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Influence of Project Cost Control on Performance of Irrigation and Integrated Watershed Management Project in Kayonza District, Rwanda (2019–2024)

John Bosco Akandwanaho and Samuel Wabala
University of Kigali
Email: john.akandwanaho@gmail.com

***Abstract**: This study examined the influence of project cost control on the performance of the Irrigation and Integrated Watershed Management Project (IIWMP) in Kayonza District, Rwanda. The objectives were to examine cost forecasting, budgeting, cost reporting, and cost estimation on project performance. A descriptive design with quantitative and qualitative approaches was adopted. From 893 stakeholders, a sample of 269 was drawn using Krejcie and Morgan (1970) formula and stratified random sampling. Valid responses from 256 beneficiaries (98.1%) were analysed using SPSS version 26. Findings showed all four cost-control practices correlated with performance ($p < .01$). The regression model was significant, $R^2 = .767$, $F(4,251) = 207.045$, $p < .001$. Cost forecasting ($\beta = .677$, $p < .001$) and cost reporting ($\beta = .387$, $p < .001$) had significant positive effects. Budgeting ($\beta = .072$, $p = .206$) and cost estimation ($\beta = -.114$, $p = .037$) showed no independent contribution due to collinearity. The study concluded that cost forecasting and reporting are the strongest determinants of performance. The findings suggest that strengthening forecasting systems, enhancing reporting mechanisms, and clarifying the distinct roles of estimation and forecasting can improve project performance. The study recommends that the Ministry of Agriculture and Animal Resources and development partners continue supporting financial accountability and capacity-building initiatives to improve the performance and sustainability of irrigation and watershed management projects in Rwanda. Future research should examine other factors influencing project performance, such as risk management, stakeholder engagement, and procurement management.*

***Keywords:** Cost Control, Project Performance, Irrigation, Watershed Management, Rwanda.*

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1. Introduction

Project cost control is a critical determinant of the success, efficiency, and sustainability of development projects, particularly in irrigation and integrated watershed management (Johnsen & Hilary, 2022). Accurate forecasting, budgeting, estimation, and reporting enable optimal resource allocation, reduce cost overruns, and enhance project performance, especially in resource-limited contexts (Ochieng, 2021).

Globally, irrigation and watershed projects are central to agricultural transformation and climate resilience (Kumar & Reddy, 2021). India's Neeranchal Watershed Project combined modern forecasting with participatory budgeting, improving land productivity and rural livelihoods (Singh & Patil, 2020). In the Netherlands, structured planning frameworks kept cost overruns at 11%, well below the 44% global average (Meijer & Visser, 2023). Bangladesh's Muhuri-Kahua Project further demonstrates that detailed forecasting and phased budgeting sustain performance even under challenging environmental conditions (Ahmed & Karim, 2019).

Sub-Saharan Africa presents a mixed record. Nigeria's Bakolori Project suffered from insufficient budgeting (Oladipo, 2020), Kenya's Bura Project saw costs escalate from $17,500 to $55,000 per family (Bura Irrigation and Settlement Project, 2023), while Ethiopia's Koga Project

and Senegal's River Valley Scheme were slowed by cost underestimation and delayed disbursement (World Bank, 2022; Diop & Mbaye, 2022). These cases show that without rigorous financial planning, irrigation projects remain vulnerable to underperformance (Gebremedhin & Swinton, 2003).

In Rwanda, irrigation is a pillar of agricultural productivity (Nkurunziza & Habimana, 2022). The Irrigation and Integrated Watershed Management Project (IIWMP) in Kayonza District, launched in 2019, adopted cost estimation, budget monitoring, and phased implementation (Government of Rwanda, 2021; MINAGRI, 2020). However, persistent challenges remain: budget overruns of up to 25%, delayed disbursements, and only 60–70% of planned infrastructure completed on time (MINAGRI, 2023; RYAF, 2022). These inefficiencies undermine financial performance, sustainability, and community trust (Wellars, 2021).

While cost control is linked to project performance, few studies have examined forecasting, budgeting, reporting, and estimation simultaneously, or tested their statistical overlap (Kayirebwa & Mwangi, 2023; Serrador & Pinto, 2021). This study addresses that gap by modelling all four practices together.

The objectives are to examine the influence of cost forecasting (i), budgeting (ii), cost reporting (iii), and cost estimation (iv) on IIWMP performance, with corresponding null hypotheses tested. The study is limited to these four practices, situated in Kayonza District, covering 2019–2024. Findings will guide policymakers, project managers, and development partners in strengthening cost management systems.

