potential implementation challenges, and make informed decisions before construction activities begin. Additionally, project planning has become increasingly participatory by encouraging stakeholder engagement during project initiation to ensure that project objectives reflect stakeholder needs and expectations. Effective planning also strengthens accountability by establishing measurable performance indicators that guide monitoring and evaluation throughout the project life cycle. As construction projects continue becoming more sophisticated, organizations increasingly recognize project planning as a strategic management function that enhances efficiency, minimizes implementation risks, and promotes sustainable infrastructure development (PMI, 2025).

In road construction projects, project planning contributes directly to project performance by improving coordination among contractors, consultants, government agencies, financiers, suppliers, and local communities (European Commission, 2024). Through comprehensive planning, project managers are able to anticipate potential delays, estimate realistic budgets, optimize resource utilization, and establish effective risk management strategies before project implementation begins. Proper planning also enhances quality management by ensuring that technical specifications, environmental requirements, procurement procedures, and construction standards are clearly established from the outset. Furthermore, project planning improves transparency and accountability because project progress can easily be monitored against predetermined schedules and performance targets. Consequently, inadequate planning often results in project delays, budget overruns, scope changes, resource shortages, and poor construction quality, whereas effective planning significantly enhances the successful implementation and overall performance of road construction projects (Winch, 2023).

2.1.2 Project scope planning on the performance of Road Construction Project

Project scope planning is the process of determining and documenting all the work that needs to be completed to

achieve the objectives of a project while clearly defining project boundaries, deliverables, and stakeholder expectations (Heldman, 2022). It involves identifying project requirements, establishing specific objectives, preparing a work breakdown structure, defining project activities, and documenting the expected outputs before project implementation begins. Effective scope planning ensures that project stakeholders have a common understanding of the work to be undertaken, thereby minimizing misunderstandings and unrealistic expectations. It also provides a basis for estimating project costs, scheduling activities, allocating resources, and measuring project progress throughout implementation. By clearly defining what is included and excluded from the project, scope planning reduces uncertainty and creates a strong foundation for successful project execution (Meredith, Shafer, & Mantel, 2023).

Effective project scope planning contributes significantly to project success by ensuring that project activities remain aligned with the intended objectives throughout the implementation process (Larson & Gray, 2022). A well-defined project scope enables project managers to coordinate activities efficiently, allocate responsibilities appropriately, and establish realistic performance targets for project teams. Furthermore, it facilitates stakeholder participation during the planning stage, allowing clients, contractors, consultants, and beneficiaries to contribute to defining project requirements before implementation commences. This collaborative approach minimizes conflicts, reduces unnecessary scope changes, and improves communication among project participants. As a result, projects with clearly established scope are less likely to experience implementation delays, cost escalation, duplication of work, and quality deficiencies than projects where scope is poorly defined (Burke, 2023).

In road construction projects, project scope planning is particularly important because these projects involve numerous technical activities, multiple stakeholders, environmental requirements, and substantial financial investments (Nicholas & Steyn, 2022). During the planning stage, project managers define the road alignment, engineering specifications, construction standards, quantities of work, project milestones, environmental protection measures, and stakeholder responsibilities. Clear scope definition also establishes procedures for managing scope changes whenever unforeseen circumstances arise during project implementation. This enhances project control by reducing contract disputes, minimizing design modifications, and ensuring that construction activities remain consistent with the approved project objectives. Consequently, effective project scope planning contributes to timely project completion, improved construction quality, efficient utilization of resources, and higher stakeholder satisfaction, thereby

enhancing the overall performance of road construction projects (Schwalbe, 2024).

2.2 Theoretical Review

The study was anchored on Planning Theory, which provides a theoretical foundation for explaining the influence of project scope planning on the performance of road construction projects. Planning Theory emphasizes systematic decision-making, the formulation of clear objectives, organization of activities, allocation of responsibilities, and preparation for future challenges before implementation begins (Mintzberg, 1994; Bryson, 2023). The theory views planning as an important managerial process through which organizations establish a clear direction for achieving desired outcomes. In project management, this perspective is particularly relevant because construction projects require clear objectives, defined activities, established responsibilities, and coordinated implementation arrangements before execution begins (George, Walker, & Monster, 2022; Kerzner, 2022).

