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Project Resource Planning and Performance of Nyakagezi Water Supply Project in Kirehe District, Rwanda

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Abstract: *Project resource planning is important to water-supply project performance because implementation depends on the coordinated use of human, financial, and material resources. This study assessed the effect of project resource planning on the performance of the Nyakagezi Water Supply Project in Kirehe District, Rwanda, with specific attention to human resource planning, financial resource planning, and material resource planning. The target population comprised 227 project employees, from whom a total sample of 143 was proportionately allocated across six occupational strata using stratified random sampling; 139 complete questionnaires were analysed. Primary data were collected through a structured questionnaire, while project and administrative records provided documentary evidence. Quantitative data were analysed using frequencies, percentages, means, standard deviations, Pearson correlation, and multiple regression in SPSS Version 28. Human resource planning ($r = 0.703$, $B = 0.216$, $t = 4.154$, $p < .001$), financial resource planning ($r = 0.763$, $B = 0.287$, $t = 5.857$, $p < .001$), and material resource planning ($r = 0.770$, $B = 0.454$, $t = 8.407$, $p < .001$) were positively and significantly associated with the measured project-performance score. The model accounted for 76.9% of the variation in respondents' project-performance scores. The study concluded that all three resource-planning dimensions were significant predictors within the respondent sample, with material resource planning showing the largest regression coefficient. It recommended periodic staff-capacity reviews, routine budget-to-actual and cash-flow monitoring, and stronger procurement scheduling and stock-control procedures.*

Keywords*: Project Resource Planning, Human Resource Planning, Financial Resource Planning, Material Resource Planning, Project Performance*

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1. Introduction

Project performance in water-supply infrastructure is commonly assessed to the extent to which planned scope, quality, time, cost, service reliability, and stakeholder expectations are achieved. Contemporary project-success perspectives emphasise that performance should be assessed against both implementation efficiency and the value delivered by the completed infrastructure (Ika & Pinto, 2022). In water systems, these expectations include dependable service, controlled expenditure, acceptable technical quality, and continuity of supply.

Across African water projects, performance remains closely connected to implementation capacity, institutional coordination, procurement efficiency, and the availability of technical resources. Evidence from water projects indicates that weak coordination and resource constraints can affect delivery efficiency and maintenance, while stronger planning practices are associated with more reliable implementation processes (Siele, 2023). These conditions make resource planning particularly relevant to infrastructure projects operating under constrained administrative and financial environments.

In Rwanda, water-supply projects are implemented within decentralised sector arrangements that require coordination between project teams, districts, and national institutions. Project performance is expected to reflect timely implementation, quality infrastructure, cost control, service continuity, and responsiveness to users. National water and sanitation planning consequently places emphasis on resource alignment, institutional coordination, and performance monitoring as part of sustainable infrastructure delivery (Ministry of Infrastructure, 2024).

Evidence from Rwandan water projects shows that planning and monitoring practices can be associated with project outcomes, although findings are not automatically transferable from one project to another. Muvunyi (2025), for example, examined monitoring and evaluation practices in the Rubona Water Supply Project and linked those practices to sustainability outcomes. Nkuranga and Bazimya (2025) likewise examined comprehensive project planning in the Nzove Water Supply Project, demonstrating the importance of project-specific evidence when interpreting performance.

The Nyakagezi Water Supply Project formed the focal organisational context for this study. Rather than presuming that the project had failed, the study assessed respondents' perceptions of scope, quality, timeliness, cost management, service-sustainability potential, and stakeholder satisfaction, and examined how those outcomes were statistically associated with human, financial, and material resource planning. This focus created a direct transition from the broader water-sector performance concern to the specific empirical question investigated in Kirehe District.

The Nyakagezi Water Supply Project operates within Kirehe District, where water-infrastructure expansion has increased the scale of implementation and the need for coordinated project resources. Available district-level evidence establishes the importance of water infrastructure and the scale of service expansion, but the material supplied for this study does not provide independently verified project records demonstrating a specific Nyakagezi cost overrun, schedule delay, or quality failure. The research problem was therefore framed as an evidence gap concerning the relationship between resource planning and measured project performance, rather than as an assumed case of project failure.

Research from other sectors also indicates that workforce planning, financial control, and material management can be related to organisational or project outcomes, but differences in sector, project scale, measurement, and implementation context limit direct transfer of those findings to a district water-supply project. What remained insufficiently established was whether each of the three resource-planning dimensions was significantly associated with the performance indicators measured among Nyakagezi project personnel.

