International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:3048-7722
Volume 4, Issue 3, May-June-2026, PP: 01-6

E-Procurement Systems and Cost Performance in Water Service Providers in Kenya: Evidence from a Multi-Method Logistic Regression Analysis

Alfred Mwatika Mghanga, Eric Mathuva, Egondi Patrick
Kenya Methodist University

Abstract – **This study examines the effect of e-procurement systems on cost performance in Water Service Providers (WSPs) in Kenya. The study is motivated by persistent inefficiencies in public procurement despite the adoption of digital procurement reforms such as IFMIS. A descriptive cross-sectional survey design employing a mixed methods approach was used. Data were collected from 221 respondents across 81 WSPs in Kenya. Spearman Rank Correlation and binary logistic regression models were applied due to non-normality and dichotomisation of the dependent variable (cost performance: 0 = low, 1 = high). Results indicate a strong positive and statistically significant relationship between e-procurement and cost performance ($\rho = 0.821$, $p < .01$). Binary logistic regression results further confirm that e-procurement significantly predicts high-cost performance in both univariate (B = 4.556, p < .001, Exp(B) = 95.230) and multivariate models (B = 3.383, p < .001, Exp(B) = 29.456). The multivariate model explained 96.4% of variance (Nagelkerke $R^2 = .964$), indicating strong predictive power. However, implementation gaps were observed, particularly low utilisation of IFMIS systems (M = 2.09). The study concludes that e-procurement is the most influential determinant of cost performance in WSPs, reinforcing Resource-Based View and Technological Determinism theories. Policy recommendations include full digital integration, ICT capacity strengthening, and enforcement of e-procurement compliance frameworks.**

Keywords **- e-procurement, cost performance, public procurement, water service providers, Kenya, logistic regression**

I. INTRODUCTION

Public procurement remains a critical determinant of cost efficiency in public sector organisations, particularly in capital intensive utilities such as Water Service Providers (WSPs). In Kenya, procurement reforms under the Public Procurement and Asset Disposal Act (PPADA, 2015) introduced electronic procurement systems, including the Integrated Financial Management Information System (IFMIS), with the objective of strengthening transparency, accountability, and cost control in public expenditure management (Public Procurement Regulatory Authority [PPRA], 2022). Despite these reforms, persistent challenges such as cost overruns, procurement delays, and inefficiencies continue to characterise procurement operations within the water sector (World Bank, 2020).

E-procurement refers to the use of digital platforms to manage end-to-end procurement processes, including requisitioning, tendering, supplier selection, contract management, and payment processing. Theoretically, e-procurement systems are expected to reduce transaction costs, enhance process efficiency, improve transparency, and strengthen accountability in public procurement systems (Vaidya et al., 2005; Svidronova & Mikus, 2015). From a theoretical standpoint, these systems are also considered strategic enablers of value for money by minimizing information asymmetry and improving procurement decision-making processes.

However, empirical evidence from developing economies suggests that the adoption of e-procurement systems does not always translate into effective utilisation or improved performance outcomes. This is largely due to infrastructural limitations, inadequate digital skills, organisational resistance to change, and weak system integration within procurement and financial management structures (Mohungoo et al., 2020). In many cases, implementation gaps persist between policy adoption and actual operational use, thereby limiting the expected benefits of digital procurement reforms.

Against this background, this study investigates the effect of e-procurement systems on cost performance in Kenyan Water Service Providers. The study employs a combination of correlation analysis and logistic regression techniques to establish both the strength of association and the predictive influence of e-procurement on cost performance outcomes within the sector.

II. LITERATURE REVIEW

1. Theoretical Framework

The study is anchored on three complementary theoretical perspectives, namely the Resource-Based View (RBV), Technological Determinism Theory, and Agency Theory. These theories collectively provide a multidimensional explanation of how e-procurement systems influence cost performance in public procurement systems, particularly within Water Service Providers (WSPs).

Resource-Based View (RBV) Theory

The Resource-Based View (RBV), as advanced by Barney (1991), posits that organisational performance and competitive advantage are derived from valuable, rare, inimitable, and non-substitutable resources and capabilities. Within the context of public procurement, digital procurement systems such as e-procurement

platforms constitute strategic organisational capabilities that enhance efficiency, transparency, and cost control.