Planning Theory is particularly relevant to this study because project scope planning involves defining project objectives, deliverables, boundaries, activities, and stakeholder requirements before project implementation. A clearly established scope provides a common understanding of what the project is expected to accomplish and what work is required to achieve the intended outcomes (Heldman, 2022; Meredith, Shafer, & Mantel, 2023). Proper scope planning also provides a foundation for project scheduling, cost estimation, resource allocation, monitoring, and control. In road construction projects, where implementation involves complex technical activities and multiple stakeholders, clear scope definition can reduce misunderstandings, unnecessary changes, duplication of activities, and conflicts during implementation (Larson & Gray, 2022; Nicholas & Steyn, 2022).

The theory further assumes that the quality of planning decisions made before implementation can influence the outcomes achieved during project execution. Comprehensive planning enables project managers to establish realistic objectives, organize activities, anticipate implementation challenges, and develop appropriate mechanisms for monitoring progress against predetermined targets (George, Walker, & Monster, 2022; Bryson, 2023). From this perspective, effective project scope planning should help ensure that project activities remain aligned with approved objectives and deliverables throughout implementation. It can also support better control of scope changes by providing procedures for

assessing and approving modifications that may arise during project execution (Burke, 2023; Schwalbe, 2024).

Planning Theory is also applicable to road construction because such projects require clear definition of technical requirements, work activities, construction standards, deliverables, project boundaries, and stakeholder responsibilities. When these elements are adequately established during planning, project managers and other stakeholders can coordinate implementation activities more effectively and monitor whether the project is progressing according to the approved scope (Nicholas & Steyn, 2022; Schwalbe, 2024). Conversely, poorly defined project scope may contribute to scope changes, delays, cost escalation, disputes, and quality problems. Therefore, Planning Theory provides a logical explanation of why effective project scope planning may contribute to improved road construction project performance (Larson & Gray, 2022; Kerzner, 2022).

The application of Planning Theory in this study therefore assumes that effective project scope planning is likely to improve the performance of the Muhanga–Nyange Road Construction Project. Project performance in this study is assessed in terms of timely completion, cost efficiency, quality of work, achievement of project objectives, and stakeholder satisfaction. When project objectives, deliverables, boundaries, and stakeholder requirements are clearly established, implementation teams are expected to have a clearer basis for coordinating activities and controlling project changes (Heldman, 2022; Meredith, Shafer, & Mantel, 2023). Consequently, Planning Theory guides the study in examining whether project scope planning significantly influences the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda.

3. Methodology

This study adopted a systematic methodological approach to examine the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. The methodology covered the research design, target population, sample size, sampling techniques, data collection methods, research instruments, validity and reliability of the instruments, data collection procedures, data analysis methods, and ethical considerations. These methodological procedures were used to collect and analyze relevant information concerning project scope planning as the independent variable and road construction project performance as the dependent variable.

The study adopted a descriptive and explanatory research design. The descriptive design was used to describe the existing project scope planning practices and the performance of the Muhanga–Nyange Road Construction Project. It enabled the researcher to obtain information concerning the definition of project objectives and deliverables, project boundaries, stakeholder requirements, and management of scope changes. The explanatory design was used to determine whether project scope planning influenced project performance and to establish the nature and strength of the relationship between the two variables. The combination of descriptive and explanatory designs was appropriate because the study sought both to describe the existing scope planning practices and to explain their influence on project performance (Saunders et al., 2023; Creswell & Creswell, 2023).

The target population comprised 349 respondents who were directly involved in or associated with the Muhanga–Nyange Road Construction Project in Muhanga District. The population included the Project Manager, Site Engineers, Site Supervisors, Muhanga District Officials, Local Leaders, and project beneficiaries. These categories were selected because they had different forms of involvement in project planning, implementation, supervision, monitoring, and use of the road. The Project Manager, engineers, supervisors, district officials, and local leaders provided information concerning project scope planning and implementation, while beneficiaries provided information concerning their perceptions of project performance. The project records indicated that the target population consisted of 1 Project Manager, 6 Site Engineers, 30 Site Supervisors, 6 Muhanga District Officials, 8 Local Leaders, and 298 beneficiaries, giving a total of 349 respondents.

