

Project Cost Management Strategies and Performance of Water Projects in Nairobi City County, Kenya

¹Julius Kiptoo & ²Dr. Paul Machoka

¹Postgraduate student, Jomo Kenyatta University of Agriculture and Technology

²Lecturer, Jomo Kenyatta University of Agriculture and Technology

Abstract

Despite significant initiatives aimed at improving water access in Nairobi City County, many communities continue to face challenges in obtaining clean and reliable water. Existing literature underscores the critical role of project cost management in the successful implementation of infrastructure projects. Therefore, a study investigating the influence of cost management strategies on the performance of water projects in Nairobi provides essential insights into the unique challenges and opportunities specific to this urban environment, while addressing existing gaps in understanding the relationship between cost management and project outcomes. This study focuses on specific objectives that assess the effects of financial resource allocation, financial monitoring and control, risk management, and procurement cost-saving strategies on water project performance. The study was grounded in Activity-Based Costing Theory, Agency Theory, Risk Management Theory, and Transaction Cost Economics Theory. A descriptive research design was adopted, targeting 100 employees from Engineering, Internal Audit and Risk, Supply Chain, Operation and Maintenance, and Finance departments. A census sampling approach was employed, and data was collected using a structured questionnaire. Pilot test results confirmed strong validity and reliability. Data was collected via structured questionnaires distributed physically and digitally to 100 Nairobi City County employees across five departments, with confidentiality assured to encourage honest responses. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 29, employing descriptive and inferential statistics including frequencies, percentages, mean, standard deviation, correlation analysis, and multiple regression analysis. Descriptive statistics revealed below-neutral perceptions across all cost management strategies and water project performance. Multiple regression analysis indicated that the four strategies collectively explained 68.1% of the variance in water project performance ($R^2 = 0.681$, $F = 45.126$, $p < 0.001$). All four variables had significant positive effects: procurement cost-saving strategies had the strongest influence ($\beta = 0.312$, $p = 0.002$), followed by financial resource allocation ($\beta = 0.287$, $p = 0.003$), financial monitoring and control ($\beta = 0.245$, $p = 0.007$), and risk management cost strategies ($\beta = 0.198$, $p = 0.034$). All four null hypotheses were rejected. Qualitative findings revealed that respondents advocated for digital financial systems, stakeholder engagement, performance-based contracting, and capacity building. Key challenges included inadequate budgeting, delayed fund disbursements, procurement inefficiencies, and scope changes. The study concludes that financial resource allocation, financial monitoring and control, risk management cost, and procurement cost-saving strategies all significantly influence water project performance. The study recommends that Nairobi City County Government strengthen financial resource allocation through Activity-Based Costing, enhance financial monitoring via real-time tracking, invest in risk management frameworks, and promote procurement cost-saving strategies including competitive bidding and framework contracts.

Keywords: *Financial resource, financial monitoring, risk management cost, procurement cost-saving, water project performance.*

1.1 Background of the Study

Project cost management is critical in the successful execution of water infrastructure projects because it supports effective planning, monitoring, and control of project expenditures. Water projects require proper resource optimization and budget discipline to ensure that they are completed within the approved cost, time, and quality standards. In Nairobi City County, effective project cost management is especially important due to increasing urban water demand, rapid population growth, aging infrastructure, and continued pressure on water service delivery systems. Globally, water infrastructure projects continue to experience cost overruns, delays, and financial inefficiencies. Countries such as the United States, Australia, Canada, Russia, and China have adopted cost management strategies such as value engineering, lifecycle cost analysis, real-time financial tracking, integrated project management systems, Building Information Modelling, and predictive analytics to improve project delivery. However, despite these efforts, many water projects still face challenges related to unforeseen expenditures, inflation, poor risk assessment, bureaucratic delays, supply chain disruptions, and environmental uncertainties. This shows that strong and adaptive cost management strategies are necessary for improving the performance and sustainability of water projects.

In Africa, water project performance is affected by financial constraints, governance weaknesses, resource mismanagement, rapid urbanization, climate variability, and inconsistent funding. Countries such as Uganda, Tanzania, South Africa, Nigeria, Egypt, and Ethiopia continue to experience delayed or incomplete water projects due to poor cost estimation, inflation, procurement weaknesses, and weak accountability systems. Although some countries have introduced reforms such as public-private partnerships, cost-reflective tariff models, centralized procurement, and phased financing, challenges such as corruption, contractual disputes, political interference, and climate-related risks continue to affect project cost performance. This highlights the need for stronger institutional frameworks, transparent financial systems, and climate-resilient cost planning in African water projects.

In Kenya, water infrastructure development remains a national priority because access to clean and reliable water is central to public health, economic growth, and social development. However, the sector continues to face challenges such as erratic funding, poor contractor selection, delayed disbursements, weak oversight, corruption, and climate-induced water shortages. Although the government has implemented major water projects such as the Northern Water Collector Tunnel and the Thwake Multipurpose Dam, audit reports show that many water projects experience budget overruns and delays. These challenges indicate that effective financial resource allocation, financial monitoring and control, risk management, and procurement cost-saving strategies are necessary for improving water project outcomes.