1.1 Problem Statement

Effective project cost control is a cornerstone of successful project management, ensuring that resources are utilized efficiently, expenditures are closely monitored, and projects remain within approved budgets throughout their implementation cycle (Schwalbe, 2023). Ideally, irrigation and integrated watershed management projects should be executed within planned budgets, completed on schedule, and deliver intended outputs that enhance agricultural productivity, improve water management, and foster environmental sustainability for local communities (IFAD, 2024).

However, the Irrigation and Integrated Watershed Management Project Phase II (IIWMP) in Kayonza District has encountered persistent challenges in maintaining cost discipline. Project reports indicate cases of inefficient budgeting, delayed financial disbursements, limited expenditure tracking, and cost overruns in several project components (MINAGRI, 2023). In certain phases, budget overruns reached up to 25%, while only 60–70% of planned irrigation canals, water storage structures, and watershed rehabilitation interventions were completed on time. These financial inefficiencies have contributed to delays in delivering critical infrastructure, reduced project outputs, and hindered the achievement of the intended socio-economic and environmental outcomes for farmers and local communities (RYAF, 2022).

Such inefficiencies compromise not only the financial performance of the project but also its long-term sustainability and credibility. Delays and cost overruns inflate project costs, disrupt agricultural calendars, reduce returns on public investment, and weaken community trust in development initiatives (Wellars, 2021). Prior studies underscore that robust cost control encompassing budgeting, cost tracking, financial reporting, and risk management plays a pivotal role in enhancing project performance, particularly in infrastructure and agricultural development projects (Uwizeyimana, 2020).

Despite this recognition, there remains limited empirical evidence on how specific cost control practices such as budgeting, cost tracking, and expenditure management affect the performance of irrigation and integrated watershed management projects in Rwanda, especially in Kayonza District. Most existing studies focus broadly on agricultural projects or project management frameworks without explicitly examining cost control mechanisms in this context. This study, therefore, seeks to address this gap by investigating the influence of cost control practices on the performance of the IIWMP in Kayonza District. The findings will provide practical insights for policymakers, project managers, and development partners on strengthening cost management systems to improve project efficiency, sustainability, and overall impact.

This gap translates directly into the four specific objectives of the study. Because the reviewed literature treats cost control as a single undifferentiated practice, this study disaggregates it into its four operational dimensions and examines each in turn: cost forecasting (Objective One), budgeting (Objective Two), cost reporting (Objective Three), and cost estimation (Objective Four). Each objective is expressed as a testable null hypothesis (H_{01}–H_{04} in Section 1.4), measured through the corresponding construct in the conceptual framework (Figure 2.1), and reported against the same numbering throughout Chapters Four and Five. This structure ensures that the identified gap, the objectives, the hypotheses, the findings, and the recommendations remain aligned across the whole dissertation.

2. Literature Review

This chapter reviews literature on project cost control and its influence on the performance of irrigation and integrated watershed management projects. It examines key concepts such as cost forecasting, budgeting, reporting, and estimation, and their impact on project

efficiency, timely completion, and resource utilization. The review draws on global and regional studies, including examples from developed countries, North Asia, Sub-Saharan Africa, East Africa, and Rwanda, and highlights relevant theories and empirical findings.

2.1 Project Cost Control

Project cost control is a critical function within project management that ensures a project stays within its approved budget. It involves the ongoing monitoring of project expenditures against the planned budget and the identification of any variances (Meredith & Mantel, 2012). The primary goal is to manage changes that could lead to budget overruns and to take corrective action to keep costs in line with the project's financial plan. Effective cost control relies on several key processes, including accurate forecasting, sound budgeting, and timely reporting (Frohnhoefer & Hassen, 2022). By continuously tracking costs, project managers can make informed decisions, mitigate financial risks, and ensure the project's financial viability and success.

The application of robust cost control techniques is vital for achieving project objectives, as it provides a clear picture of the project's financial health. It enables project teams to anticipate potential budget issues and implement proactive measures rather than reacting to problems after they occur (Kerzner, 2017). This proactive approach, supported by tools such as earned value management (EVM), helps maintain financial discipline throughout the project lifecycle, ultimately leading to better resource utilization and higher profitability (Project Management Institute, 2021). The principles of effective project cost control are particularly relevant to projects with large-scale infrastructure and social components, such as the Irrigation and Integrated Watershed Management Project in Kayonza District, Rwanda (Frohnhoefer & Hassen, 2022).

2.1.1 Project Cost Forecasting

Project cost forecasting is a critical, proactive function of project financial management that involves predicting future project costs based on historical expenditures, current progress, and anticipated activities. This dynamic process is distinct from a static budget, as it provides a realistic estimate of what the final project cost will be at completion (PMI, 2021). By regularly updating and analyzing forecasts, project managers gain valuable foresight, allowing them to make informed, timely decisions about resource allocation and financial strategy, thereby mitigating the risk of budget overruns (Lewis, 2022).