1.1 General Objective

The purpose of this study is to assess the effect of Project resource planning on performance of Nyakagezi water supply system project in Kirehe District, Rwanda.

1.2 Specific Objectives

This study had the following specific objectives:

i. To assess the effect of human resource planning on performance of Nyakagezi water supply system project in Kirehe District, Rwanda.

ii. To determine the effect of financial resource planning on performance of Nyakagezi water supply system project in Kirehe District, Rwanda.

iii. To examine the effect of material resource planning on performance of Nyakagezi water supply system project in Kirehe District, Rwanda.

2. Literature Review

This section reviews empirical and theoretical literature on project resource planning and project performance.

2.1 Theoretical Review

The theoretical framework explains why human capabilities, stakeholder relationships, and internally controlled resources may be associated with project performance. Human Capital Theory, Stakeholder Theory, and Resource-Based View were retained because each addresses a different aspect of the study variables and together provide a basis for interpreting the findings.

2.1.1 Human Capital Theory

Midway through the twentieth century, Human Capital Theory was created by Gary Becker and Theodore Schultz. Value of healthcare, education, and training as a whole is calculated. Human capital, which encompasses a person's education, work history, and other relevant experiences, is believed to boost productivity and GDP expansion (Goldin, 2024). Similar to how investments in human capital might boost earnings in the short term, these investments pay off in the long run.

Human Capital Theory informed the human resource planning objective by explaining why staff competence, training, experience, and appropriate deployment may contribute to implementation performance. Its limitation is that it can understate institutional, financial, and

material constraints; consequently, it was used to interpret the human-resource dimension rather than as a complete explanation of project performance.

2.1.2 Stakeholder Theory

Stakeholder Theory, first proposed in 1984 by R. Edward Freeman, posits that firms need to consider the welfare and interests of all stakeholders, not only shareholders. Any individual or group whose interests are impacted by an organization's operations is considered a stakeholder. All members of society, including workers, clients, vendors, and even governments, are included in this. Putting the needs of all stakeholders first leads to more ethical and environmentally friendly business practices, according to this theory, which questions the traditional focus on shareholder primacy (Gutterman, 2023). It is believed that companies will achieve more success in the long run if they actively include and meet the needs of their stakeholders.

Stakeholder Theory supported interpretation of financial and coordination practices by emphasising accountability, communication, and the interests of parties affected by project decisions. The theory is useful for understanding transparent budgeting, supplier relationships, and stakeholder expectations, although it does not by itself specify the technical resource requirements of infrastructure delivery.

2.1.3 Resource-Based View Theory

In 1991, Barney updated Wernerfelt's Resource-Based View (RBV) concept from 1984 so that companies may better understand their competitive advantage. The real drivers of an organization's success, according to RBV, are not external variables like market conditions or competition, but rather the organization's internal skills (Putra et al., 2021). This theory states that the unique mix of a company's physical assets, reputation, and intellectual capital among intangible resources determines the firm's capacity to outperform rivals.

The Resource-Based View informed the material and broader resource-planning dimensions by emphasising the value of internally controlled resources and capabilities. In this public-infrastructure study, the theory was applied to the effective deployment of people, finance, materials, and organisational capabilities rather than to competitive advantage. Its firm-level origins therefore constitute a limitation when it is transferred to a public water supply project.

2.2 Empirical Review

Rono et al. (2023), in the study 'Influence of Human Resource Planning on Project Performance in Konoin Sub County,' used a quantitative census-based approach and analysed the data using descriptive statistics and regression. The study reported that stronger human resource planning was associated with improved project performance and recommended targeted training for management teams. Its education-sector setting, however, differs from a water-infrastructure project that relies on engineers, technicians, procurement staff, finance personnel, and construction labour.

From the vantage point of Dar es Salaam, Tanzania's Kinondoni Municipal Council, another research examined HRP procedures and service provision. The study identified challenges such as inaccurate workforce forecasting, labor turnover, seasonal employment, market volatility, and technological changes that constrained effective human resource planning. Although the council practiced internal recruitment, promotions, and transfers, limited strategic involvement of the human resource function reduced effectiveness (Mikongo, 2020). The study proposed the adoption of specialized information systems and supportive policy frameworks to enhance human resource planning and motivation in local government institutions.

