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E-PROCUREMENT SYSTEMS AND PERFORMANCE OF CITY OF KIGALI, RWANDA

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Abstract: **The general purpose of this study was to assess the influence of e-procurement systems on the City of Kigali's performance. The research methodologies used in the study were descriptive and correlational. The study is based on three theoretical frameworks: The Technology Acceptance Model, the Resource-Based View, and the Transaction Cost Theory. Out of the 239 individuals who were involved in the research, 63 were officers of procurement, logistics, and warehouse; 59 were suppliers and contractors; 61 were finance department workers; and 56 were management and policy-making elite from Kigali. Using Slovin's method and simple random sampling procedures, the research selected 150 individuals at random to ensure reliable findings. Primary data was gathered via surveys, while secondary data was derived from document analysis. The study used Statistical Product and Service Solutions (version 25) for descriptive statistics, bivariate correlation, and regression analysis to look at how the city's efficiency was affected by computerized bidding, sourcing, and invoicing. Factor analysis was also used to improve model fit and construct validity. Study findings on the impact of the e-procurement system on government agency effectiveness were more trustworthy and accurate as a result of integrating these methodologies. The findings indicate that there is a favorable and statistically significant impact on performance from e-bidding ($\beta = 0.240$, $p < 0.05$), e-sourcing ($\beta = 0.474$, $p < 0.05$), and e-invoicing ($\beta = 0.251$, $p < 0.05$). When it comes to these, e-sourcing, e-invoicing, and e-bidding are the three most important indicators. To keep its online bidding systems accessible, safe, and easy to use, the Kigali City Government should put money into their ongoing development. To make e-bidding even more efficient and productive, educating procurement workers and suppliers should be a regular occurrence.**

Keywords: **E-Procurement Systems, Electronic Bidding, Sourcing, Invoicing and Performance.**

I. INTRODUCTION

Organizations in today's fast-paced, globally competitive business climate must innovate technologically to provide customers with cost-effective overall solutions and increase customer loyalty via creative thinking and new approaches. The proliferation of ICT has forced businesses to abandon traditional methods of e-Procurement in favor of more environmentally friendly alternatives (Aithal, 2023). How both buyers and sellers obtain products and services is changing as a result of technological advancements. Acquisition management websites have made it easier than ever before to centralize the oversight and monitoring of performance contracts, bids, and records. This is assisting businesses in achieving record levels of productivity while also meeting requirements in a way that is favorable, economical, and conducive to risk aversion throughout the supply chain (Mourtzis *et al*., 2021).

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Problem statement

Public organizations throughout the world, including Rwanda, are embracing e-procurement platforms to improve transparency, efficiency, and service delivery. However, despite the potential benefits of e-procurement, several challenges hinder its effectiveness in public institutions. According to a report by the Rwanda Public Procurement Authority (2022), only 60% of public institutions have fully integrated e-procurement systems into their operations, raising concerns about the overall impact on institutional performance. The lack of comprehensive adoption may be contributing to persistent inefficiencies and delays in public service delivery (Rukundo & Niyonsenga, 2023).

Offline tendering caused unfairness and non-transparency, delayed the process, and led to tenders being awarded at higher prices due to limited competition often because information was not adequately disseminated. This resulted in the non-achievement of objectives, poor-quality in-service provision, diminished citizen trust in public institutions, and mismanagement of public finances. Consequently, these issues have contributed to the characterization of public institutions in Rwanda as underperforming (Umumararungu & Irechukwu, 2023).

A study by Nshimiyimana *et al*. (2023) highlighted that 48% of surveyed public officials reported no significant cost reduction since the implementation of e-procurement systems. This raises questions about the actual financial benefits associated with e-procurement in the Rwandan context, particularly in light of limited training and digital literacy among procurement staff. Consequently, the expected advantages of enhanced competitiveness and increased supplier participation may not be fully realized (Uwitware *et al*., 2024).

As indicated by Kamugisha and Musoni (2021), data integrity issues and cyber threats erode trust in e-procurement platforms, which in turn affects supplier engagement and overall project success. Public institutions must ensure that their e-procurement systems are resilient and secure to foster an environment of transparency and reliability (Safari & Nkurunziza, 2022). According to a survey conducted by the Rwanda Governance Board (2023), 55% of citizens expressed dissatisfaction with the responsiveness of public services, suggesting that e-procurement may not be sufficiently addressing the needs of stakeholders. This dissatisfaction highlights the necessity for public institutions to holistically redefine their performance metrics to include user experiences and stakeholder feedback (Mukagatare & Nyankesha, 2024).