In Nairobi City County, water projects play a vital role in addressing the shortage of clean and reliable water for a rapidly growing urban population. However, the county continues to struggle with inadequate infrastructure, inaccurate cost estimation, weak financial monitoring, governance challenges, delayed implementation, and inflated budgets. Reports indicate that many water projects in Nairobi exceed their initial budgets and fail to meet planned completion timelines. Over 30% of Nairobi residents lack reliable water access, while more than half of water projects reportedly experience budget overruns and delays. These inefficiencies reduce service delivery, strain public resources, and weaken the capacity of water projects to meet the needs of residents.

The performance of water projects in Nairobi City County is therefore closely linked to how project costs are planned, allocated, monitored, controlled, and saved during procurement. Poor cost management contributes to delayed completion, budget overruns, compromised quality,

and weak service delivery. This study therefore examined the relationship between project cost management strategies and the performance of water projects in Nairobi City County. Specifically, it focused on financial resource allocation strategies, financial monitoring and control strategies, risk management cost strategies, and procurement cost-saving strategies as key factors influencing water project performance in terms of budget adherence, timely completion, and quality standards.

1.2 Statement of the Problem

The efficient management of water infrastructure projects in Nairobi City County represents a critical development challenge with far-reaching implications for urban sustainability. In an optimal scenario, water projects would demonstrate rigorous cost containment, strict adherence to project timelines, and consistent delivery of high-quality infrastructure to meet the needs of Nairobi's growing population. However, the current operational reality reveals systemic deficiencies in project cost management that undermine these objectives. This problematic disconnect between intended and actual project outcomes constitutes a significant barrier to achieving water security in Kenya's capital city.

The core problem manifests as chronic cost overruns, schedule delays, and quality shortfalls in water infrastructure projects across Nairobi County. Recent project audits reveal that 67% of major water initiatives exceeded their original budgets by an average of 38% (Controller of Budget, 2023), while completion timelines were extended by 42% beyond planned durations (Nairobi City County Project Monitoring Report, 2023). These systemic failures occur despite the existence of formal project management frameworks and substantial investments in the water sector. The Nairobi City Water and Sewerage Company (NCWSC) reports that only 58% of its capital projects in the 2021-2023 period achieved their intended outputs (NCWSC Annual Report, 2023), indicating widespread underperformance in project execution.

The consequences of these cost management failures are severe and multi-dimensional. At the household level, 42% of Nairobi residents experience intermittent water supply, with low-income settlements receiving water for fewer than 4 days per week (Water Services Regulatory Board, 2023). Economically, businesses incur additional costs of KES 3.8 billion annually due to water shortages (KNBS Economic Survey, 2023). Institutionally, the financial viability of NCWSC is compromised, with cost overruns consuming 23% of its annual development budget (NCWSC Financial Statements, 2023). These impacts are particularly concerning given Nairobi's projected population growth to 6.5 million by 2030 (UN-Habitat, 2023), which will further strain already inadequate water infrastructure.

The cost management challenges have persisted over multiple fiscal years, with audit reports documenting consistent budget variances since 2018 (Office of the Auditor General, 2023). The problem has intensified in recent years due to inflationary pressures that increased construction material costs by 27% between 2021-2023 (Kenya National Construction Authority, 2023). Project delays have become chronic, with the average implementation period for water infrastructure extending from the planned 2.5 years to 3.8 years (Nairobi County Infrastructure Report, 2023). These temporal extensions significantly reduce the economic returns on water infrastructure investments.

The problem is most acute in Nairobi's rapidly expanding informal settlements and peri-urban areas, where 73% of water projects experience the highest cost variances (Nairobi Water Master Plan, 2022). Geographical analysis shows that projects in Embakasi, Kasarani, and Ruaraka sub-counties demonstrate 35% higher cost overruns than other areas (Nairobi County GIS Mapping Report, 2023), attributed to complex land issues and infrastructure challenges. The problem also manifests differently across project types, with pipeline networks showing 28%

higher cost variances than treatment plants (Water Infrastructure Performance Report, 2023). Critical examination reveals several problematic components: procurement processes account for 42% of cost overruns due to tender irregularities (Public Procurement Regulatory Authority, 2023), while project supervision deficiencies contribute to 31% of quality shortfalls (National Construction Authority, 2023). Financial monitoring systems are particularly weak, with 54% of projects lacking real-time expenditure tracking (Institute of Certified Public Accountants, 2023). Technological gaps are evident, as only 29% of projects utilize modern cost management tools like Building Information Modeling (BIM) (Construction Industry Report, 2023).

The problem manifests through concrete operational failures: contractors report that 63% of projects experience mid-stream design changes (Contractors Association of Kenya, 2023), while 47% face material supply disruptions (Construction Materials Suppliers Association, 2023). Financial audits reveal that 38% of projects show evidence of irregular expenditure patterns (Office of the Auditor General, 2023). Quality inspections indicate that 41% of completed water infrastructure requires rehabilitation within 3 years of operation (Water Services Trust Fund, 2023), demonstrating poor durability outcomes. These operational failures collectively undermine Nairobi's water security and urban development goals. The persistence of these challenges despite substantial investments highlights the urgent need for research into more effective cost management strategies tailored to Nairobi's unique urban context. This study systematically examines the root causes of these cost management failures and identify practical solutions to enhance water project performance in the count.

1.3 Research Objectives

- i. To evaluate the effect of financial resource allocation strategies on performance of water projects in Nairobi City County, Kenya.
- ii. To examine the effect of financial monitoring and control strategies on performance of water projects in Nairobi City County, Kenya.
- iii. To analyze the effect of risk management cost strategies on the performance of water projects in Nairobi City County, Kenya.
- iv. To establish the effect of Procurement cost saving strategies on the performance of water projects in Nairobi City County, Kenya.