Aradukunda and Sikubwabo (2024), in 'Influence of Financial Resources Management on Project Performance in Public Institutions: A Case of Kigali City (2018-2022),' used questionnaires, interviews, document review, stratified sampling, descriptive analysis, and regression. The study found that stronger financial planning and control were associated with better project performance. The Kigali public-institution setting provides relevant Rwandan evidence, although it does not isolate the financial requirements of a single rural water-supply infrastructure project.

An agricultural study out of Nakuru County, Kenya, looked at how financial planning affected the success of floriculture initiatives. The research used questionnaires and descriptive and inferential statistics, guided by control theory. The findings demonstrated that financial planning accounted for a significant percentage of the variance in project performance, suggesting that better financial planning enhances the stability and success of projects (Kamau et al., 2023). To improve efficiency and sustainability, the research stressed that project management approaches should include financial planning.

An empirical study examined the effects of material management tasks on building project performance, including planning, providing, logistics, transportation, stocking, and waste control. Data was collected from construction crews using structured questionnaires and analyzed using multiple regression analysis. Results showed that although material handling, inventory and waste management, and supply improved project performance as a whole, material planning and logistics had no such effect (Yıldız et al., 2024). The research underscored the necessity of enhancing material management methods to enhance the performance of building projects.

Additional information was sourced from the construction sector, namely descriptive and multi-regression studies that investigated the impact of material management on project outcomes. Information acquired from several construction sites indicates that material procurement had a negative impact on project performance, whereas material planning, transportation, handling, stock and waste management had a positive effect (Asefa, 2021). According to the study, material management systems may need significant improvement to increase project performance and decrease inefficiencies.

3. Methodology

This section describes the methodology used to examine project resource planning and performance, including the research approach and design, study location, target population, sampling, instruments, pilot testing, validity and reliability, data-collection procedures, analysis, and ethical considerations.

3.1 Research Design

A descriptive and correlational research design was used. The descriptive component summarised respondents' assessments of resource-planning practices and project performance, while the correlational component examined the direction and strength of statistical relationships among the measured variables.

The descriptive survey generated quantitative evidence on human resource planning, financial resource planning, material resource planning, and project performance. The unit of observation was the individual project employee responding to the questionnaire, while the unit of analysis was the set of respondent-level perceptions concerning one project, the Nyakagezi Water Supply Project.

Pearson correlation and multiple regression were used to estimate associations among the respondent-level composite scores. The analysis did not treat the 139 respondents as 139 independent projects; therefore, the inferential results were interpreted within the Nyakagezi project context and were not used to claim national causal effects.

3.2 Study Population

The target population comprised 227 stakeholders directly involved in the Nyakagezi Water Supply Project. These categories formed the sampling frame because their members were directly involved in planning, allocating, using, or supervising project resources.

3.3 Sampling Design

The study adopted the Krejcie and Morgan (1970) formula, ensuring proportional representation across all categories of the project team. The study used proportionate stratified random sampling. The target population comprised 227 project employees, from whom a total sample of 143 was proportionately allocated across six occupational strata using stratified random sampling.

3.4 Data Collection Instruments

The questionnaire was the main quantitative instrument. It contained respondent-identification items and four six-item scales covering human resource planning, financial resource planning, material resource planning, and project performance, giving 24 substantive Likert items in the final instrument. Each substantive item used a five-point scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The closed-ended format supported consistent coding and statistical analysis across the sampled occupational groups.

Documentation also served as a complementary method of data collection. According to Alabi (2023), documentation involves the use of existing written records and reports to supplement primary data. Secondary data for this study was drawn from project progress reports, district performance reviews, financial audits, and related government publications on water supply projects.

3.5 Pilot Study, Validity and Reliability

Fourteen participants, approximately 10% of the planned questionnaire sample, took part in the pilot in Rwamagana District and were excluded from the main study. Feedback from the pilot was used to refine wording and improve the final questionnaire before administration to the Nyakagezi sample.

Content validity was assessed through expert review of the draft questionnaire. Reviewers evaluated whether the proposed items adequately represented the intended study variables. The CVI therefore provided evidence of content relevance; it was not treated as proof of every form of validity.

The study shows that all four six-item scales exceeded the 0.70 criterion: human resource planning recorded an alpha of 0.811, material resource planning 0.840, financial resource planning 0.821, and project performance 0.871. These coefficients indicated acceptable internal consistency in the pilot sample and supported use of the refined questionnaire in the main data collection.