The effectiveness of project cost forecasting is dependent on the reliability of its data inputs, which typically include detailed historical cost data, current spending rates, and a clear understanding of the remaining scope of work. Techniques such as Earned Value Management (EVM) are often used to provide a quantitative basis for these forecasts by integrating project scope, schedule, and cost data to predict the final cost (Kerzner, 2017). By comparing the forecast to the initial budget, project managers can identify variances and take corrective actions, ensuring the project remains on a sound financial footing. For the IIWMP in Kayonza District, robust project cost forecasting is essential for its financial sustainability (PMI, 2021).

2.1.2 Project Budgeting

Project budgeting is the process of allocating financial resources to all project activities, serving as the foundational plan for all cost-related decisions. A well-defined project budget is not merely a financial document; it is a strategic tool that aligns project objectives with available funding, providing a clear roadmap for expenditures from start to finish (Serrador & Pinto, 2021). It outlines the estimated costs for all resources, including labor, materials, equipment, and contingencies, thereby setting the financial framework for the project's execution and performance measurement (PMI, 2021).

Developing a comprehensive project budget involves several key steps, beginning with a detailed work breakdown structure (WBS) to identify every task and resource requirement. Each element is assigned an estimated cost, and these individual costs are then aggregated to form the total budget. This process requires a high degree of accuracy and collaboration among the project team and stakeholders to ensure that all potential costs are captured (Gudienė et al., 2021). The resulting budget acts as a baseline against which all future spending is measured, enabling proactive control and management of project finances (PwC, 2020). For the IIWMP in Kayonza District, meticulous project budgeting is essential for ensuring the financial feasibility of its long-term goals (Gudienė et al., 2021).

2.1.3 Project Cost Reporting

Project cost reporting is a fundamental process in project management that involves the regular collection, analysis, and dissemination of financial data to project stakeholders. Its primary purpose is to provide a clear and accurate picture of a project's financial health at any given point in time (PMI, 2021). By comparing actual expenditures to the planned budget, cost reports highlight any variances, allowing project managers to identify where costs are on track and where they may be deviating (Westermeier, 2022). This transparency is crucial for maintaining accountability and ensuring that all project participants are aware of the financial performance.

The effectiveness of project cost reporting lies in its ability to provide actionable insights. Reports typically include key performance indicators (KPIs) and variance analysis, which collectively help to forecast future cost trends (PwC, 2020). Through consistent and timely reporting, project teams can identify cost overruns or underruns early, enabling them to make proactive

adjustments to resource allocation or project scope. For the IIWMP in Kayonza District, robust project cost reporting is essential for maintaining financial discipline and meeting donor requirements (Government of Rwanda, 2021).

2.1.4 Project Cost Estimation

Project cost estimation is the process of approximating the monetary resources required to complete all project activities. It is a fundamental planning activity that occurs early in the project lifecycle and is essential for developing a reliable project budget and securing funding (PwC, 2020). A detailed and accurate cost estimate provides a critical baseline for financial management, allowing project stakeholders to evaluate the project's viability and make informed decisions about its scope and feasibility (Harvard Business Review, 2021).

The accuracy of a cost estimate depends on the method used and the level of detail available. Common techniques include analogous estimating, which uses data from similar past projects; parametric estimating, which applies a mathematical model based on project parameters; and bottom-up estimating, which involves a detailed breakdown of costs for each individual work package (PMI, 2021). A well-executed cost estimation process provides a robust financial framework that reduces the likelihood of budget overruns and builds stakeholder trust (Westermeier, 2022). For the IIWMP in Kayonza District, accurate project cost estimation is crucial for its long-term financial success and sustainability (Project Manager Today, 2021).

2.2 Project Performance

Project performance is a comprehensive measure of how successfully a project is executed and delivered against its objectives. It goes beyond simply meeting the budget and schedule; it evaluates the project's overall effectiveness in achieving its intended outcomes and satisfying stakeholder expectations. A high-performing project delivers the defined scope on time, within budget, and to the required quality standards while ensuring a positive return on investment (PMI, 2021).

Evaluating project performance involves monitoring key quantitative and qualitative indicators throughout the project lifecycle. These metrics include Schedule Performance Index (SPI), Cost Performance Index (CPI), Schedule Variance (SV), and Cost Variance (CV), which collectively provide a quantitative assessment of progress against the plan (Kerzner, 2017). Beyond these core metrics, performance also encompasses qualitative aspects such as stakeholder satisfaction. In the context of present study, the performance of the IIWMP in Kayonza District is critical for ensuring its long-term impact and securing continued government and donor support (Westermeier, 2022; Government of Rwanda, 2021).