From an RBV perspective, e-procurement systems are not merely administrative tools but critical technological resources that enable organisations to streamline procurement processes, reduce operational inefficiencies, and improve decision-making accuracy. When effectively deployed and integrated into organisational processes, these systems contribute to improved cost performance through better coordination, reduced transaction costs, and enhanced supplier management. However, RBV also emphasizes that the mere possession of technology is insufficient; value is only realised when organisations possess complementary capabilities such as ICT skills, process integration, and managerial competence to fully exploit the system's potential.

Technological Determinism Theory

Technological Determinism Theory argues that technological innovation is a primary driver of organisational and social transformation (Mayer, 2022). In procurement systems, the introduction of digital platforms fundamentally reshapes institutional processes, decision-making structures, and inter-organisational relationships.

In the context of e-procurement, technological systems redefine traditional procurement workflows by automating requisitioning, tendering, supplier evaluation, contract management, and payment processes. This transformation enhances speed, accuracy, and transparency while minimizing human intervention in routine procurement activities. Consequently, organisational behaviour, procurement culture, and accountability mechanisms are increasingly shaped by the capabilities embedded in digital procurement technologies.

However, the theory also implies that the effectiveness of such transformation depends on the level of technological adoption and integration. Where implementation is partial or inconsistent, the anticipated improvements in cost performance may not be fully realised, leading to a gap between technological potential and actual outcomes.

Agency Theory

Agency Theory, developed by Jensen and Meckling (1976), explains the relationship between principals (government, oversight bodies, or citizens) and agents (procurement officials and implementing entities), where conflicts of interest and information asymmetry may arise. In public procurement systems, such asymmetry often manifests in inefficiencies, corruption risks, and suboptimal decision-making.

E-procurement systems play a critical role in mitigating these challenges by increasing transparency, traceability, and accountability in procurement transactions. Digital platforms create structured audit trails, standardise procurement documentation, and enhance real-time monitoring of procurement activities. This reduces opportunities for opportunistic behaviour and improves alignment between organisational actions and regulatory requirements.

From an Agency Theory perspective, e-procurement systems strengthen governance mechanisms by ensuring that principals have better visibility into procurement processes, thereby reducing information gaps and enhancing cost control. This ultimately contributes to improved cost performance through more efficient resource utilisation and reduced wastage.

Theoretical Integration

Collectively, the three theories provide a comprehensive explanatory framework for the study. The RBV explains e-procurement as a strategic organisational capability, Technological Determinism highlights its transformative power in reshaping procurement systems, and Agency Theory explains its governance and accountability benefits.

Together, these theories support the central argument that effective implementation and utilisation of e-procurement systems enhance cost performance by improving efficiency, reducing transaction costs, strengthening accountability, and optimising resource allocation within Water Service Providers.

2. Empirical Review

Empirical studies consistently demonstrate that e-procurement improves procurement efficiency and cost outcomes. For instance, Kunnapapdeelert and Thepmongkorn (2017) found that e-procurement significantly reduces procurement cycle time and costs. Similarly, Amalia (2017) established that digital procurement systems enhance transparency and reduce fraud.

In Kenya, Ingavo and Moronge (2019) found that e-procurement improves procurement performance in state corporations. However, Mathenge and Wausi (2018) noted that adoption is often constrained by inadequate ICT infrastructure and resistance to change.

This study extends existing literature by integrating both correlation and logistic regression approaches to quantify the predictive power of e-procurement on cost performance.

III. METHODOLOGY

1. Research Design

The study adopted a descriptive cross-sectional survey design supported by a mixed methods approach. The descriptive cross-sectional design was considered appropriate because it allows for the systematic collection of data from a defined population at a single point in time, enabling the researcher to describe existing phenomena and examine relationships among variables without

manipulation of study conditions (Yıldız, 2023; Sun, 2020). In the context of this study, the design facilitated the assessment of compliance with public procurement practices and their effect on cost performance in Water Service Providers (WSPs) in Kenya.

A mixed methods approach was incorporated to enhance the depth and breadth of analysis through triangulation. Quantitative data provided measurable evidence of relationships between procurement practices and cost performance, while qualitative data from open-ended questions enriched interpretation by capturing contextual explanations, institutional experiences, and operational challenges within WSPs (Aramo-Immonen, 2011). This integration strengthened the validity of findings by allowing convergence of statistical results with practical insights from respondents.