3.6 Data Analysis

Quantitative data from the 139 complete questionnaires were coded and analysed in SPSS Version 28. Frequencies and percentages described categorical responses, while means and standard deviations summarised the Likert items. Composite scores for each construct were based on the six substantive items for that scale; no reverse-coded items were used. Mean scores were interpreted as follows: 1.00-1.80 = very low, 1.81-2.60 = low, 2.61-3.40 = moderate, 3.41-4.20 = high, and 4.21-5.00 = very high. Pearson correlation and multiple regression were used to assess statistical associations at the 0.05 significance level. A standard deviation of 0.50 or below was treated as relatively homogeneous for item-level interpretation, while values above 0.50 indicated greater dispersion.

To evaluate the connection between project resource planning and performance, a regression model was developed. This model was stated as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where:

Y = Project Performance

X_1 = Human Resource Planning

X_2 = Financial Resource Planning

X_3 = Material Resource Planning

β_0 = Constant term

β_1, β_2, β_3 = Coefficients of the independent variables

3.7 Ethical Considerations

Several ethical measures were therefore strictly observed in this study to ensure adherence to these principles. All procedures respected participant autonomy, confidentiality, and anonymity, while data collection and reporting complied with academic integrity and national data protection regulations. Mount Kenya University formally requested access to the Nyakagezi Water Supply Project by presenting a letter of authorization to the appropriate Kirehe District authorities, outlining the goals of the research. To ensure openness and conformity with institutional and governmental ethical regulations, the study did not proceed until permission had been given.

4. Result and Discussions

This section presents the statistical findings from the 139 complete questionnaires, followed by the objective-based discussion.

4.1 Response Rate

The response rate indicates the proportion of the planned questionnaire sample that provided usable data. A high response rate improves coverage of the selected sample, although it does not by itself eliminate possible non-response or measurement bias.

Table 1: Response Rate of Respondents

Questionnaire	Frequency	Percentage
Returned and completed	139	97.2%
Incomplete	1	0.7%
Unreturned	3	2.1%
Total	**143**	**100.0%**

Source: Field data, 2026

Of the 143 questionnaires distributed, 139 were returned complete and analysed, representing 97.2% of the planned sample. One questionnaire was incomplete and excluded from analysis, while three were not returned. The achieved response provided substantial coverage of the selected sample; however, the response rate was not treated as independent evidence that the measurements were unbiased or valid.

4.2 Inferential Statistics

Inferential analysis examined the statistical associations between the respondent-level scores for human resource planning, financial resource planning, material resource planning, and project performance. Pearson correlation assessed bivariate relationships, while multiple regression estimated the unique association of each predictor with the measured performance score when the other predictors were held constant.

4.2.1 Correlation Analysis

To determine how closely related the water project's performance was to the resource planning aspects, this research used correlation analysis. The direction and intensity of these correlations are shown by the Pearson Correlation coefficient (r), and their statistical significance is determined by the p-value.

Table 2: Correlations

		Human Resource Planning	Materials Resource Planning	Financial Resource Planning	Project Performance
Human Resource Planning	Pearson Correlation	1	.536**	.667**	.703**
	Sig. (2-tailed)		< .001	< .001	< .001
	N	139	139	139	139
Materials Resource Planning	Pearson Correlation	.536**	1	.589**	.770**
	Sig. (2-tailed)	< .001		< .001	< .001
	N	139	139	139	139
Financial Resource Planning	Pearson Correlation	.667**	.589**	1	.763**
	Sig. (2-tailed)	< .001	< .001		< .001
	N	139	139	139	139
Project Performance	Pearson Correlation	.703**	.770**	.763**	1
	Sig. (2-tailed)	< .001	< .001	< .001	
	N	139	139	139	139

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

Source: Field Data, 2026

Table 2 presents the Pearson correlation results between human resource planning, financial resource planning, material resource planning and the performance of the Nyakagezi Water Supply Project.

Human resource planning had a strong positive and statistically significant relationship with project performance ($r = 0.703$, $p < .001$). Higher scores for recruitment, allocation, training, retention, and succession planning were therefore associated with higher respondent-rated project-performance scores.