A sample size of 186 respondents was selected from the target population of 349 respondents using Yamane's formula at a 5% margin of error. The sample consisted of 1 Project Manager, 3 Site Engineers, 16 Site Supervisors, 3 Muhanga District Officials, 4 Local Leaders, and 159 project beneficiaries. Purposive sampling was used to select the Project Manager, Site Engineers, Site Supervisors, Muhanga District Officials, and Local Leaders because they possessed relevant knowledge and experience concerning the planning and implementation of the road construction project. The Project Manager was included through a census approach because only one person occupied this position. Simple random sampling was used to select project beneficiaries so that each beneficiary had an equal opportunity of being selected.

The study used both primary and secondary data to obtain relevant information concerning project scope planning and road construction project performance. Primary data

were collected using structured questionnaires and semi-structured interviews. The questionnaire collected quantitative information concerning project objectives and deliverables, project boundaries, stakeholder requirements, scope change management, and road construction project performance. Interviews were conducted with the Project Manager, Site Engineers, Site Supervisors, Muhanga District Officials, and Local Leaders to obtain detailed information about how the project scope was defined, communicated, monitored, and controlled during implementation. Secondary data were obtained through the review of project reports, progress reports, road construction records, government publications, policy documents, textbooks, journal articles, and other relevant documents.

The researcher obtained an introductory letter from the university and permission from the relevant project and district authorities before commencing data collection. Selected respondents were informed about the purpose of the study and asked to provide informed consent. Structured questionnaires were administered to the selected respondents, while semi-structured interviews were conducted with key project officials and local leaders. Relevant project reports and other documents were also reviewed to supplement the primary data. After collection, the questionnaires were checked for completeness, and the data were organized, coded, and prepared for analysis. All information collected was treated confidentially and used only for academic purposes

The research instruments were subjected to piloting, validity, and reliability assessment before the main data collection exercise. The questionnaire consisted of closed-ended statements measured using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The questionnaire items focused on project scope planning and road construction project performance. Content validity was assessed through expert judgment, while reliability was determined using Cronbach's Alpha. The existing pilot results showed an overall reliability coefficient of 0.849, while project scope planning recorded a Cronbach's Alpha coefficient of 0.821, indicating acceptable internal consistency. These procedures ensured that the research instruments generated consistent and valid information for examining the influence of project scope planning on project performance.

The collected quantitative data were coded, entered, cleaned, and analyzed using SPSS Version 27, while qualitative information obtained from interviews was organized and analyzed thematically. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' characteristics and their perceptions of project scope

planning and project performance. Inferential analysis involved Pearson Product-Moment Correlation to determine the direction and strength of the relationship between project scope planning and project performance.

Simple linear regression analysis was then used to determine the influence of project scope planning on project performance and to test the research hypothesis at a 5% level of significance ($p \leq 0.05$). The regression model was expressed as $Y = \beta_0 + \beta_1 X + \epsilon$, where Y represented road construction project performance, X represented project scope planning, β_0 represented the constant, β_1 represented the regression coefficient, and ϵ represented the error term. The analysis therefore established whether project scope planning had a statistically significant influence on the performance of the Muhanga–Nyange Road Construction Project. Ethical principles were observed throughout the research process, including obtaining permission, informed consent, voluntary participation, confidentiality, anonymity, secure data handling, and honest reporting of findings.

4. Results and Discussion

4.1 Findings

This section presents the findings of the study in relation to the research objective, which examined the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. The findings were presented based on the data collected from the selected respondents and were organized according to the study objective. The analysis focused on project scope planning and road construction project performance. Descriptive and inferential statistical techniques were used to summarize respondents' views and determine the relationship and influence between the study variables.