2.0 Literature Review

This section contains a review of the literature that exists on this particular topic. It is divided into the theoretical framework, the empirical review and the conceptual framework.

2.1 Theoretical Framework

This study utilized four theories to explore the relationship between financial management strategies and the performance of water projects in Nairobi City County, Kenya. Project Management Theory explains how structured planning, execution, monitoring, and control contribute to project success. The theory informed the overall relationship between project cost management strategies and performance of water projects because water projects require proper budgeting, scheduling, cost control, risk management, procurement planning, stakeholder coordination, and quality assurance. In this study, the theory supports the view that effective project management practices help align financial strategies with project objectives, thereby improving budget adherence, timely completion, and quality standards in water projects.

Activity-Based Costing Theory emphasizes the allocation of costs based on specific project activities that consume resources. The theory informed the variable of financial resource allocation strategies because water projects require accurate cost estimation, proper budgeting, and

allocation of funds to key activities such as design, procurement, labour, materials, construction, and maintenance. In this study, the theory supports the argument that identifying cost drivers and allocating resources according to actual project activities reduces wastage, improves financial efficiency, and enhances the performance of water projects.

Agency Theory explains the relationship between principals, such as project funders or government agencies, and agents, such as project managers and contractors. The theory informed the variable of financial monitoring and control strategies because water projects require accountability mechanisms to ensure that project funds are used for their intended purpose. In this study, the theory supports the use of financial audits, expenditure tracking, variance analysis, performance-based contracts, and reporting systems to reduce information gaps, prevent misallocation of funds, and improve water project performance.

Risk Management Theory focuses on the identification, assessment, and mitigation of risks that may affect project outcomes. The theory informed the variable of risk management cost strategies because water projects in Nairobi face risks such as inflation, delayed procurement, supply chain disruptions, climate-related challenges, scope changes, and unexpected cost increases. In this study, the theory supports the use of risk identification, mitigation strategies, contingency funding, and financial risk assessment to control cost overruns, reduce delays, and improve the performance of water projects.

Transaction Cost Economics Theory explains how organizations can reduce the costs associated with contracting, negotiation, monitoring, enforcement, and procurement transactions. The theory informed the variable of procurement cost-saving strategies because water projects depend heavily on suppliers, contractors, competitive bidding, contract reviews, and framework agreements. In this study, the theory supports the view that efficient procurement practices reduce unnecessary transaction costs, improve supplier relationships, enhance contract management, and contribute to better water project performance through cost savings, timely delivery, and improved quality standards.

2.2 Conceptual Framework

A conceptual framework is a structured representation of the key concepts, variables, and their relationships within a research study (Mishra & Alok, 2022). Figure 1 present the conceptual framework.