These studies suggest that the expected benefits efficiency, transparency, and improved service delivery were not be fully realized. There is a critical need for empirical research that assesses the effectiveness of e-procurement systems and their impact on public institutions in Rwanda, especially as the country continues to strive towards digital transformation in governance. To address that knowledge vacuum, this paper examines how the City of Kigali has benefited from e-procurement.

The general objective of this study is to assess the effect of e-procurement on performance of City of Kigali.

The specific objectives of the study are:

i. To examine the effect of e-bidding on performance of City of Kigali, Rwanda.
ii. To find out the effect of e-sourcing on performance of City of Kigali, Rwanda.
iii. To find out the effect of e-invoicing on performance of City of Kigali, Rwanda.

II. LITERATURE REVIEW

2.1 Theoretical Literature Review

Three theoretical frameworks served as the basis for this study: Technology Acceptance Model (TAM), the Resource-Based View (RBV) Theory, and the Transaction8Cost Theory (TCT).

2.1.1 Technology Acceptance Model (TAM)

In 1989, Fred Davis laid down the groundwork for what would become known as the Technology Acceptance Model (TAM). The motivations for adopting new technology are the focus of this approach. Perceived utility and ease of use are the two most important factors in determining a system's acceptability, according to this hypothesis (Saf & Hachimi, 2021). The degree to which a system improves task performance is related to its perceived utility, yet its apparent ease of use reflects the amount of work required to operate it. These beliefs influence not just attitudes but also behavioral intentions and actual usage. A system that enhances performance yet presents significant operational challenges may encounter resistance, while a system that is easy to use but lacks functional advantages may fail to gain traction (Spiryagin *et al*., 2022).

Using the Technology Acceptance Model (TAM), the study examined how e-procurement-systems' perceived usefulness and ease of use affected their uptake. Gaining a grasp of these criteria aided in determining the level of efficiency, transparency, and overall performance enhanced by electronic bidding, sourcing, and invoicing in public institutions.

2.1.2 Resource-Based View (RBV) Theory

Chatterjee et al. (2023) states that Birger Wernerfelt first introduced the Resource-Based View (RBV) in 1984, and Jay Barney expanded on it in 1991. It highlights the importance of internal resources as a strategic tool for gaining a competitive advantage. According to the idea, an organization's ability to succeed in the long run is determined by its resources, which are categorized as precious, uncommon, inimitable, and non-substitutable. Internal capabilities such as technological expertise, proprietary processes, and skilled human capital contribute to long-term performance improvements. Strengthening these assets through continuous investment in innovation, training, and development enhances operational efficiency and differentiates organizations from competitors (Jerab & Mabrouk, 2023).

The study used Resource-Based View (RBV) Theory to analyse how internal capabilities such as technological infrastructure, procurement expertise, and digital integration influence e-procurement outcomes. Strengthening institutional resources enhances competitive advantage, operational efficiency, and long-term performance, enabling public institutions to optimize procurement processes and achieve sustainable improvements in service delivery.

2.1.3 Transaction Cost Theory (TCT)

The Transaction Cost Theory (TCT), introduced through the work of Ronald Coase in 1937 and later refined through Oliver Williamson, examines economic exchanges through the lens of cost efficiency. Every transaction generates expenses related to searching for partners, negotiating agreements, enforcing contracts, and monitoring compliance (Anjaria, 2024). Organizations weigh these costs against the benefits of internalizing certain functions. When transaction costs rise, in-house production may present a more viable option, whereas lower transaction costs encourage reliance on external suppliers. Organizations may make better judgments about procurement strategies and resource allocation when they use a systematic strategy to evaluate transaction costs (Adebayo *et al*., 2024).

Industries such as manufacturing, logistics, finance, and service provision apply transaction cost principles to determine sourcing strategies and streamline procurement processes. Digital platforms that enhance transparency, automate financial transactions, and facilitate vendor management contribute to cost reductions and performance improvements. Analysing transaction costs provides a structured framework for evaluating the benefits of various procurement models. Strategic resource management enables organizations to achieve long-term development by prioritizing cost efficiency while preserving quality and compliance (Olaleye *et al*., 2024).