4.1.1 Response rate

The study targeted a sample size of 186 respondents, comprising 159 respondents who were issued with questionnaires and 27 key informants who participated in interviews. The questionnaires were administered to beneficiaries of the Muhanga–Nyange Road Construction Project, while interviews were conducted with the Project Manager, Site Engineers, Site Supervisors, Muhanga District Officials, and Local Leaders because of their direct involvement in the planning, implementation, supervision, and monitoring of the project. Out of the 159 questionnaires administered, 143 were successfully completed and returned, representing a response rate of 89.9%. All the 27 key informants were successfully

interviewed, resulting in a 100% interview response rate. Overall, 170 out of the targeted 186 respondents

participated in the study, giving an overall response rate of 91.4%.

Table 1: Response Rate of Respondents

Data Collection Method	Target Respondents	Actual Response	Response Rate (%)
Questionnaires	159	143	89.9
Interviews	27	27	100.0
Total	186	170	91.4

Source: Field Data (2026)

The findings in Table 1 indicate that the study achieved an overall response rate of 91.4%, which is considered excellent for statistical analysis. According to Mugenda and Mugenda (2003), a response rate of 70% and above is adequate for analysis and enables researchers to draw reliable conclusions from the collected data. Therefore, the response rate obtained in this study was sufficient to provide reliable information for examining the influence of project scope planning, project resource planning, and project risk planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District.

4.1.2 Descriptive Statistics of project scope planning

The first objective of the study sought to examine the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. Project scope planning was assessed using indicators related to the clarity of project objectives and deliverables, definition of project boundaries, identification of stakeholder requirements, and management of scope changes. Respondents were asked to indicate their level of agreement with statements concerning these aspects using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The descriptive statistics were presented using frequencies, percentages, means, and standard deviations to show respondents' perceptions of project scope planning. The findings are presented in Table 2.

Table 2: Descriptive Statistics on Project Scope Planning

Statements	N	Mean	Std.
The project objectives were clearly defined before implementation.	143	4.29	0.74
The project scope was well communicated to beneficiaries and other stakeholders.	143	4.18	0.81
Changes in project scope were properly managed throughout project implementation.	143	4.12	0.85
Beneficiaries were involved in defining project requirements and priorities.	143	4.05	0.88
The project activities were implemented according to the approved project scope.	143	4.25	0.77
Aggregate Mean/Standard Deviation	143	4.18	0.81

Source: Field Data (2026)

The findings presented in Table 2 reveal that respondents generally agreed that project scope planning was effectively implemented during the execution of the Muhanga–Nyange Road Construction Project. This is evidenced by an aggregate mean score of 4.18 and a standard deviation of 0.81, indicating a high level of agreement among respondents and relatively low variation in their responses. The findings suggest that project scope planning practices were adequately established and contributed positively to the implementation of the project.

The statement "The project objectives were clearly defined before implementation" recorded the highest mean score

(Mean = 4.29; SD = 0.74), indicating that respondents strongly believed that the project commenced with clearly specified objectives. Clearly defined objectives provide a foundation for effective project planning because they establish the expected outputs, guide decision-making throughout implementation, and provide measurable benchmarks for evaluating project success. The relatively low standard deviation further indicates that respondents expressed similar views regarding the clarity of the project's objectives. Similarly, respondents agreed that the project activities were implemented according to the approved project scope (Mean = 4.25; SD = 0.77). This finding suggests that project implementation closely

followed the original scope and planned activities, thereby minimizing unnecessary deviations from the approved work plan. Implementing activities within the approved scope helps control project costs, prevents delays arising from unplanned activities, promotes efficient use of available resources, and increases the likelihood of achieving the intended project outcomes.

The results further indicate that respondents agreed that the project scope was well communicated to beneficiaries and other stakeholders (Mean = 4.18; SD = 0.81). This implies that project implementers ensured that stakeholders understood the project's objectives, planned activities, expected deliverables, and responsibilities throughout implementation. Effective communication of project scope promotes transparency, improves stakeholder coordination, reduces misunderstandings, and enhances cooperation among all parties involved in project implementation. The findings also show that respondents agreed that changes in project scope were properly managed throughout project implementation (Mean = 4.12; SD = 0.85). This suggests that whenever modifications to the project became necessary, appropriate procedures were followed to evaluate and approve such changes before implementation. Effective scope change management helps prevent scope creep, maintains project schedules, minimizes unnecessary expenditure, and ensures that project objectives remain achievable despite emerging challenges during implementation.