Financial resource planning had a strong positive and statistically significant relationship with project performance ($r = 0.763$, $p < .001$). Higher scores for budgeting, forecasting, financial allocation, monitoring, cash-flow management, and risk management were associated with higher project-performance scores.

Material resource planning recorded the strongest bivariate relationship with project performance ($r = 0.770$, $p < .001$). Higher scores for estimation, procurement, inventory control, distribution, storage, and supplier management were associated with higher respondent-rated performance.

All three resource-planning dimensions were positively and significantly associated with the measured project-performance score. Material resource planning had the largest bivariate correlation, followed by financial resource planning and human resource planning.

4.2.2 Regression Analysis

Multiple regression was used to estimate the combined explanatory power of the three resource-planning scores and the unique association of each predictor with project performance. The model summary reports explained variance, ANOVA assesses the overall regression model, and the coefficients table reports the contribution of each predictor.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.877[a]	.769	.764	.18941	1.685

a. Predictors: (Constant), Financial Resource Planning, Materials Resource Planning, Human Resource Planning

b. Dependent Variable: Project Performance

Source: Field Data, 2026

Table 3 presents the regression model summary for the combined influence of human, financial and material resource planning on project performance. The coefficient of multiple correlation was 0.877, indicating a strong relationship between the combined resource-planning variables and project performance.

The R Square value of 0.769 indicates that the three resource-planning scores collectively accounted for 76.9% of the variation in the measured project-performance scores within the 139-respondent sample. The remaining variation represents residual variability, including measurement error and influences not captured by the fitted predictors; it should not be attributed to specific external factors without additional evidence.

The adjusted R Square value of 0.764 shows that the model maintained strong explanatory power after adjusting for the number of independent variables. The standard error of the estimate was 0.18941, indicating that the model's predicted values were relatively close to the observed project-performance values. The Durbin-Watson statistic was 1.685. This value does not indicate an obvious residual-dependence problem, but it does not by itself verify all regression assumptions. The reported VIF values in the coefficients table address multicollinearity; conclusions from the model were therefore kept within the limits of the cross-sectional respondent data.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.152	3	5.384	150.081	< .001
	Residual	4.843	135	.036		
	Total	20.995	138			

a. Dependent Variable: Project Performance

b. Predictors: (Constant), Financial Resource Planning, Materials Resource Planning, Human Resource Planning

Source: Field Data, 2026

Table 4 presents the analysis of variance for the regression model. Using the displayed sums of squares and degrees of freedom, the model F-statistic is 150.081, and the overall significance is $p < .001$. The overall regression model was statistically significant, indicating that the three resource-planning scores jointly explained a significant proportion of variation in respondent-rated project performance. The ANOVA result supports use of the fitted model for examining associations within this sample; it does not, on its own, establish that resource planning caused the observed project-performance outcomes.

Table 5: Coefficients

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.201	.199		1.010	.313		
	Human Resource Planning	.216	.052	.236	4.154	< .001	.524	1.910
	Materials Resource Planning	.454	.054	.439	8.407	< .001	.617	1.622
	Financial Resource Planning	.287	.049	.348	5.857	< .001	.480	2.083

a. Dependent Variable: Project Performance

Source: Field Data, 2026

Table 5 presents the individual contribution of human, financial and material resource planning to project performance when the other variables were controlled.

Human resource planning had a positive and statistically significant regression coefficient ($B = 0.216$, $t = 4.154$, $p < .001$). Holding the other predictors constant, a one-unit increase in the human-resource planning score was associated with a 0.216-unit increase in the measured project-performance score.

The standardised coefficient for human resource planning was 0.236 and the VIF was 1.910. The VIF does not indicate problematic multicollinearity for this predictor, and the coefficient remained statistically significant in the fitted model.

Financial resource planning had a positive and statistically significant regression coefficient ($B = 0.287$, $t = 5.857$, $p < .001$). Holding the other predictors constant, a one-unit increase in the financial-resource planning score was associated with a 0.287-unit increase in the measured project-performance score.

The standardised coefficient for financial resource planning was 0.348 and the VIF was 2.083. The reported VIF remained below conventional multicollinearity thresholds.

Material resource planning had the largest positive regression coefficient ($B = 0.454$, $t = 8.407$, $p < .001$). Holding human and financial resource planning constant, a one-unit increase in the material-resource planning score was associated with a 0.454-unit increase in the measured project-performance score.