This research examined the ways in which electronic procurement reduces the transaction costs of managing contracts, keeping tabs on suppliers, and ensuring compliance using Transaction Cost Theory (TCT). Digital procurement systems reduce inefficiencies, enhance cost-effectiveness, and improve operational performance, ensuring that public institutions achieve optimal resource utilization while maintaining accountability and service delivery standards.

2.2 Empirical Review

Research by Boafo *et al*. (2020) examined how e-procurement affected the efficiency and effectiveness of Ghana's public sector procurement systems. Electronic bidding, tendering, and contracting have enhanced openness, efficiency, and cost-effectiveness in procurement, according to data from many organizations. Electronic procurement improved transparency and efficiency, according to the research. It stressed that less spending and improved service delivery resulted from digital procurement processes that were successfully implemented. The widespread use of electronic procurement procedures by government entities was one of the suggestions made. The paper went on to recommend further research into the difficulties of implementing e-procurement systems in various parts of Africa and whether or not such systems can be scaled.

Research by Sibomana (2022) looked at how e-procurement affected Rwandan government contracts. In particular, the research focused on competent leadership, technical know-how, and information and communication technology infrastructure. Three district hospitals' worth of staff, twenty-one vendors, and twenty-four service providers contributed to the data set. The results demonstrated that operational performance was much enhanced by the use of electronic requisitioning, electronic tendering, electronic supplier selection, and procurement record keeping. The study's findings corroborated e-procurement's favorable impact on procurement efficiency, which is fueled by enhanced supplier

relationships and legal compliance. The research emphasized the need of enhancing ICT capabilities and suggested that government agencies broaden their digital infrastructure to guarantee open and responsible purchasing procedures.

Bellon *et al.* (2022) investigated the impact of electronic invoicing on tax compliance and firm performance in Peru using a quasi-experimental methodology. The findings showed that e-invoicing boosted reported sales, purchases, and VAT responsibilities by over 5% in the first year, especially among smaller enterprises and sectors with weak compliance rates. The system's ability to decrease transaction costs and increase enforcement led to better compliance. Nevertheless, companies restrict revenue rises by offsetting profits via the use of VAT credits. According to the research, electronic invoicing does improve compliance, but more tax changes are needed for it to have a complete fiscal effect. Policymakers using digital technologies to update tax systems and enhance enforcement should rely on these results for critical recommendations.

III. METHODOLOGY

Research design

Researcher used a descriptive and correlational approach to their investigation. This study employed a mixed-methodologies strategy, integrating quantitative and qualitative methods, to guarantee thorough analysis.

Parget Population

The population for this study consist of 239 individuals, including Procurement, Logistics and Warehouse officers, Suppliers and Contractors, Finance Department Personnel, and City Management and Policy Makers of the City of Kigali.

Sample Size

When researchers lack the means to study the whole population, Slovin's method allows them to take a representative sample of the community. Using Slovin's approach, scientists found out what size sample is necessary to make accurate results.

To get the correct form of Slovin's equation, follow these steps:

$$n = \frac{N}{1+(Ne^2)}$$

n= Number of samples or sample size

N= Total population

e = Error tolerance

$n = \frac{N}{1+(Ne^2)}$, $n = \frac{239}{1+(239x0.05^2)}$, $n = \frac{239}{1+(239x0.0025)}$,

$n = \frac{239}{1+0.5975}$, $n = \frac{239}{1.5975}$, $n = 150$

Research instruments

This research utilized both primary and secondary data, each collected through distinct instruments. Primary data was gathered directly by the researcher, such as through surveys or direct field observations. This method provided firsthand information crucial for understanding specific research questions. In contrast, secondary data provides useful context by drawing on previously published materials such as books, journals, films, newspapers, and online resources. To collect data, the researcher employed document analysis for secondary data and surveys for primary data, ensuring a comprehensive approach to data gathering.

Data Analysis Techniques and Presentation

This study made good use of a variety of methodologies to examine the collected data. In order to evaluate the results, descriptive and inferential statistics were used, including a bivariate correlation analysis and a linear regression model. Data processing and analysis were carried out using SPSS (version 25) in the research. Means, standard deviations, frequencies, and percentages were given special attention.

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Factor analysis was employed to identify underlying constructs and reduce data dimensionality, ensuring that only the most relevant variables contributed to the final model. This technique supported the validation of measurement structures and enhanced the interpretive depth of the findings.