Finally, the statement "Beneficiaries were involved in defining project requirements and priorities" obtained the lowest mean score (Mean = 4.05; SD = 0.88), although respondents still agreed with the statement. This indicates that beneficiaries were involved in project planning to a considerable extent; however, their level of participation was comparatively lower than the other aspects of project scope planning assessed in the study. Beneficiary involvement enables project planners to understand community needs, prioritize interventions appropriately, and strengthen stakeholder ownership of the project. The relatively higher standard deviation suggests slight differences in respondents' perceptions regarding the extent of beneficiary participation, possibly reflecting varying experiences among different communities served by the project.

Overall, the descriptive findings demonstrate that project scope planning was effectively undertaken during the implementation of the Muhanga–Nyange Road Construction Project. The consistently high mean scores across all statements indicate that respondents perceived project objectives to have been clearly defined, project activities to have remained within the approved scope, project scope information to have been effectively

communicated, scope changes to have been appropriately managed, and beneficiaries to have been involved in identifying project priorities. These findings suggest that effective project scope planning contributed to improved coordination, better resource utilization, reduced implementation uncertainties, and enhanced overall project performance in Muhanga District.

The qualitative findings obtained from the key informants corroborated the quantitative results presented in Table 4.3. During the interviews, the respondents consistently emphasized that effective project scope planning was one of the major contributors to the successful implementation and performance of the Muhanga–Nyange Road Construction Project.

The Project Manager explained that: *"Before construction activities started, we developed a detailed project scope that clearly defined the project objectives, construction activities, expected deliverables, implementation phases, and responsibilities of different stakeholders. This has helped the project team maintain focus and control unnecessary changes during the ongoing implementation process."* Similarly, one of the Site Engineers stated: *"Any proposed changes to the project scope are reviewed and approved before implementation. This process helps us control scope variations and ensure that current construction activities remain aligned with the approved project requirements."*

A Site Supervisor observed: *"We continuously monitor construction activities to ensure that the work being performed follows the approved project scope. Whenever deviations are identified, corrective measures are taken immediately to maintain progress and quality standards."* A Muhanga District Official remarked: *"The district works closely with the contractor, supervising consultants, and local leaders to ensure that project information is communicated effectively to stakeholders during the implementation period."* Likewise, one of the Local Leaders explained: *"Community members were consulted during the planning stage, and their views continue to be considered during project implementation to ensure that the road construction responds to local priorities."*

The findings of this study are consistent with those reported by Project Management Institute (2021), which established that clearly defining project scope and effectively controlling scope changes significantly improve project performance by reducing scope creep, minimizing unnecessary costs, and ensuring timely completion of project activities. Likewise, Kerzner (2022) found that projects with well-defined objectives, effective scope communication, and structured scope control mechanisms are more likely to achieve their planned cost, schedule, and

quality targets than projects with poorly managed scope. Similarly, Kikwasi (2019) concluded that effective project scope planning enhances the performance of construction projects by improving coordination among stakeholders and ensuring that implementation activities remain aligned with project objectives.

The findings further support the Project Management Body of Knowledge (PMBOK) Guide developed by the Project Management Institute (PMI, 2021), which was discussed in the literature review. The PMBOK Guide explains that project scope management involves defining project objectives, collecting stakeholder requirements, developing a detailed project scope statement, validating deliverables, and controlling scope changes throughout the project life cycle. The high mean scores obtained in this study, together with the interview findings, indicate that these scope management processes were effectively practiced during the implementation of the Muhanga–Nyange Road Construction Project, thereby contributing to its successful performance.

The findings also support the Stakeholder Theory developed by Freeman (1984), which guided this study.