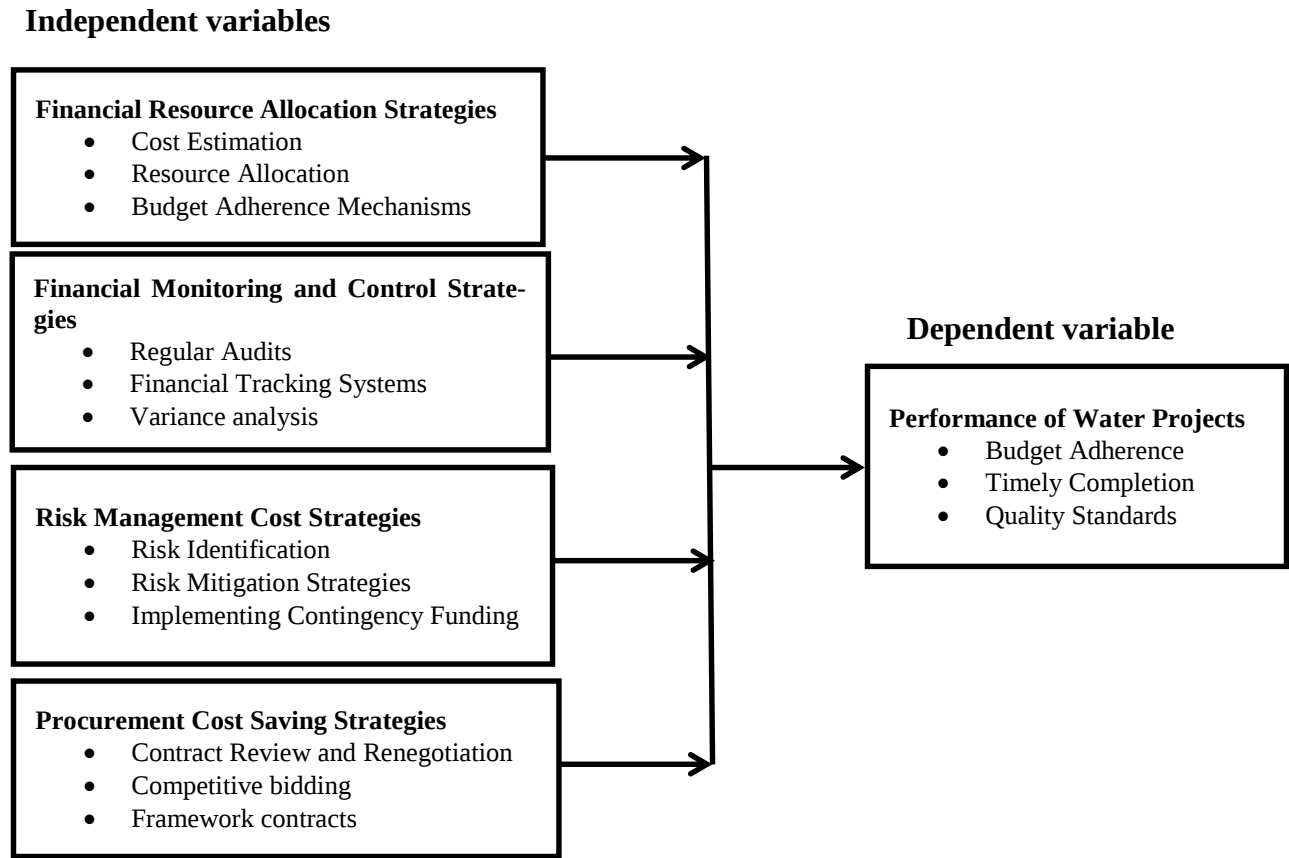


Figure 1: Conceptual Framework

2.3 Empirical Review

Mutia (2022) observed that poor allocation of financial resources in infrastructure projects leads to delays, cost overruns, and compromised project quality. Similarly, Mutambuki and Kabui (2022) found that poor budgeting practices and failure to allocate adequate resources at the right time contributed to inefficiencies in the execution of water projects in Kenya. Koval et al. (2021), in a study conducted in Nairobi, established that projects using strategic financial allocation models recorded improved financial performance and reduced delays. The study emphasized the importance of cost-benefit analysis, forecasting, cash flow management, and financial contingency planning in ensuring effective use of project funds. Other studies by the United Nations Development Programme (2023), World Bank (2023), Asian Development Bank (2023), and African Development Bank (2023) further showed that participatory budgeting, digital financial systems, climate-resilient budgeting, and real-time budget tracking improve cost recovery, budget utilization, and sustainability of water projects. These studies indicate that effective financial resource allocation enhances water project performance by improving budgeting, reducing wastage, supporting timely financing, and ensuring that funds are directed to priority project activities.

Mutambuki and Kabui (2022) found that water projects in Nairobi experienced delays because of weak monitoring of financial transactions, which allowed cost overruns to remain undetected for long periods. The study recommended real-time expenditure tracking and independent audits as ways of identifying financial discrepancies early. Njau et al. (2019) also established that projects with strict financial controls were more likely to meet deadlines and remain within

budget. Other studies showed that modern financial monitoring tools improve accountability and transparency in water projects. For example, Singapore's PUB water system demonstrated that use of smart meters, sensors, and automated monitoring reduced unexplained water losses and improved financial accountability. Studies on continuous auditing in the Netherlands also showed that machine learning-based audit systems reduced financial irregularities and audit costs. These findings show that financial monitoring and control strategies improve water project performance by supporting regular audits, variance analysis, expenditure tracking, fraud detection, early corrective action, and better budget discipline.

Maina and Mungai (2023) found that risk management strategies such as contingency budgeting and risk transfer mechanisms help reduce the financial impact of unexpected risks in Nairobi water infrastructure projects. Their findings showed that projects with proactive risk management approaches were better able to handle unexpected costs and improve performance outcomes. The World Bank (2023) also reported that water projects using comprehensive risk management frameworks experienced fewer cost overruns and delays compared to projects using weak or ad hoc risk approaches. Zou et al. (2021) found that structured risk assessment tools such as SWOT analysis and failure mode effects analysis helped identify more risks during planning stages. Memon et al. (2020) further showed that advanced risk mitigation measures reduced project delays and cost overruns. Ahiaga-Dagbui et al. (2021) emphasized the importance of risk-adjusted contingency funding, while the Global Water Partnership (2023) highlighted the value of risk-sharing approaches such as insurance, guarantees, and contingency funds. These studies show that risk management cost strategies enhance water project performance by supporting early risk identification, mitigation planning, contingency budgeting, and financial preparedness against unexpected project disruptions.

Mutia (2022) found that effective procurement strategies in Nairobi's water sector, including bulk purchasing, long-term supplier contracts, and competitive bidding, contributed to cost savings and reduced procurement delays. The study showed that projects applying these strategies were more likely to avoid cost escalation and improve project performance. The International Water Association (2023) also reported that strategic procurement practices can reduce project costs while maintaining quality standards. The European Water Utility Partnership (2023) found that regular contract review and renegotiation helped utilities achieve cost savings, while performance-based contracting improved contractor performance. The Global Water Intelligence (2023) further showed that advanced negotiation techniques improved pricing outcomes, and the African Development Bank found that pooled procurement increased bargaining power and reduced procurement costs. Studies on digital procurement and spend analysis also showed that artificial intelligence, procurement analytics, and blockchain-based systems reduce irregular spending, improve transparency, and identify savings opportunities.