The standardised coefficient for material resource planning was 0.439 and the VIF was 1.622. Within the fitted model, material resource planning therefore had the largest unique statistical association with project performance among the three predictors.

The constant recorded a coefficient of 0.201 and a significance value of 0.313. Since its significance value was above 0.05, the constant was not statistically significant. However, this did not affect the statistical significance of the three independent variables.

The estimated regression model was expressed as follows:

$$Y = 0.201 + 0.216X1 + 0.287X2 + 0.454X3 + e$$

Where:

Y = Project Performance

X1 = Human Resource Planning

X2 = Financial Resource Planning

X3 = Material Resource Planning

e = Error term

4.2.3 Decision on Null Hypotheses

The decisions on the three null hypotheses are presented using the 0.05 significance level.

Table 6: Decision on Null Hypotheses

Null Hypothesis	Sig. Value	Decision
H01: Human resource planning does not have a statistically significant effect on performance.	< .001	Rejected
H02: Financial resource planning does not have a statistically significant effect on performance.	< .001	Rejected
H03: Material resource planning does not have a statistically significant effect on performance.	< .001	Rejected

Source: Field Data, 2026

Table 6 presents the decisions on the three null hypotheses. Human resource planning, financial resource planning, and material resource planning each recorded $p < .001$, below the 0.05 level of significance.

The first null hypothesis stated that human resource planning did not have a statistically significant effect on project performance. The hypothesis was rejected because human resource planning had a positive and statistically significant coefficient.

The second null hypothesis stated that financial resource planning did not have a statistically significant effect on project performance. The hypothesis was rejected because financial resource planning had a positive and statistically significant effect on the performance of the Nyakagezi Water Supply Project.

The third null hypothesis stated that material resource planning did not have a statistically significant effect on project performance. The hypothesis was also rejected because material resource planning had a positive and statistically significant effect on project performance.

The hypothesis tests therefore indicate that all three resource-planning dimensions were statistically significant predictors of the respondent-rated project-performance score within the fitted model.

4.3 Discussion of Research Findings

This section discusses the quantitative findings in relation to the study objectives, relevant empirical literature and the theories underpinning the study. The discussion establishes how the findings of the Nyakagezi Water Supply Project compare with previous research concerning resource planning and project performance.

4.3.1 Human Resource Planning and Project Performance

The first objective examined the influence of human resource planning on the performance of the Nyakagezi Water Supply Project. The descriptive findings showed a high level of agreement that the project applied effective recruitment, allocation, training, retention, employee-development and succession-planning practices. Training received the highest rating, demonstrating that respondents particularly valued activities that improved employees' technical competence.

The inferential findings showed a strong positive correlation between human resource planning and project performance, and the regression coefficient remained positive and statistically significant after the other predictors were controlled. The first null hypothesis was therefore rejected, supporting a statistical association within the fitted model rather than proof of causation.

These findings agree with Rono et al. (2023), who observed that adherence to fundamental project-planning principles improves value for money through effective management of human resources. The findings also correspond with Mikongo (2020), who reported that proper workforce forecasting and strategic involvement of the human resource function improve service delivery in local government institutions.

The results are also consistent with Aryal and Singh (2023), who established that strategic workforce planning is positively associated with organisational performance. In the context of the Nyakagezi Water Supply Project, the availability of qualified and appropriately allocated employees enabled project plans to be converted into actual construction outputs.

The findings further support Human Capital Theory, which considers employees' knowledge, experience and competencies to be productive assets. Goldin (2024) explained that investments in training and education generate long-term benefits through improved productivity and operational performance. The findings from the project demonstrate this theoretical relationship because staff training improved technical competence, problem-solving ability and execution of water infrastructure activities.

4.3.2 Financial Resource Planning and Project Performance

The second objective examined the influence of financial resource planning on project performance. The descriptive findings demonstrated a high level of agreement regarding financial budgeting, forecasting, allocation, monitoring, cash-flow management and financial risk management. Systematic budgeting obtained the highest rating, indicating that expenditure control and efficient utilisation of funds were central to project implementation.

The correlation findings showed a strong positive relationship between financial resource planning and project performance, while financial resource planning also retained a positive and statistically significant coefficient in the regression model. The second null hypothesis was therefore rejected, indicating a significant association within the respondent sample.