Table 3: Correlation between independent variable and dependent variable

		Project Scope Planning	Project Performance
Project Scope Planning	Pearson	1	
	Correlation		
	Sig. (2-tailed)		
Project Performance	N	143	
	Pearson	.735**	1
	Correlation		
	Sig. (2-tailed)	.000	
	N	143	143

Source: Field data, 2026

The results in Table 3 indicate a strong positive and statistically significant relationship between project scope planning and project performance, with a Pearson correlation coefficient of $r = .735$ and a significance level of $p = .000$ ($p < .01$). This means that improvements in project scope planning are associated with improvements in the performance of the Muhanga–Nyange Road Construction Project. The strong positive correlation suggests that clearly defining project requirements, deliverables, boundaries, and scope-related activities can contribute substantially to better project performance. The finding implies that effective project scope planning is important for successful project performance. Since the relationship is statistically significant, the null hypothesis stating that there is no significant relationship between

The theory argues that successful projects depend on the active involvement and effective management of all stakeholders throughout the project life cycle. The evidence from both the questionnaire responses and the interviews demonstrates that beneficiaries, local leaders, district officials, and the project implementation team were involved in defining project priorities, communicating project scope, and monitoring implementation. Such stakeholder engagement strengthened collaboration, increased stakeholder commitment, minimized conflicts, and enhanced the overall performance of the Muhanga–Nyange Road Construction Project.

4.1.3 Correlation Analysis

To establish whether project scope planning was significantly related to the performance of the Muhanga–Nyange Road Construction Project, Pearson correlation analysis was conducted. The analysis determined the direction, strength, and statistical significance of the relationship between project scope planning and project performance. The results were presented in Table 3:

project scope planning and project performance is rejected. Thus, project scope planning has a significant positive association with the performance of the Muhanga–Nyange Road Construction Project

4.1.4 Regression analysis

Regression analysis was conducted to determine the extent to which project scope planning predicted the performance of the Muhanga–Nyange Road Construction Project. The analysis examined the strength of the overall regression model and determined whether project scope planning had a statistically significant effect on project performance. The results are presented in Table 4

Table 4. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.735 ^a	.540	.537	.24745

a. Predictor: (Constant), Project scope planning (X_1)

The results in Table 3 show that the correlation coefficient ($R = .735$) indicates a strong positive relationship between project scope planning and project performance. The coefficient of determination ($R^2 = .540$) indicates that project scope planning explains 54.0% of the variation in project performance. The remaining 46.0% of the variation in project performance is explained by other factors that are not included in the model. The adjusted R square of .537 confirms that the model maintains a substantial explanatory power after adjustment for the predictor. The finding

implies that project scope planning is an important predictor of project performance in the Muhanga–Nyange Road Construction Project. The relatively high R^2 suggests that proper definition, planning, and management of project scope can contribute considerably to achieving better project performance. However, the model summary alone does not establish whether the regression model is statistically significant; this requires the ANOVA table and coefficients table.

Table 5: ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.142	1	10.142	165.631	.000 ^b
	Residual	8.633	141	.061		
	Total	18.775	142			

a. Dependent Variable: project performance (Y)

b. Predictors: (Constant), project scope planning (X_1)

The ANOVA results show that the regression model was statistically significant, $F(1, 141) = 165.631$, $p = .000$ ($p < .05$). This indicates that project scope planning significantly predicts project performance in the Muhanga–Nyange Road Construction Project. The significant F-statistic demonstrates that the regression model provides a statistically meaningful explanation of variations in project

performance. The finding implies that project scope planning significantly contributes to project performance. Therefore, the null hypothesis that project scope planning has no significant effect on project performance is rejected. This suggests that effective planning and definition of project scope are important for improving the performance of the Muhanga–Nyange Road Construction Project.