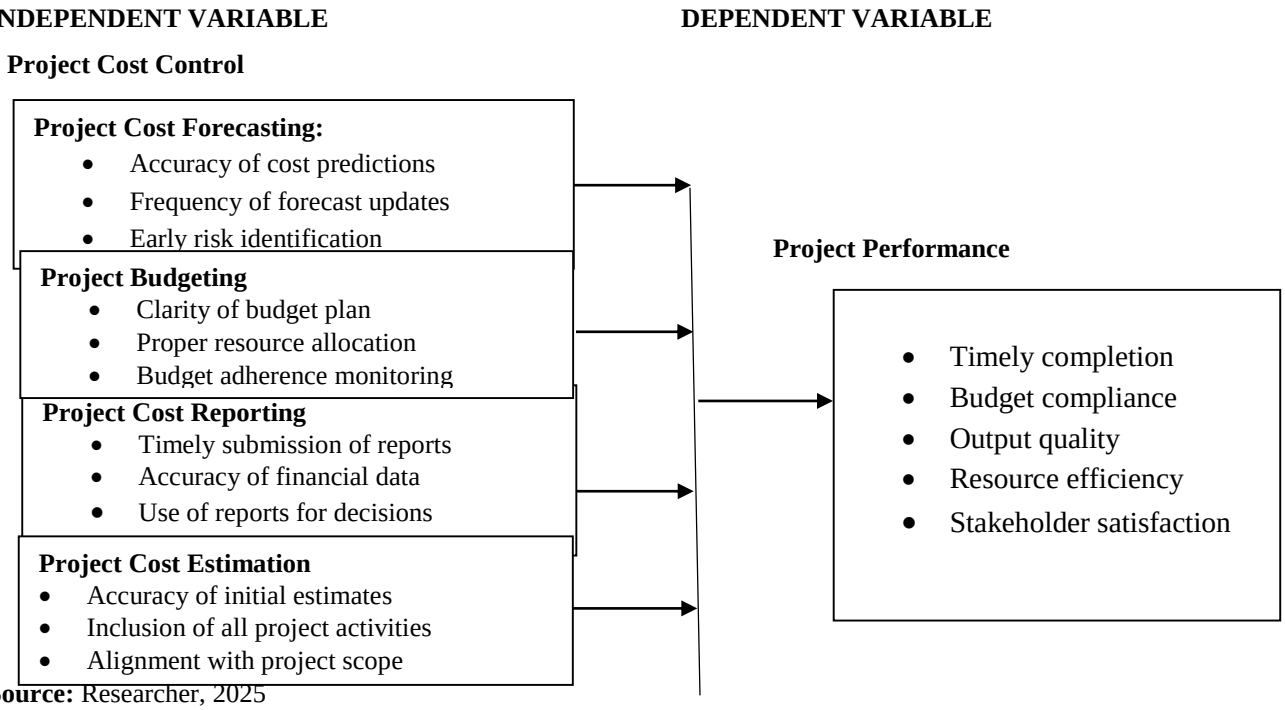
2.3 Theoretical Review

The study was anchored on three complementary theories. The Theory of Cost Predictability holds that the more precisely a project's costs are estimated and forecast, the better its overall performance is, because accurate figures let managers build realistic baselines from the outset (Kerzner, 2017; Project Management Institute, 2021; Barbara, 2023). The Theory of Budgetary Control treats the budget as an active control mechanism whose effectiveness hinges on how closely actual spending is tracked against that baseline (Project Management Institute, 2022; Raul, 2022; Paddock & Wellars, 2022). The Theory of Financial Transparency holds that frequent, open financial reporting builds stakeholder trust and allows budget variances to be identified and corrected early (Gael & Farah, 2021; Henry, 2024; Samson, 2020). These three theories map onto the study's four constructs forecasting and estimation from the Theory of Cost Predictability, budgeting from the Theory of Budgetary Control, and reporting from the Theory of Financial Transparency justifying modelling their combined influence on project performance.

Project managers should recognize that these theories are not mutually exclusive. Effective cost control requires integrating accurate forecasting (Cost Predictability), disciplined budget monitoring (Budgetary Control), and transparent reporting (Financial Transparency) into a cohesive financial management system. Prioritizing forecasting and reporting while ensuring budgeting and estimation are well-aligned can strengthen project performance and stakeholder confidence.

2.4 Conceptual Framework

A conceptual framework serves as a visual representation of the relationships between key variables in a research study. This study's framework illustrates the relationship between project cost control practices and the performance of the IIWMP in Kayonza District, Rwanda. The framework identifies project cost control as the independent variable, which includes key dimensions such as cost forecasting, budgeting, cost reporting, and cost estimation. These practices are expected to influence the dependent variable, project performance, which is measured through indicators such as timely completion, budget adherence, resource utilization, and quality of project outputs.