The findings agree with Aradukunda and Sikubwabo (2024), who concluded that effective financial resource management improves the outcomes of public infrastructure projects. Proper financial planning ensures that funds are available for planned activities and that expenditure is controlled according to approved budgets.

The results also correspond with Kamau et al. (2023), who observed that financial planning improves project stability and success. Accurate forecasting, timely allocation and cash-flow management reduce the possibility that project activities will be suspended because of inadequate funding. In the Nyakagezi Water Supply Project, financial planning supported the procurement of materials, payment of suppliers and implementation of construction activities.

The findings may also be interpreted through Stakeholder Theory. Gutterman (2023) maintained that transparent management practices enable organisations to respond ethically and sustainably to the interests of different stakeholders. Transparent budgeting and timely payment of suppliers strengthened accountability and protected relationships with contractors, employees, community representatives and project beneficiaries.

4.3.3 Material Resource Planning and Project Performance

The third objective examined the influence of material resource planning on project performance. The descriptive findings showed a high level of agreement regarding material estimation, procurement, inventory control, distribution, storage and supplier management. Material estimation obtained the highest rating, demonstrating the importance of accurately determining the quantities and types of materials required for implementation.

Material resource planning recorded the strongest correlation with project performance and the largest regression coefficient among the three predictors. It remained statistically significant after human and financial resource planning were controlled, so the third null hypothesis was rejected. The result indicates the largest statistical association in this model, not proof that material planning alone determined project success.

The current findings should be compared cautiously with Yıldız et al. (2024). That study reported positive effects for several material-management activities but found that material planning and logistics did not show the same positive effect. The difference suggests that material-management dimensions may operate differently across construction settings and that the present positive association should not be treated as universally established.

Asefa (2021) likewise reported mixed evidence: material planning, transportation, handling, stock control, and waste management were positively related to performance, whereas procurement showed a negative effect. This contrasts with the generally positive Nyakagezi ratings for procurement and highlights the importance of project context, measurement, and procurement conditions when interpreting material-resource findings.

The findings further support the Resource-Based View. Putra et al. (2021) argued that an organisation's physical resources and internal capabilities determine its ability to

achieve superior performance. In the project under study, materials only contributed to performance when they were combined with internal capabilities such as procurement planning, inventory management, storage and logistics coordination.

5. Conclusion and Recommendations

This section presents the conclusions and recommendations arising from the three specific objectives.

5.1 Conclusions

The conclusions answer each specific objective on the basis of statistical evidence and remain bounded to the Nyakagezi Water Supply Project and the study period.

Human resource planning was positively and significantly associated with project performance. The evidence indicates that recruitment, allocation, training, employee development, retention, and succession planning are relevant to performance in this project, but the design supports an association rather than proof of a causal effect.

Financial resource planning was positively and significantly associated with project performance. Budgeting, forecasting, allocation, cash-flow control, monitoring, and financial risk management were therefore important management practices within the project, although the evidence does not establish that these practices prevented every financial problem or delay.

Material resource planning was positively and significantly associated with project performance and showed the largest regression coefficient among the three resource-planning dimensions. Estimation, procurement, inventory control, handling, storage, distribution, and supplier management therefore warrant particular attention, while the findings should not be interpreted as proof that material planning eliminated all delays or losses.

Overall, the study concludes that human, financial, and material resource planning were each significantly associated with respondent-rated project performance in the Nyakagezi Water Supply Project, with material resource planning showing the largest statistical contribution in the fitted model. The conclusion is limited to perceptions and evidence from one project during the defined study period and does not establish long-term or nationwide causal effects.

5.2 Recommendations

The recommendations are derived from the objective-specific findings and identify the responsible project actors and practical review intervals.

1. The Project Manager and Site Engineers should maintain a quarterly competency review linked to the project's skills requirements and use the results to plan targeted technical training and staff deployment.
2. Technical and supporting staff should participate in the agreed capacity-development activities, while project management should review retention and succession arrangements at least twice each year to preserve continuity in specialised functions.
3. Project management should maintain periodic internal expenditure reviews and documented approval controls. The finance function should track outstanding supplier obligations and funding requirements using the existing financial records, with corrective actions followed up at the next monthly review.
4. The Procurement Officer and Logistics Coordinator should maintain a procurement schedule and stock-control register that links expected material requirements to the construction programme. Because inventory and distribution showed the greatest response variation, stock balances and pending deliveries should be reconciled weekly and exceptions reported to the Project Manager.

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