The regression model used to evaluate causal relationships among variables is expressed as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X2 + \beta_3 X_3 + \varepsilon$

Where:

Y = Performance of the City of Kigali

X_1 = E-bidding

X_2 = E-sourcing

X_3 = E-invoicing

α = Constant

β_0=Constant/Intercept

β_1, β_2, β_3 : Coefficients

ε: Error Term

IV. FINDINGS & DISCUSSIONS

4.1 Response Rates

Based on the data, 87.3% of the 150 questionnaires sent out were filled out and returned, with 19 questionnaires (12.7%) going unreturned or missing information. An excellent response rate for survey research is defined as 70% or above (Mugenda & Mugenda, 2003). Consequently, the confidence in the results and the validity of the data are both bolstered by the high response rate of this research.

4.2 Inferential Statistics

The purpose of the inferential study was to determine how the City of Kigali's performance was impacted by electronic procurement, more especially electronic bidding, sourcing, and invoicing. The study's general and particular goals are used to interpret the findings, which are reported in Tables.

Table 1: Correlations matrix

		E-bidding	E-sourcing	E-invoicing	Performance
E-bidding	Pearson Correlation	1	.625**	.752**	.779**
	Sig. (2-tailed)		.000	.000	.000
	N		131	131	131
E-sourcing	Pearson Correlation		1	.588**	.802**
	Sig. (2-tailed)			.000	.000
	N			131	131
E-invoicing	Pearson Correlation			1	.775**
	Sig. (2-tailed)				.000
	N				131
Performance	Pearson Correlation				1
	Sig. (2-tailed)				
	N				131

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

Source: Field data, 2025

Table 1 shows the correlations between e-bidding, e-sourcing, e-invoicing, and Kigali City's performance. There is a favorable and statistically significant association between performance and all three e-procurement components, according to the data, at the 0.05 significance level. To be more precise, e-sourcing had the most robust positive correlation with performance ($r=0.802$, $p<0.05$), while e-bidding and e-invoicing followed with $r=0.779$ and $r=0.775$, respectively, and all three were statistically significant. Thus, it is probable that the City of Kigali will see improved performance results in tandem with any of these e-procurement procedures that are improved.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.900[a]	.810	.805	.17475	1.803

a. Predictors: (Constant), E-invoicing, E-sourcing, E-bidding

Source: Field data, 2025

Table 2 (Model Summary) demonstrates that there is a very strong association between the combined e-procurement variables and performance, with a multiple correlation coefficient R of 0.900. Electronic sourcing, electronic bidding, and electronic invoicing account for 81% of the performance variance ($R^2=0.810$). The model's robustness is confirmed by the modified R2 value of 0.805, which takes into account the number of predictors. The comparatively modest prediction error is shown by the standard error of 0.17475. The Durbin-Watson statistic of 1.803 indicates that there is no significant autocorrelation in the residuals of the regression model. Since the value is close to 2, it suggests that the assumption of independent errors is met, supporting the reliability of the regression results.

Table 3: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.483	3	5.494	179.920	.000[b]
	Residual	3.878	127	.031		
	Total	20.362	130			

a. Dependent Variable: Performance

b. Predictors: (Constant), E-invoicing, E-sourcing, E-bidding

Source: Field data, 2025

The ANOVA findings are shown in Table 3, indicating that the statistical significance of the entire regression model is confirmed ($F(3, 127)=179.920$, $p<0.05$). This indicates that there is a statistically significant relationship between performance and the integration of electronic bidding, sourcing, and billing. Even further proof that the model fits the data well is the significant F-value.

Table 4: Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	.167	.182		.917	.361
	E-bidding	.240	.058	.260	4.157	.000
	E-sourcing	.474	.053	.456	8.943	.000
	E-invoicing	.251	.049	.312	5.168	.000

a. Dependent Variable: Performance

Source: Field data, 2025

Table 4 shows the regression coefficients for each predictor variable. The findings indicate that there is a favorable and statistically significant impact on performance from e-bidding ($\beta= 0.240$, $p < 0.05$), e-sourcing ($\beta= 0.474$, $p<0.05$), and e-invoicing ($\beta=0.251$, $p<0.05$). When it comes to these, e-sourcing, e-invoicing, and e-bidding are the three most important indicators. It is not possible to make a useful prediction of performance levels without these e-procurement variables, as the constant term is not statistically significant ($p>0.05$).

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4.3 Discussion of Findings

The general objective of this study was to assess the effect of e-procurement on the performance of the City of Kigali, with specific emphasis on e-bidding, e-sourcing, and e-invoicing. The discussion below relates the study's findings to existing empirical literature.