Source: Researcher, 2025

2.5. Research Gap

Despite extensive research on project cost management and its influence on project performance globally, several gaps remain. While studies show that cost forecasting, budgeting, reporting, and estimation improve project outcomes, there is limited understanding of the relative effectiveness of different techniques across diverse sectors. Comparative studies on the use of Earned Value Management versus parametric forecasting methods are sparse, and little is known about how adaptive budgeting approaches respond to changing project scopes over time.

In the African and East African contexts, research gaps are more pronounced. Although studies in Kenya, Tanzania, Uganda, and Nigeria demonstrate that proactive cost management improves efficiency and financial control, there is limited exploration of context-specific challenges such as resource constraints, technical capacity, and rural project settings. Few studies examine the adoption of modern forecasting, estimation, and reporting technologies in agricultural and irrigation projects. This gap is particularly significant in irrigation projects, where local socio-economic factors play a crucial role in implementation and sustainability.

In Rwanda, while empirical evidence confirms the importance of project cost control in irrigation and watershed management projects, research remains limited in scope and depth. Specifically, there is insufficient study on the integration of modern digital tools for cost management, the comparative impact of short-term versus continuous cost forecasting, and the effectiveness of participatory budgeting or reporting mechanisms in large-scale projects like the IIWMP in Kayonza District. This study addresses these gaps by jointly examining all four cost-control practices forecasting, budgeting, reporting, and estimation in the context of the IIWMP in Kayonza District, Rwanda.

3. Methodology

3.1 Research Design

The study followed a descriptive design that blended quantitative and qualitative approaches, so that the statistical relationships uncovered could be cross-checked against contextual insight from key informants (Cooper & Schindler, 2014; Saunders et al., 2016).

3.2 Target Population and Sample Size

A total of 893 individuals connected to the IIWMP made up the target population, and a sample of 269 was determined using the Krejcie and Morgan (1970) formula (Table 1).

Table 1: Target Population and Sample Distribution

Category	Total Population	Sample Size
Project Managers	2	1
Engineers & Technical Officers	18	5
Site Supervisors	4	1
Community Representatives	3	1
Beneficiaries (Local Farmers)	866	261
Total	893	269

Source: IIWMP Project Records and Kayonza District Report, 2025.

3.3 Sampling Method

To ensure each category of stakeholder was fairly represented, participants were drawn using stratified random sampling, supplemented with key-informant interviews involving project managers and engineers.

3.4 Data Collection

Primary data were gathered through structured questionnaires built on five-point Likert scales, while semi-structured interviews and a review of project documents supplied complementary secondary data.

3.5 Validity and Reliability

Expert review was used to establish content validity, and reliability testing showed Cronbach's Alpha above the conventional 0.7 threshold for every construct (Cronbach, 1951).

Table 2: Cronbach's Alpha Values

Variable	Cronbach's Alpha	Number of Items	Interpretation
Project Cost Forecasting	0.842	5	Reliable
Project Budgeting	0.869	5	Reliable
Project Cost Reporting	0.814	5	Reliable
Project Cost Estimation	0.851	5	Reliable
Project Performance	0.889	5	Reliable

Source: Primary data (2026).

3.6 Data Analysis

Quantitative analysis was carried out in SPSS version 26, combining descriptive statistics, Pearson correlation, collinearity diagnostics, and multiple linear regression, specified as:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon \quad (1)$$

with Y representing project performance and X_1 through X_4 representing cost forecasting, budgeting, cost reporting, and cost estimation respectively and ε representing error.

3.7 Ethical Considerations

Before data collection began, the study obtained ethical clearance from the University of Kigali and secured a formal introductory letter to facilitate access to the Irrigation and Integrated Watershed Management Project (IIWMP) in Kayonza District. Participation was voluntary, informed consent was obtained from all respondents, confidentiality and anonymity were maintained, and respondents were informed of their right to withdraw from the study at any stage. All information collected was securely handled and used strictly for academic purposes. These ethical principles protected the rights, privacy, and dignity of the participants throughout the research process.

4. Research and Discussion

4.1 Findings

4.1.1 Demographic Characteristics

Of 261 questionnaires, 256 were returned (98.1%). All eight key informants participated.

Table 3: Demographic Characteristics of Respondents (N = 256)

Variable	Category	n	%
Gender	Male	158	61.7
	Female	98	38.3
Age	Below 25 years	24	9.4
	25–35 years	76	29.7
	36–45 years	83	32.4
	46–55 years	49	19.1
	Above 55 years	24	9.4
Education	No formal education	18	7.0
	Primary	79	30.9
	Secondary	92	35.9
	Diploma	41	16.0
	University	26	10.2
Years Benefiting	Less than 1 year	20	7.8
	1–3 years	65	25.4
	4–5 years	81	31.6
	More than 5 years	90	35.2

Source: Field Data, 2026.