2. Population and Sample

The target population comprised 102 licensed Water Service Providers (WSPs) in Kenya as classified by the Water Services Regulatory Board (WASREB, 2024). These utilities operate under diverse regional and institutional structures and are responsible for water supply and sanitation services across the country.

From this population, a sample of 81 Water Service Providers was selected using statistical sampling procedures to ensure representativeness and reliability of findings. Within each selected WSP, three key informants were targeted, drawn from the procurement, finance, and operations departments. These departments were selected because they are directly involved in procurement planning, financial control, and operational execution, which are central to cost performance outcomes.

This yielded a total of 221 valid respondents, representing procurement officers, finance managers, and operations managers. The sample size was considered adequate for inferential statistical analysis and generalization of findings across the water sector.

The sampling strategy ensured proportional representation across institutions and functional roles, thereby improving the reliability, external validity, and sector-wide applicability of the study findings.

3. Data Analysis

Data analysis was conducted using IBM SPSS Version 26. Prior to inferential analysis, diagnostic tests were performed to determine the suitability of statistical techniques. The Kolmogorov–Smirnov and Shapiro–Wilk tests indicated that all study variables were not normally distributed ($p < .001$), necessitating the use of non-parametric and robust statistical techniques.

To examine relationships between procurement practices and cost performance, Spearman Rank Correlation analysis was employed. This method was appropriate for assessing the strength and direction of monotonic relationships between ranked variables without assuming normal distribution or linearity. It provided correlation coefficients (ρ) to determine the degree of association between procurement planning, staff capacity, e-procurement, procurement documentation, and cost performance.

To assess predictive relationships, binary logistic regression analysis was conducted. The dependent variable, cost performance, was dichotomised into two categories:

- 0 = Low-Cost Performance
- 1 = High-Cost Performance

This transformation allowed for the estimation of the probability of achieving high cost performance based on procurement-related predictors. The logistic regression model produced odds ratios (Exp(B)), which measured the likelihood of high cost performance associated with changes in independent variables.

Model significance was evaluated using the Omnibus Tests of Model Coefficients, while model fit was assessed using -2 Log Likelihood, Cox & Snell R^2, Nagelkerke R^2, and the Hosmer and Lemeshow goodness-of-fit test. Predictor significance was determined using the Wald statistic and p-values ($p < 0.05$).

The combined use of Spearman correlation and binary logistic regression provided a robust inferential framework by establishing both associative and predictive relationships among procurement practices and cost performance in WSPs.

IV. RESULTS

1. Descriptive Findings

The descriptive analysis examined respondents' perceptions regarding the effectiveness of e-procurement systems in enhancing procurement outcomes and cost performance within WSPs.

The results indicate that e-procurement systems are highly perceived to improve organizational performance, particularly in areas of cost efficiency, transparency, and procurement effectiveness. Respondents strongly agreed that:

- E-procurement contributes to cost savings (Mean = 4.76, SD ≈ 0.43)
- E-procurement enhances transparency in procurement processes (Mean = 4.67, SD ≈ 0.47)
- E-procurement improves procurement efficiency and coordination (Mean = 4.71, SD ≈ 0.46)

These findings suggest that stakeholders view digital procurement systems as a critical reform tool that enhances value-for-money outcomes and strengthens accountability in procurement operations.

International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:3048-7722
Volume 4, Issue 3, May-June-2026, PP: 01-6

However, despite these positive perceptions, the study found a significant gap between perceived effectiveness and actual implementation. The utilization of the Integrated Financial Management Information System (IFMIS) was notably low:

IFMIS usage (Mean = 2.09, SD = 0.496)
This result indicates weak operational integration of e-procurement systems in daily procurement activities. The divergence between high perceived benefits and low system usage reveals a clear policy–implementation gap, where digital procurement reforms exist in principle but are not fully embedded in operational practice within many WSPs.

2. Correlation Analysis
Spearman Rank Correlation analysis was conducted to determine the relationship between e-procurement systems and cost performance. The results revealed a strong positive and statistically significant relationship between the variables:

$$\rho = 0.821, p < .01$$

This indicates that higher levels of e-procurement adoption and effectiveness are strongly associated with improved cost performance in WSPs.