3.1 Research Methodology

The study adopted a descriptive research design to examine the effect of project cost management strategies on the performance of water projects in Nairobi City County, Kenya. The unit of analysis was the 66 completed water projects undertaken by Nairobi City County, while the unit of observation comprised 100 employees involved in water project implementation across Engineering, Internal Audit and Risk, Supply Chain, Operation and Maintenance, and Finance departments. A census sampling approach was used because the target population was small and accessible, allowing all 100 staff members to participate in the study. Primary data were collected using a structured questionnaire containing both closed-ended and open-ended questions to capture quantitative and qualitative information on financial resource allocation, finan-

cial monitoring and control, risk management cost strategies, procurement cost-saving strategies, and water project performance. A pilot test was conducted using 15 respondents, representing 15% of the target population, to assess the reliability and validity of the research instrument. Reliability was tested using Cronbach's alpha, while validity was assessed through face, content, and construct validity with support from supervisors and subject experts. Data were edited, coded, classified, tabulated, and analyzed using SPSS version 29. Descriptive statistics, including frequencies, percentages, means, medians, modes, and standard deviations, were used to summarize the data, while inferential statistics, including correlation, ANOVA, coefficient analysis, and multiple regression analysis, were used to test the relationship between the independent variables and performance of water projects. The regression model assessed the effect of financial resource allocation strategies, financial monitoring and control strategies, risk management cost strategies, and procurement cost-saving strategies on water project performance. Ethical considerations were observed through informed consent, confidentiality, anonymity, voluntary participation, proper approvals, accurate reporting, and avoidance of plagiarism.

4.0 Data Analysis, Presentation and Discussions

This chapter presents the analysis, interpretation, and presentation of the data collected from respondents in the study on project cost management strategies and performance of water projects in Nairobi City County, Kenya.

4.1 Response Rate

Table 1 below illustrates the response rate for the study, showing the number of expected, received, and not received responses.

Table 1: Response Rate

	Response Rate	Frequency	Valid Percent
	Received responses	82	82.0%
	Responses not received	18	18.0%
Total	Expected responses	100	100%

Out of the 100 expected responses, 82 were received, giving a valid response rate of 82.0%. This indicates a high level of participation from the targeted sample. Conversely, 18 responses were not received, accounting for 18.0% of the expected total. The response rate of 82% suggests good engagement with the survey, although the 18% non-response could potentially introduce some bias if those who did not respond differ systematically from those who did. According to Mugenda and Mugenda (2003), a response rate above 70% is considered excellent for social science research. This strong participation was achieved through personal follow-ups, management support, and the use of a clear and relevant questionnaire.

4.2 Descriptive Results

Financial Resource Allocation Strategies and Performance of Water Projects

The first objective sought to evaluate the effect of financial resource allocation strategies on the performance of water projects in Nairobi City County, Kenya. The descriptive findings showed a slightly below-neutral perception of financial resource allocation strategies, with an overall mean of 2.93 and a standard deviation of 1.336. The highest mean was recorded for the statement that project budget allocation was based on a comprehensive assessment of needs,

with a mean of 3.26 and a standard deviation of 1.312. This was followed by the statement that resource allocation aligned with the strategic objectives of the project, with a mean of 3.15 and a standard deviation of 1.308. Regular analysis of cost variations recorded a mean of 3.06, while use of past financial data recorded a mean of 2.94. However, stakeholder feedback influencing financial decision-making had the lowest mean of 2.71, followed by transparency in financial resource allocation with a mean of 2.77. These results imply that although some budgeting and alignment practices exist, financial resource allocation in Nairobi water projects remains weak in transparency, stakeholder involvement, funding diversification, and timely financial adjustments.

Financial Monitoring and Control Strategies and Performance of Water Projects

The second objective examined the effect of financial monitoring and control strategies on the performance of water projects in Nairobi City County, Kenya. The findings showed a slightly below-neutral perception of financial monitoring and control, with an overall mean of 2.92 and a standard deviation of 1.323. The highest mean was recorded for monitoring financial performance metrics against project goals, with a mean of 3.06 and a standard deviation of 1.305. This was followed by established protocols for financial reporting, with a mean of 3.04, and systems for capturing and analyzing financial project data, with a mean of 3.02. Regular financial audits recorded a mean of 2.96, while budget forecast updates recorded a mean of 2.95. However, stakeholder updates on financial status had the lowest mean of 2.72, followed by timely reporting and management of financial risks with a mean of 2.80. These findings suggest that financial monitoring systems exist to some extent, but weaknesses remain in stakeholder communication, corrective action, audit consistency, and real-time financial risk reporting.

Risk Management Cost Strategies and Performance of Water Projects

The third objective analyzed the effect of risk management cost strategies on the performance of water projects in Nairobi City County, Kenya. The results showed a below-neutral perception of risk management cost strategies, with an overall mean of 2.79 and a standard deviation of 1.342. The highest mean was recorded for integration of risk management into overall project planning, with a mean of 2.96 and a standard deviation of 1.322. This was followed by development of strategies to mitigate identified financial risks, with a mean of 2.90, and periodic risk assessments, with a mean of 2.88. Financial reserves for unforeseen risks recorded a mean of 2.82, while early identification of financial risks recorded a mean of 2.79. The lowest mean was recorded for project teams being trained on risk management techniques, with a mean of 2.61. Stakeholder involvement in risk management and effective communication of financial risks both recorded a mean of 2.70. These findings indicate that risk management cost strategies are not consistently implemented in Nairobi water projects, especially in training, stakeholder involvement, risk communication, financial reserves, and early risk identification.