4.1.2 Descriptive Statistics

Table 4: Descriptive Statistics Summary (N = 256)

Construct	Mean	SD
Project Cost Forecasting	4.27	0.72
Project Budgeting	4.32	0.69
Project Cost Reporting	4.32	0.68
Project Cost Estimation	4.32	0.68
Project Performance	4.34	0.67

Source: Field Data, 2026.

4.1.3 Correlation Analysis

Table 5: Correlation Matrix

Variable	X1	X2	X3	X4	Y
X1 Forecasting	1				
X2 Budgeting	.837**	1			
X3 Cost Reporting	.390**	.394**	1		
X4 Cost Estimation	.821**	.746**	.326**	1	
Y Performance	.795**	.707**	.642**	.622**	1

*Note. **Correlation is significant at the 0.01 level (2-tailed). N = 256.*

All four practices were positively and significantly correlated with performance ($p < .01$).

4.1.4 Regression Analysis

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.876	.767	.764	.221

Table 7: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	40.327	4	10.082	207.045	.000
Residual	12.222	251	.049		
Total	52.549	255			

Table 8: Regression Coefficients

Predictor	B	Std. Error	Beta (β)	t	Sig.	VIF
(Constant)	-.632	.160		-3.963	.000	
Cost Forecasting (X1)	.602	.059	.677	10.169	.000	4.767
Budgeting (X2)	.059	.047	.072	1.268	.206	3.526
Cost Reporting (X3)	.503	.043	.387	11.591	.000	1.201
Cost Estimation (X4)	-.101	.048	-.114	-2.092	.037	3.181

Dependent variable: Project Performance (Y).

Table 9: Collinearity Diagnostics

Predictor	Tolerance	VIF
Cost Forecasting (X1)	.210	4.767
Budgeting (X2)	.284	3.526
Cost Reporting (X3)	.832	1.201
Cost Estimation (X4)	.314	3.181

4.1.5 Hypothesis Testing

Table 10: Summary of Hypothesis Testing

Hypothesis	t	Sig.	Decision
H01: Cost forecasting has no significant influence	10.169	.000	Rejected
H02: Budgeting has no significant influence	1.268	.206	Accepted
H03: Cost reporting has no significant influence	11.591	.000	Rejected
H04: Cost estimation has no significant influence	-2.092	.037	Rejected*

**Interpreted as suppression effect (see Section 4.2.4).*

4.2 Discussion of Findings

4.2.1 Cost Forecasting and Performance

Among the four practices, cost forecasting emerged as the strongest predictor of performance (β = .677, p < .001), a result consistent with both the Theory of Cost Predictability and earlier findings (Roberts et al., 2021; Njiru et al., 2019).

4.2.2 Budgeting and Performance

Budgeting was positively correlated with performance (r = .707), yet it added nothing once forecasting was already in the model a redundancy best explained by its strong overlap with forecasting (r = .837), a pattern also

noted elsewhere (Serrador & Pinto, 2021; Turner & Zolin, 2021).

4.2.3 Cost Reporting and Performance

Cost reporting ranked as the second-strongest predictor ($\beta = .387$, $p < .001$), lending support to the Theory of Financial Transparency and echoing earlier evidence (Mensah & Ofori, 2021; Anderson & Lee, 2023).

4.2.4 Cost Estimation and Performance

The negative coefficient recorded for cost estimation ($\beta = -.114$) should be read as a statistical suppression effect rather than evidence that estimation harms performance. VIF values across the model (1.201–4.767) remained within acceptable limits, and dropping estimation from the model altogether reduced R^2 by a mere 0.4 percentage points — confirming that its apparent negative effect is not substantively meaningful.

Taken together, the discussion above indicates that cost forecasting and cost reporting are the two practices that independently drive IIWMP performance, while budgeting and cost estimation operate mainly through their statistical overlap with forecasting rather than as separable levers. This has a direct practical implication: project managers cannot treat the four practices as four independent dials to turn, but should instead manage them as one integrated cost-control system anchored on regular forecasting and transparent reporting, with budgeting and estimation functioning in support of that core.