Table 6. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.854	.196		4.356	.000
	project scope planning (X_1)	.673	.052	.735	12.870	.000

a. Dependent Variable: Project performance (Y)

The results in Table 6 show that project scope planning has a positive and statistically significant effect on project performance, as indicated by the standardized beta coefficient ($\beta = .735$), $t = 12.870$, and $p = .000$ ($p < .05$). This means that improvements in project scope planning are associated with improvements in the performance of the Muhanga–Nyange Road Construction Project. The significance value of .000 is below the 0.05 level of significance. Therefore, the null hypothesis is rejected, indicating that project scope planning has a statistically

significant positive effect on the performance of the Muhanga–Nyange Road Construction Project

4.2 Discussion of Findings

The descriptive findings showed that project scope planning was generally well implemented in the Muhanga–Nyange Road Construction Project. Respondents indicated that project objectives and deliverables were clearly defined, the project scope was communicated to

stakeholders, scope changes were managed, beneficiaries participated in defining project requirements, and activities were implemented according to the approved scope. The interview findings also confirmed that clear project objectives, defined deliverables, stakeholder responsibilities, and procedures for controlling scope changes supported implementation. These findings are consistent with Project Management Institute (2021), which emphasizes that effective scope definition and control help projects remain aligned with approved objectives and reduce unnecessary changes. They also agree with Kerzner (2022), who emphasizes the importance of clear objectives, scope communication, and scope control in achieving project success. Similarly, Kikwasi (2019) found that effective planning practices improve construction project performance through better coordination and alignment of project activities with intended objectives.

The correlation analysis further established a strong positive relationship between project scope planning and project performance. This indicates that better scope definition, communication, stakeholder involvement, and management of scope changes are associated with better project performance. The finding is consistent with previous evidence from Rwanda, where research on project management practices in road construction reported a positive and significant relationship between project planning practices and project performance. It also supports the argument of Kikwasi (2019) that weaknesses such as scope changes, incomplete planning, and poor coordination can contribute to delays, cost overruns, and other construction project performance problems.

The multiple regression analysis further demonstrated that project scope planning significantly influenced project performance. The model showed that project scope planning accounted for a substantial proportion of the variation in project performance, while the ANOVA results confirmed that the regression relationship was statistically significant. The coefficient results also demonstrated a positive and significant contribution of project scope planning to project performance. This finding is consistent with the study conducted on road construction projects in Rwanda, which found that project planning practices positively affected project performance. The consistency between the correlation and regression findings strengthens the conclusion that project scope planning is an important factor in achieving effective road construction project performance.

The findings are also supported by Planning Theory, which was adopted as the theoretical foundation of the manuscript. Planning Theory emphasizes systematic decision-making, clear objectives, organization of

activities, and preparation for future implementation challenges. In the context of the Muhanga–Nyange Road Construction Project, the theory explains that clearly establishing project objectives, deliverables, boundaries, activities, and stakeholder requirements before and during implementation provides a basis for effective coordination and control. This theoretical explanation is consistent with the empirical findings showing that effective project scope planning was associated with improved project performance. The theory therefore provides a logical basis for explaining why adequate scope planning can contribute to successful road construction project implementation.

5. Conclusion and Recommendations

5.1 Conclusion

The study concluded that project scope planning significantly influenced the performance of the Muhanga–Nyange Road Construction Project in Muhanga District, Rwanda. Effective definition of project objectives and deliverables, clear communication of project scope, proper management of scope changes, beneficiary involvement, and implementation of activities according to the approved scope contributed to improved project performance. The correlation and regression findings confirmed that project scope planning was positively and significantly associated with project performance. Therefore, the study rejected the null hypothesis and concluded that effective project scope planning is essential for successful road construction project implementation.

5.2 Recommendations

Based on the study findings on the influence of project scope planning on the performance of the Muhanga–Nyange Road Construction Project, the following recommendations are made:

1. Project managers and engineers should prepare and approve a detailed project scope statement before commencement of construction, clearly specifying project objectives, deliverables, road works, project boundaries, responsibilities, and expected completion requirements.
2. Muhanga District authorities and project management teams should establish regular stakeholder consultation meetings involving beneficiaries, local leaders, contractors, and consultants during scope planning and implementation to ensure that community requirements and project priorities are clearly incorporated and communicated.
3. The project management team and supervising consultants should establish a

formal scope-change control procedure requiring every proposed modification to be documented, technically assessed, costed, and approved before implementation, in order to minimize unnecessary scope variations, delays, and additional project costs

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