Procurement Cost-Saving Strategies and Performance of Water Projects

The fourth objective sought to establish the effect of procurement cost-saving strategies on the performance of water projects in Nairobi City County, Kenya. The descriptive findings showed a slightly below-neutral perception of procurement cost-saving strategies, with an overall mean of 2.92 and a standard deviation of 1.326. Competitive bidding recorded the highest mean of 3.20 and a standard deviation of 1.294, showing that it was the most commonly recognized procurement cost-saving practice. Standardization of the procurement process followed with a mean of 3.04, while early procurement planning recorded a mean of 2.98. Cost-benefit analysis

in procurement decision-making had a mean of 2.96, while supplier relationship management and use of framework contracts each recorded a mean of 2.89. The lowest mean was recorded for sharing cost-saving strategies across similar projects, with a mean of 2.72, followed by bulk purchasing with a mean of 2.78. These results suggest that while competitive bidding is fairly practiced, Nairobi water projects still face weaknesses in supplier management, market research, bulk purchasing, framework contracts, and organizational learning on procurement cost-saving practices.

Performance of Water Projects

The descriptive findings on the performance of water projects showed a below-neutral perception, with an overall mean of 2.81 and a standard deviation of 1.344. Budget adherence being regularly monitored recorded the highest mean of 3.06, followed by achievement of project objectives and expected outcomes with a mean of 2.93, and quality of completed water projects meeting required standards with a mean of 2.91. However, completion of projects within established timelines recorded a low mean of 2.73, while delivery within approved project budget recorded a mean of 2.79. Customer feedback mechanisms were also weak, with systematic gathering of customer feedback recording a mean of 2.68 and adjustments based on customer feedback recording the lowest mean of 2.63. These results show that water project performance in Nairobi City County remains below expectation, particularly in timely completion, budget adherence, stakeholder satisfaction, and use of customer feedback to improve future projects.

4.2 Correlation Analysis

The correlation matrix displays the Pearson correlation coefficients between all pairs of variables in the study. This analysis helps in understanding the strength and direction of the linear relationships between the variables.

Table 2: Correlations Analysis

				Financial Resource Allocation	Financial Monitoring and Control	Risk Management Cost Strategies	Procurement Cost-Saving Strategies	Performance of Water Projects
Financial Resource Allocation	Pearson	Correlation	Sig. (2-tailed)	1.000				
				82				
Financial Monitoring and Control	Pearson	Correlation	Sig. (2-tailed)	.745**	1.000			
				.000				
				82				
Risk Management Cost Strategies	Pearson	Correlation	Sig. (2-tailed)	.712**	.698**	1.000		
				.000	.000			
				82	82	82		
Procurement Cost-Saving Strategies	Pearson	Correlation	Sig. (2-tailed)	.768**	.723**	.689**	1.000	
				.000	.000	.000		
				82	82	82	82	
Performance of Water Projects	Pearson	Correlation	Sig. (2-tailed)	.734**	.701**	.665**	.756**	1.000
				.000	.000	.000	.000	
				82	82	82	82	82

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

The correlation matrix presented in Table 2 provides insight into the interrelationships among key variables relevant to the overarching topic: Project Cost Management Strategies and Performance of Water Projects in Nairobi City County, Kenya. These variables include Financial Resource Allocation, Financial Monitoring and Control, Risk Management Cost Strategies,

Procurement Cost-Saving Strategies, and Performance of Water Projects. The Pearson correlation coefficients show statistically significant positive correlations at the 0.01 level, suggesting a high degree of reliability in the associations. Financial Resource Allocation reveals a high correlation with all other variables, with the strongest link to Procurement Cost-Saving Strategies ($r = .768$), indicating that effective resource allocation within Nairobi's water projects might be significantly augmented by strategic procurement practices. Its correlation with Performance of Water Projects ($r = .734$) further suggests that how financial resources are allocated has a direct bearing on project outcomes in this context.

Financial Monitoring and Control correlates most strongly with Financial Resource Allocation ($r = .745$), pointing to the importance of oversight mechanisms in ensuring that allocated resources are properly utilized. This correlation, along with the one to Performance of Water Projects ($r = .701$), highlights the critical role that monitoring plays in ensuring that water projects meet their performance objectives. Risk Management Cost Strategies exhibits significant relationships with all variables, with the strongest correlation with Financial Resource Allocation ($r = .712$). Its correlation with Performance of Water Projects ($r = .665$), while still significant, is the lowest among the predictors, suggesting that risk management practices may be the least developed or least effectively implemented among the cost management strategies in Nairobi's water projects.

Procurement Cost-Saving Strategies has the strongest correlation with Performance of Water Projects ($r = .756$), indicating that among all cost management strategies, procurement practices have the most direct influence on project performance. This finding aligns with the statement of the problem, which noted that procurement processes account for 42% of cost overruns due to tender irregularities. Performance of Water Projects shows strong positive correlations with all independent variables, with the highest being with Procurement Cost-Saving Strategies ($r = .756$), followed by Financial Resource Allocation ($r = .734$). These findings align with research that has explored similar themes in various contexts, such as the studies by Mutia (2022) on procurement practices in Nairobi's water sector and Mutambuki and Kabui (2022) on resource allocation and service delivery. However, this analysis uniquely applies these principles to the specific case of water projects in Nairobi City County, thereby providing a context-specific understanding of how cost management strategies underpin water project performance in an urban Kenyan setting.

4.3 Multiple Regression Analysis

This section presents the results of the regression analysis conducted to assess the relationships between the independent variables financial resource allocation, financial monitoring and control, risk management cost strategies, and procurement cost-saving strategies and the dependent variable, performance of water projects. Each table is accompanied by a brief introduction to facilitate understanding of the findings.