The strength of the correlation suggests that organizations that effectively utilize e-procurement systems tend to experience better cost control, improved transparency, and enhanced procurement efficiency. The relationship is both statistically significant and practically meaningful, confirming that e-procurement is a key determinant of procurement performance outcomes.

3. Logistic Regression Results
Univariate (Simple Binary Logistic Regression) Model
A univariate binary logistic regression model was used to assess the independent effect of e-procurement on cost performance. The results indicate that e-procurement is a highly significant predictor of cost performance:

- B = 4.556
- Wald = 31.093
- p < .001
- Exp(B) = 95.230

The regression coefficient (B = 4.556) shows a strong positive effect, indicating that improvements in e-procurement significantly increase the likelihood of achieving high-cost performance.

The odds ratio (Exp(B) = 95.230) implies that a one-unit increase in e-procurement adoption increases the likelihood of high-cost performance by approximately 95 times, holding all other factors constant. This demonstrates a very strong effect size, highlighting the strategic importance of e-procurement in improving cost outcomes.

Multivariate Logistic Regression Model
A multivariate binary logistic regression model was conducted to control for other procurement-related variables. The results show that e-procurement remains a statistically significant predictor of cost performance even when other factors are included:

- B = 3.383
- p < .001
- Exp(B) = 29.456
- Nagelkerke $R^2 = 0.964$

The results indicate that while the effect size reduces slightly when other variables are introduced, e-procurement remains a strong and consistent predictor of cost performance.

The odds ratio (Exp(B) = 29.456) suggests that a one-unit increase in e-procurement increases the likelihood of achieving high cost performance by approximately 29 times, confirming its robust predictive influence.

The Nagelkerke R^2 value of 0.964 indicates that the model explains approximately 96.4% of the variation in cost performance, demonstrating excellent explanatory power and strong predictive validity.

4. Model Fit
Model fit was assessed using the Hosmer and Lemeshow goodness-of-fit test as well as classification accuracy measures.

Hosmer and Lemeshow Test
The Hosmer and Lemeshow test results indicate that the model fits the data well:

- $\chi^2 = 1.932$
- p = 0.926

Since the p-value is greater than 0.05, the result is not statistically significant, indicating no significant difference between observed and predicted values. This confirms that the model is well-specified and provides an adequate fit to the data.

Classification Accuracy
The classification results show a very high predictive accuracy:

Overall correct classification rate = 98.6%
This indicates that the model is highly effective in distinguishing between low and high cost performance outcomes. The high classification accuracy further confirms the robustness and predictive strength of the logistic regression model.

Overall, the findings demonstrate that:

- E-procurement is strongly and positively associated with cost performance
- It is a statistically significant predictor in both univariate and multivariate models

- The system demonstrates extremely high explanatory and predictive power
- However, implementation gaps persist due to low system utilisation (IFMIS usage)

These results provide strong empirical evidence that e-procurement is a critical driver of cost performance in Water Service Providers in Kenya, although its full benefits are constrained by incomplete implementation.

V. DISCUSSION

The findings confirm that e-procurement is the strongest determinant of cost performance in WSPs. This aligns with Vaidya et al. (2005), who argue that digital procurement systems enhance operational efficiency and transparency. Similarly, Gunasekaran et al. (2009) found that e-procurement reduces transaction costs and improves supply chain performance.

However, the study reveals a critical implementation gap, as system usage remains low despite high perceived benefits. This supports the findings of Mohungoo et al. (2020), who noted that e-procurement success is often hindered by organisational resistance and inadequate ICT infrastructure.

From a theoretical perspective, the findings strongly support Technological Determinism, as digital systems significantly shape procurement outcomes. RBV is also validated, as e-procurement represents a strategic capability that enhances organisational performance when effectively integrated.

VI. CONCLUSION

E-procurement systems have a statistically significant and substantial effect on cost performance in Kenyan Water Service Providers. However, the full benefits of digital procurement are constrained by low utilisation and implementation gaps.

Recommendations of the Study
Based on the empirical findings from Spearman Rank Correlation, simple binary logistic regression, and multivariate logistic regression analyses, the study proposes the following evidence-based recommendations to enhance cost performance in Water Service Providers (WSPs) in Kenya through improved e-procurement implementation.