4.3.1 Discussion on E-Bidding on Performance

A favorable and statistically significant influence on performance ($\beta=0.240$, $p<0.05$) was discovered by the research, along with a substantial connection ($r=0.779$, $p<0.05$) between e-bidding and performance. This implies that improvements in e-bidding processes such as timely tender notifications, transparent bid evaluations, and efficient contract awards are associated with higher institutional performance in the City of Kigali.

These results are consistent with Gatore (2022), who found that e-bidding significantly improved procurement efficiency in Rwanda's Kirehe District by enhancing response times and contract signature rates. Similarly, Rukerataro (2024) reported that e-bidding, as part of broader e-procurement practices, improved competitiveness and budget management in Rwandan public institutions. The findings also align with Boafo et al. (2020), who highlighted that e-bidding fosters transparency and reduces costs in Ghana's public procurement, and with Mwalukasa (2024), who emphasized its role in improving efficiency in Tanzanian government entities. Furthermore, Umumararungu and Irechukwu (2023) reported a very strong correlation ($r=0.910$, $p<0.05$) between e-bidding and performance in Muhanga District, reinforcing this study's conclusion that e-bidding is a key driver of performance in public institutions.

4.3.2 Discussion on E-Sourcing on Performance

The study revealed that e-sourcing had the strongest effect on performance ($\beta=0.474$, $p<0.05$) and the highest correlation ($r=0.802$, $p<0.05$) among the three predictors. This indicates that improvements in e-sourcing such as supplier identification, prequalification, and information sharing are strongly linked to enhanced performance in the City of Kigali.

This finding corroborates Maagi and Mwakalobo (2023), who found that e-sourcing significantly reduced procurement delays and improved service delivery in Tanzania. Shatta et al. (2024) similarly demonstrated that electronic sourcing positively influences supply chain performance both directly and through behavioral intention. Mwangata and Hapompwe (2024) observed that e-sourcing improved supplier management, transparency, and cost savings in Zambia's public procurement system. Sibomana (2022) also found that e-sourcing enhances operational performance in Rwandan government contracts by strengthening supplier relationships and ensuring legal compliance. Additionally, Kamanzi and Irechukwu (2023) confirmed that effective procurement processes, including e-sourcing, significantly improve quality performance in health service delivery.

4.3.3 Discussion on E-Invoicing on Performance

The research also discovered that e-invoicing significantly improved performance ($\beta=0.251$) and was strongly correlated ($r=0.775$, $p<0.05$). This indicates that the City of Kigali benefits from increased payment efficiency, decreased mistake rates, and improved overall performance as a result of automating invoice preparation, submission, and tracking.

Marsintauli *et al.* (2023) found that electronic invoicing systems boost administrative efficiency by reducing the time it takes to file tax returns, which is in line with our findings. Soliman (2024) similarly found that enabling environments and performance expectations positively influence e-invoicing adoption, especially in resource-rich organizations. In Slovenia, Bojanc et al. (2024) observed that e-invoicing promotes efficiency and sustainability despite implementation challenges. Bellon et al. (2022) demonstrated that e-invoicing increases compliance and performance by reducing transaction costs and improving reporting accuracy in Peru's public sector. Although Umuhire and Irechukwu (2023) explored outsourcing in Rwanda's telecom sector, their findings indirectly support the performance benefits of technology-based process automation, which is a central feature of e-invoicing.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

It is concluded that e-bidding is an effective tool for improving procurement performance in the City of Kigali. The adoption of e-bidding has enhanced transparency, fairness, and efficiency in tendering processes, making it a vital component of modern procurement practices. The study concludes that e-sourcing significantly strengthens procurement operations by improving supplier management, fostering competition, and enabling data-driven procurement decisions. It is a strategic

tool that enhances procurement quality and operational performance. It is concluded that e-invoicing is an important contributor to performance improvement, particularly in financial management within the procurement cycle. By minimizing errors and improving transaction speed, e-invoicing supports efficiency, accountability, and reliability in public procurement systems.

5.2 Recommendations

The City of Kigali should invest in continuous improvement of e-bidding platforms, ensuring they remain user-friendly, secure, and accessible. Regular training for procurement staff and suppliers can further enhance the efficiency and effectiveness of the e-bidding process.

Management should prioritize the expansion and optimization of e-sourcing systems to support comprehensive supplier databases, real-time communication, and advanced analytics for supplier evaluation. Policy makers should ensure procurement regulations align with evolving digital sourcing practices.

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