Model Summary

The model summary provides key metrics that evaluate the overall fit of the regression model. The R and R Square values indicate the strength of the relationship between the independent variables and the dependent variable.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.825a	0.681	0.664	0.48736

a. Predictors: (Constant), Procurement Cost-Saving Strategies, Risk Management Cost Strategies, Financial Monitoring and Control, Financial Resource Allocation

The model summary in Table 3 provides a concise evaluation of the regression model's fit regarding the impact of project cost management strategies on the performance of water projects in Nairobi City County, Kenya. The R value of .825 suggests a strong positive correlation between the predictors (Financial Resource Allocation, Financial Monitoring and Control, Risk Management Cost Strategies, and Procurement Cost-Saving Strategies) and the dependent variable (Performance of Water Projects). The R Square value of .681 indicates that 68.1% of the variance in water project performance can be explained by these predictors, which is a robust fit for the model. The Adjusted R Square, slightly lower at .664, accounts for the number of predictors in the model and provides a more cautious estimate of the model's explanatory power. This means that approximately 66.4% of the variation in water project performance is explained by the four cost management strategies, while the remaining 31.9% is attributed to other factors not included in this study. Lastly, the Standard Error of the Estimate at .48736 reflects the average distance that the observed values fall from the regression line, indicating a moderate level of dispersion around the predicted values.

Analysis of Variance (ANOVA)

The analysis of variance (ANOVA) was tested as shown in Table 4. The overall significance of the regression model indicates whether the model provides a better fit to the data compared to a model with no predictors.

Table 4: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	42.876	4	10.719	45.126	.000
Residual	18.287	77	0.238		
Total	61.163	81			

a. Dependent Variable: Performance of Water Projects

b. Predictors: (Constant), Procurement Cost-Saving Strategies, Risk Management Cost Strategies, Financial Monitoring and Control, Financial Resource Allocation

The ANOVA table in Table 4 assesses the statistical significance of the regression model for the study on the effect of project cost management strategies on the performance of water projects in Nairobi City County, Kenya. The regression sum of squares (42.876) with 4 degrees of

freedom yields a mean square of 10.719, which, when compared to the residual mean square (0.238) from 77 degrees of freedom, results in an F-statistic of 45.126. This high F-value, paired with a significance level (Sig.) of $p < .001$, indicates that the model is statistically significant at the conventional alpha level of 0.05. This means that the collective predictors (financial resource allocation, financial monitoring and control, risk management cost strategies, and procurement cost-saving strategies) significantly improve the model's fit over a model with no predictors, suggesting that these variables together have a strong explanatory power for variations in the performance of water projects in Nairobi City County.

Regression Coefficients

Table 5 provides the estimated coefficients for each predictor in the model, along with their standard errors, t-values, and significance levels. These metrics help in understanding the individual contribution of each predictor to the dependent variable.

Table 5: Regression Coefficients

Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	0.312	0.148		2.108	0.038
Financial Resource Allocation	0.287	0.094	0.301	3.053	0.003
Financial Monitoring and Control	0.245	0.088	0.268	2.784	0.007
Risk Management Cost Strategies	0.198	0.092	0.215	2.152	0.034
Procurement Cost-Saving Strategies	0.312	0.096	0.324	3.250	0.002

a. Dependent Variable: Performance of Water Projects

Based on these coefficients in Table 5, the regression equation for predicting the performance of water projects (Y) can be written as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

$$Y = 0.312 + 0.287X_1 + 0.245X_2 + 0.198X_3 + 0.312X_4 + \varepsilon$$

According to the findings, Financial Resource Allocation (X1) significantly affects the performance of water projects with a coefficient of 0.287 ($\beta_1 = 0.287$, $p = 0.003 < 0.05$). The data suggest that enhancing financial resource allocation by one unit could lead to a 0.287-unit increase in water project performance. This aligns with the work of Koval *et al.* (2021), where strategic financial allocation models led to improved financial performance and reduced delays. The significance of this relationship is further supported by Mutambuki and Kabui (2022), who emphasized the importance of proper resource allocation for service delivery in water projects.

The study findings revealed that Financial Monitoring and Control (X2) significantly affects the performance of water projects, with a coefficient of 0.245 ($\beta_2 = 0.245$, $p = 0.007 < 0.05$). This suggests that each unit improvement in financial monitoring and control could result in a 0.245-unit enhancement in water project performance. The significance here matches the research by Mutambuki and Kabui (2022), who found that water projects in Nairobi with stringent financial controls were more likely to meet their deadlines and stay within budget. This is

echoed in the studies by Njau *et al.* (2019), where financial monitoring mechanisms were found to be critical for identifying and addressing inefficiencies before they escalate into major issues.

Based on the results, Risk Management Cost Strategies (X3) have a significant impact on the performance of water projects, with a coefficient of 0.198 ($\beta_3 = 0.198, p = 0.034 < 0.05$). Here, an increase of one unit in risk management practices would boost water project performance by 0.198 units. This outcome is consistent with the research from Maina and Mungai (2023), where risk management strategies such as contingency budgeting and risk transfer mechanisms helped reduce the financial impact of project risks. These findings underscore the importance of proactive risk identification and mitigation for achieving successful water project outcomes.