Full Implementation of IFMIS Across All WSPs
Given the strong positive and statistically significant effect of e-procurement on cost performance, Water Service Providers should ensure complete and mandatory implementation of IFMIS and other e-procurement platforms across all procurement units. This should include full integration of procurement, finance, and audit functions to eliminate fragmented processes and reduce inefficiencies. Partial adoption should be discouraged, as the findings indicate a clear implementation gap between perceived benefits and actual system usage.

Mandatory ICT Training for Procurement Staff
The study established that low system utilisation is partly driven by limited ICT competence. Therefore, WSPs should institutionalize mandatory and continuous ICT training programs for procurement personnel. Training should focus on IFMIS usage, digital procurement workflows, data analytics, and system-based reporting. Certification-based training programs should also be introduced in collaboration with professional bodies such as KISM and CIPS to strengthen technical capacity and improve system adoption.

Strengthening Digital Infrastructure in County-Based Utilities
To support effective e-procurement implementation, there is a need for significant investment in ICT infrastructure across county-level water utilities. This includes reliable internet connectivity, secure servers, updated hardware systems, and integrated procurement platforms. Strengthened infrastructure will reduce system downtime, improve real-time procurement tracking, and enhance overall procurement efficiency and cost control.

Enforcement of E-Procurement Compliance Audits
Regulatory bodies such as PPRA and WASREB should strengthen routine compliance audits on e-procurement usage and adherence. These audits should not only focus on documentation compliance but also assess actual system usage, transaction traceability, and procurement process integrity. Strict enforcement mechanisms, including sanctions for non-compliance, will ensure that e-procurement systems are not only adopted at policy level but effectively utilized in practice.

Integration of Procurement and Financial Systems for Real-Time Monitoring
The study recommends full integration of procurement systems with financial management platforms to enable real-time tracking of expenditures, budget utilization, and procurement decisions. Such integration will improve transparency, reduce cost overruns, and enhance decision-making accuracy. It will also strengthen coordination between procurement and finance departments, ensuring that procurement decisions are aligned with approved budgets and financial controls.

Summary
Overall, the recommendations emphasize that improving cost performance in Water Service Providers requires not only adoption of e-procurement systems but also full digital integration, human capacity development, regulatory enforcement, and system interoperability. These measures collectively reinforce the study's conclusion that technology-driven procurement systems are central to

achieving efficient and sustainable cost performance outcomes.

REFERENCES

1. Amalia, S. (2017). Legal and administrative barriers in e-procurement implementation. International Journal of Public Sector Management, 30(2), 1–15.
2. Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108
3. Gunasekaran, A., et al. (2009). E-procurement adoption in supply chain management. International Journal of Production Economics, 122(1), 1–13.
4. Ingavo, J. A., & Moronge, M. (2019). Influence of e-procurement on performance of state corporations in Kenya. Strategic Journal of Business & Change Management, 6(1), 1–15.
5. Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm. Journal of Financial Economics, 3(4), 305–360.
6. Kunnapapdeelert, T., & Thepmongkorn, S. (2017). E-procurement and supply chain efficiency. Journal of Supply Chain Management, 53(2), 1–10.
7. Mathenge, E., & Wausi, A. (2018). ICT infrastructure and e-procurement adoption in Kenya. African Journal of Procurement, 4(1), 22–35.
8. Mayer, S. (2022). Digital transformation in procurement systems. Journal of Business Research, 142, 1–10.
9. Mohungoo, I., Brown, I., & Kabanda, S. (2020). Implementation challenges in e-procurement systems. In E-Procurement in Developing Countries (pp. 1–10). Springer.
10. Public Procurement Regulatory Authority. (2022). Annual compliance report. Government of Kenya.
11. Svidronova, M., & Mikus, T. (2015). E-procurement as ICT innovation. Journal of Public Procurement, 15(3), 1–20.
12. Vaidya, K., Sajeev, A. S. M., & Callender, G. (2005). Critical factors in e-procurement implementation. Journal of Public Procurement, 5(1), 70–99.
13. World Bank. (2020). Enhancing government procurement practices in developing countries. World Bank Publications.