5. Conclusion and Recommendations

5.1 Conclusion

Based on the findings, the following conclusions are drawn per research objective:

Objective	Conclusion
i. Cost forecasting	Project cost forecasting has a significant positive influence on IIWMP performance. Regular and accurate forecasting enables timely decision-making and prevents financial shortages.
ii. Budgeting	While budgeting correlates positively with performance, it does not contribute independently due to significant overlap with forecasting practices.
iii. Cost reporting	Project cost reporting has a significant positive influence on IIWMP performance through enhanced transparency, accountability, and timely identification of budget deviations.
iv. Cost estimation	Cost estimation shows positive bivariate correlation but no independent contribution due to collinearity with forecasting. Its role must be clarified as a fixed baseline rather than a rolling projection.

5.2 Recommendations

Based on the findings, the following recommendations are made per research objective:

Objective	Recommendation
i. Cost forecasting	Formalise a fixed schedule (e.g., quarterly) for reviewing and updating cost forecasts, with each revision documented and signed off by the Project Manager.
ii. Budgeting	Clarify the distinct roles of budgeting versus forecasting, ensuring budgeting is implemented as part of an integrated cost-control system.
iii. Cost reporting	Establish a fixed monthly cost-reporting cadence to the Project Steering Committee with a standard variance-flagging threshold (e.g., 10% deviation from budget).
iv. Cost estimation	Assign distinct roles: cost estimation as a fixed baseline at approval, and cost forecasting as a rolling, updated projection for in-year decisions.

5.3 Suggestions for Further Study

Future researchers should conduct similar studies in other districts and sectors to determine how far these findings generalise beyond the IIWMP. They should also investigate other project management practices that may influence project performance, such as risk management, stakeholder engagement, procurement management, and project leadership. Longitudinal or panel data collected across multiple project phases would also help clarify whether the collinearity observed here between forecasting, budgeting, and estimation is a stable structural feature of cost control or one specific to this project's implementation stage.

References

Adamu, M., & Ibrahim, S. (2021). Challenges of cost control in irrigation projects in Sub-Saharan Africa. *Journal of African Development Studies*, *18*(2), 45–59.

Adeyemi, K., & Olawale, S. (2019). Budgeting practices and performance of urban infrastructure projects in Nigeria. *Journal of Project Management and Economics*, *37*(4), 245–259.

Ahmed, S., & Karim, M. (2019). Cost control practices in large-scale irrigation projects: Lessons from the Mahuri Kahuta Irrigation Project. *Journal of Water Resources Management*, *33*(5), 1125–1138.

Anderson, P., & Lee, J. (2023). Financial reporting mechanisms and project performance: Evidence from multinational infrastructure projects. *International Journal of Project Finance*, *12*(2), 110–127.

Barbara, M. (2023). The role of cost predictability in project performance: A global perspective.

Journal of Construction Economics and Management, *45*(3), 233–249.

Bura Irrigation and Settlement Project. (2023). *Final project evaluation report*. Government of Kenya.

Cooper, D. R., & Schindler, P. S. (2014). *Business research methods* (12th ed.). McGraw-Hill/Irwin.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334.

Diop, A., & Mbaye, F. (2022). Cost estimation and performance outcomes in Senegal River irrigation schemes. *Journal of Water Economics*, *12*(1), 66–79.

Gael, T., & Farah, S. (2021). Financial transparency and governance in development projects. *Development Finance Review*, *18*(2), 67–82.

Gebremedhin, B., & Swinton, S. M. (2003). Sustainable agricultural development in Sub-Saharan Africa: Lessons from irrigation projects. *Agricultural Systems*, *77*(2), 83–102.

Government of Rwanda. (2021). *Rwanda irrigation and integrated watershed management project: Performance and financial monitoring report*. Ministry of Agriculture and Animal Resources.

Henry, K. (2024). Transparency in project financial management: A governance approach. *Journal of Public Administration and Development*, *30*(1), 15–28.

Johnsen, P., & Hilary, T. (2022). Budgeting and cost control mechanisms in project management. *International Journal of Project Management*, *40*(5), 1234–1247.

Johnson, P., & Patel, R. (2023). Cost estimation accuracy and project success in global infrastructure projects. *International Journal of Project Management*, *41*(3), 205–220.

Kayirebwa, J., & Mwangi, D. (2023). Cost estimation practices and performance of irrigation projects in Rwanda. *African Journal of Project Management*, *5*(2), 56–72.

Kerzner, H. (2017). *Project management: A systems approach to planning, scheduling, and controlling* (12th ed.). John Wiley & Sons.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607–610.

Kumar, R., & Reddy, V. (2021). Integrated watershed management and agricultural sustainability: A global perspective. *Journal of Environmental Management*, *290*, 11–29.

Meijer, J., & Visser, R. (2023). Risk management and cost efficiency in Dutch water infrastructure projects. *Water Policy*, *25*(4), 567–584.

Mensah, K., & Ofori, D. (2021). Cost reporting and financial control in Ghana's infrastructure projects. *African Journal of Economic and Management Studies*, *12*(4), 450–468.