The analysis indicates that Procurement Cost-Saving Strategies (X4) have a significant effect on the performance of water projects, with a coefficient of 0.312 ($\beta_4 = 0.312, p = 0.002 < 0.05$). This suggests that for every unit increase in procurement cost-saving strategies, there is a corresponding 0.312 unit increase in water project performance. This finding is in harmony with the work of Mutia (2022), which demonstrated that effective procurement strategies such as bulk purchasing, long-term supplier contracts, and competitive bidding lead to significant cost savings and improved project performance. This highlights that procurement management is indispensable for successful water project outcomes in Nairobi City County. Among all the predictors, Procurement Cost-Saving Strategies ($\beta = 0.312$) has the strongest influence on water project performance, followed by Financial Resource Allocation ($\beta = 0.287$), Financial Monitoring and Control ($\beta = 0.268$), and Risk Management Cost Strategies ($\beta = 0.215$). This ranking suggests that improving procurement practices may yield the greatest returns in terms of water project performance in Nairobi City County.

5.1 Conclusion

Based on the findings, it was concluded that financial resource allocation has a significant impact on the performance of water projects. The positive relationship between financial resource allocation practices and the successful execution of water projects suggests that effective and well-informed resource allocation processes significantly contribute to achieving project outcomes within budget and on time. The quality of resource allocation decisions within a project context can enhance its ability to meet performance targets, thus demonstrating the critical role of financial resource allocation in ensuring that project objectives are achieved. Therefore, financial resource allocation is a key driver of water project performance in Nairobi City County.

Based on the findings, it was concluded that financial monitoring and control has a notable influence on the performance of water projects. The systematic nature of financial monitoring and control fosters accountability and transparency among project implementers, ensuring that financial resources are utilized as planned and that deviations are detected early for corrective action. This highlights the importance of effective financial monitoring in guiding projects toward successful completion by establishing clear reporting protocols and oversight mechanisms. Thus, financial monitoring and control plays a crucial role in achieving water project performance, underscoring its importance for successful project management in the water sector.

Based on the analysis, it was concluded that risk management cost strategies have a positive impact on the performance of water projects. The findings suggest that proactive identification and mitigation of financial risks enable projects to withstand unexpected challenges such as inflation, material price fluctuations, and supply chain disruptions. Effective risk management

ensures that contingency plans are in place, reducing the likelihood of cost overruns and delays. Therefore, risk management cost strategies are a crucial factor in achieving successful water project outcomes in Nairobi City County.

The findings led to the conclusion that procurement cost-saving strategies have the strongest significant impact on the performance of water projects. By facilitating competitive bidding, framework contracts, and early procurement planning, these strategies ensure that materials and services are acquired at optimal prices while minimizing delays. The ability to leverage bulk purchasing and manage supplier relationships effectively allows for significant cost reductions, which directly contributes to projects staying within budget. Thus, procurement cost-saving strategies are an essential element in achieving successful water project performance.

6.1 Recommendations

The findings revealed that effective financial resource allocation has a significant impact on the performance of water projects. It is recommended that policymakers in Nairobi City County prioritize the development of standardized guidelines for needs-based budgeting and transparent resource allocation processes. This would involve creating frameworks for participatory budgeting that include community representatives and other stakeholders in financial decision-making. The Nairobi City County Government, through the Department of Water and Sanitation and the County Treasury, should be responsible for ensuring that such guidelines are developed and integrated into water project management frameworks to support improved project performance across the county.

The findings indicated that financial monitoring and control plays a key role in water project performance. It is recommended that policies be developed to mandate regular financial audits, real-time expenditure tracking, and timely reporting for all water projects. This includes ensuring that project managers are held accountable for financial deviations and that corrective actions are implemented promptly. The Nairobi City County Internal Audit Department and the Water Services Regulatory Board (WASREB) should take the lead in formulating and enforcing financial monitoring policies that integrate transparency and accountability as central focuses in water project management.

The findings demonstrated that risk management cost strategies significantly enhance water project performance. It is recommended that Nairobi City County organizations, particularly the Nairobi City Water and Sewerage Company (NCWSC), invest in risk assessment tools and contingency planning frameworks that facilitate proactive risk identification and mitigation. This would ensure that financial risks such as inflation, currency fluctuations, and supply chain disruptions are anticipated and managed effectively. The National Treasury and the County Government should collaborate to create policies that require risk management plans for all water projects above a certain budget threshold, fostering resilience and sustainability in project delivery.

The findings highlighted the importance of procurement cost-saving strategies in achieving water project performance. It is recommended that policy frameworks be developed to encourage competitive bidding, framework contracting, and early procurement planning across all water projects. This could involve establishing centralized procurement units with specialized expertise in water infrastructure and mandating the sharing of cost-saving strategies across similar projects. The Public Procurement Regulatory Authority (PPRA) and the Nairobi City

County Supply Chain Department should be responsible for promoting procurement cost-saving strategies by creating platforms for knowledge sharing and ensuring compliance with best practices.

Based on the study findings, it is recommended that the Nairobi City Water and Sewerage Company (NCWSC) strengthen financial resource allocation by adopting Activity-Based Costing (ABC) principles and involving stakeholders in budget formulation. Other water service providers in Kenya should also adopt transparent and needs-based resource allocation practices to align their operations with performance goals. Water sector agencies involved in project implementation should prioritize financial monitoring through real-time expenditure tracking systems and regular audit follow-ups. Contractors and suppliers should be encouraged to participate in framework agreements and long-term contracts that promote cost stability. Project managers should receive regular training on risk management techniques and modern cost management tools. These efforts will contribute to more effective project execution and long-term improvement in water service delivery across Nairobi City County and beyond.

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