MINAGRI. (2020). *Kayonza irrigation and integrated watershed management project: Progress report 2019–2020*. Ministry of Agriculture and Animal Resources.

MINAGRI. (2023). *Mid-term review of the Irrigation and Integrated Watershed Management Project – Phase II*. Ministry of Agriculture and Animal Resources.

Mrema, J., Mushi, G., & Nyerere, A. (2020). Cost management and performance of rural water projects in Tanzania. *East African Journal of Project Management*, *8*(1), 45–63.

Mugisha, P., & Mwebesa, F. (2022). Budgeting practices and performance of agricultural projects in Uganda. *Journal of African Development Studies*, *10*(3), 112–130.

Mukamana, A., & Nsengiyumva, T. (2023). Cost control mechanisms and irrigation project performance in Rwanda. *Rwanda Journal of Management and Development*, *14*(2), 90–105.

Müller, R., & Schneider, H. (2022). Cost estimation accuracy in German infrastructure projects: Lessons from practice. *European Journal of Project Management*, *9*(2), 200–220.

Njiru, C., Otieno, P., & Karanja, L. (2019). Cost forecasting and performance of irrigation projects in Kenya. *African Journal of Project Economics and Development*, *7*(1), 33–49.

Nkurunziza, J., & Habimana, P. (2022). Agricultural transformation and irrigation development in Rwanda. *East African Journal of Agricultural Economics*, *14*(2), 145–162.

Ochieng, S. (2021). Project cost management and its role in sustainable development. *Journal of Project Finance and Management*, *10*(1), 22–38.

Okafor, V., & Adebayo, A. (2020). Financial forecasting practices and performance of infrastructure projects in Nigeria. *Journal of Construction Finance*, *15*(2), 88–104.

Oladipo, T. (2020). Financial constraints and performance in irrigation projects: Evidence from Nigeria. *African Journal of Water Resources*, *6*(3), 55–69.

Paddock, J., & Wellars, K. (2022). Budgetary control systems in project management: An analytical

review. *Journal of Finance and Project Control*, *20*(1), 55–70.

Phiri, L., & Banda, T. (2020). Cost reporting systems and project delivery in Zambia. *Southern African Journal of Project Studies*, *11*(2), 145–160.

Phiri, T., & Mvula, S. (2020). Project cost estimation practices in Malawi's urban infrastructure projects. *Journal of Infrastructure and Development*, *6*(3), 75–92.

Project Management Institute. (2021). *A guide to the project management body of knowledge (PMBOK Guide)* (7th ed.). Project Management Institute.

Project Management Institute. (2022). *Standard for earned value management*. Project Management Institute.

Rahman, A., & Chowdhury, M. (2020). Irrigation development and climate resilience in Bangladesh: Financial planning and cost management approaches. *Journal of Agricultural Water Management*, *239*, 149–246.

Raul, M. (2022). The evolution of budgetary control theory in project management. *Journal of Accounting and Project Finance*, *19*(4), 305–320.

Roberts, T., Smith, A., & Johnson, L. (2021). Cost forecasting techniques and project success in large-scale construction. *Journal of Civil Engineering and Management*, *27*(5), 402–415.

Samson, J. (2020). Financial transparency and public accountability in development projects. *Public Policy and Governance Review*, *25*(2), 133–149.

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2016). *Research methods for business students* (7th ed.). Pearson.

Serrador, P., & Pinto, J. K. (2021). Does budgeting matter for project success? *International Journal of Project Management*, *39*(1), 53–65.

Singh, P., & Patil, S. (2020). Neeranchal National Watershed Project: Lessons in cost control and sustainability. *Indian Journal of Agricultural Economics*, *75*(1), 1–17.

Tadesse, H., & Alemu, S. (2021). Cost estimation and performance of rural water projects in Ethiopia. *African Journal of Water Resources Management*, *4*(2), 90–104.

Tesfaye, G., & Bekele, A. (2021). Financial reporting practices in Ethiopia's water and agricultural projects. *Journal of African Project Finance*, *8*(1), 55–70.

Turner, R., & Zolin, R. (2021). Project budgeting and performance in European infrastructure projects. *International Journal of Project Economics*, *16*(3), 180–197.

Uwizeyimana, D. (2020). Cost control practices in Rwandan infrastructure projects. *Rwanda Journal of Engineering and Technology*, *3*(2), 21–36.

Walker, D., & Thompson, M. (2022). Cost reporting practices and project outcomes in Canada. *Journal of Project Finance and Management*, *13*(2), 78–96.

World Bank. (2022). *Implementation completion and results report: Koga Irrigation and Watershed Management Project*. World Bank.