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RESEARCH ARTICLE

EVALUATION OF E-PROCUREMENT PRACTICE AND ITS EFFICIENCY IN PUBLIC SECTOR PROCUREMENT IN RIVERS STATE MINISTRIES, DEPARTMENTS AND AGENCIES (MDAS)

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ABSTRACT

This study evaluates e-procurement practice and its effect on procurement efficiency in selected Ministries, Departments, and Agencies (MDAs) in Rivers State, Nigeria, examining three efficiency indicators: procurement cycle time, cost reduction, and transparency. A quantitative cross-sectional survey design was adopted; structured questionnaires were administered to 150 procurement staff across seven MDAs, yielding 147 valid responses. Multiple linear regression and ANOVA were conducted using SPSS version 23. E-procurement adoption was the strongest predictor of reduced cycle time ($\beta = 0.475$, $R^2 = 0.294$, $p < 0.05$) and a significant predictor of cost reduction ($\beta = 0.381$, $R^2 = 0.218$, $p < 0.05$). A significant but weaker relationship was found for transparency ($R^2 = 0.093$). ICT infrastructure was a co-significant predictor of cost reduction only; organizational policy and human capacity were non-significant. The study concludes that e-procurement effectively drives operational efficiency in Rivers State but that governance reforms are required to fully realize transparency gains. Recommendations include enforcing full platform integration, investing in robust ICT infrastructure, and implementing complementary accountability measures.

Keywords: Cost reduction, e-procurement, procurement cycle time, public sector, rivers state, transparency.

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1.0. INTRODUCTION

Public procurement constitutes one of the most significant government activities, accounting for approximately 70% of total government spending in Nigeria (Williams & Adeniran, 2024) and between 15–30 percent of GDP in developing countries (Thai, 2001). Effective procurement systems are pivotal for national development, infrastructure delivery, and service provision. Yet, procurement in Nigeria has historically been characterized by inefficiency, corruption, prolonged cycle times, and limited transparency (Akenroye, 2013).

In response, Nigeria enacted the Public Procurement Act (PPA) of 2007 and established the Bureau of Public Procurement (BPP) as the national regulatory authority. A key innovation emerging from this reform agenda is electronic procurement (e-procurement), defined by Thai (2009) as the integration, management, and automation of procurement business processes through electronic means. E-procurement systems encompass activities including e-tendering, bidding, supplier registration, contract management, and payment processing. Global evidence suggests that e-procurement can reduce procurement costs by up to 30% and cycle times by up to 50 percent (Gunasekaran & Ngai, 2008; Hunja, 2003).

Rivers State, as one of Nigeria's major economic hubs, has institutionalized procurement oversight through the Rivers State Bureau on Public Procurement (RSBOPP) and has introduced e-procurement platforms across its MDAs. Despite these initiatives, MDAs continue to experience prolonged procurement cycles, limited competitive participation, and constraints in accessing complete procurement records (Okonkwo & Eze, 2021). Moreover, while several studies have examined e-procurement at the federal level in Nigeria, empirical evidence specifically targeting sub-national entities remains scarce (Odediran, 2021; Odia & Ogolo, 2020). Most existing literature also tends to emphasize transparency and anti-corruption outcomes, with limited attention to operational efficiency indicators such as cycle time and cost savings (OECD, 2016).

This study addresses these gaps by empirically evaluating the effect of e-procurement on procurement efficiency in selected Rivers State MDAs. The specific objectives are to: (i) assess the level of e-procurement adoption across selected MDAs; (ii) evaluate efficiency indicators comprising cycle time, cost reduction, and transparency; (iii) examine the relationship between e-procurement adoption and efficiency; and (iv) identify organizational, infrastructural, and human capacity factors that influence e-procurement efficiency. Three null hypotheses were tested: H_{01} — e-procurement has no significant impact on procurement cycle time; H_{02} — e- procurement has no significant effect on cost reduction; and H_{03} — e-procurement has no significant relationship with transparency.

2.0. LITERATURE REVIEW

2.1. E-Procurement: Concept and Application

E-procurement refers to the use of digital technologies, particularly internet and web-based applications, to carry out procurement activities such as requisitioning, ordering, bidding, tendering, supplier selection, contract management, and payment in public and private sector organizations (OECD, 2022; Afolabi & Adegbite, 2023). Musa, Jaafar and Raslim (2023) noted that e-procurement enhances the procurement life-cycle by automating manual processes, enabling real-time monitoring,

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and reducing direct human involvement, thereby improving transactional efficiency and facilitating policy compliance. Common modules include e-tendering, e-sourcing, e-auctioning, e-cataloging, and e-invoicing. In Nigeria, e-procurement adoption gained momentum following the enactment of the PPA 2007, though implementation at sub-national levels has remained inconsistent due to infrastructural, institutional, and capacity constraints (World Bank, 2022).

2.2 E-Procurement and Procurement Efficiency

Efficiency in procurement refers to the ability of systems to achieve intended objectives with minimal waste of time, cost, and resources while maintaining quality and compliance (Raymond, 2008). In the UK, Eadie, Perera and Heaney (2017) found that e-procurement significantly reduces cycle time and transaction costs in public works projects. In Nepal, Neupane et al. (2014) reported enhanced efficiency and reduced corruption risks attributable to e-procurement. In Ghana, Osei-Tutu et al. (2019) observed partial adoption with limited efficiency gains owing to infrastructural and human resource constraints. In Nigeria, Okonkwo and Eze (2021) documented persistent inefficiencies in Rivers State MDAs despite digital platform availability, calling for empirical studies on actual efficiency outcomes. Essien and Akpan (2023), studying 12 ministries in Akwa Ibom State, found that e-procurement improved transparency and shortened procurement cycles, though limited ICT skills remained a barrier.

2.3 Theoretical Framework

This study is anchored on two theoretical frameworks. The Technology Acceptance Model (TAM), introduced by Davis (1989) based on the Theory of Reasoned Action, posits that perceived usefulness and perceived ease of use are the principal determinants of technology acceptance behaviour. Applied to this study, TAM explains how procurement staff perceptions of e-procurement platforms as efficiency-enhancing and user-friendly drive adoption and, consequently, procurement efficiency outcomes (Brandon-Jones & Kauppi, 2018).

Institutional Theory (Selznick, 1957; Meyer & Rowan, 1977) posits that organizations conform to formal rules, norms, and expectations to gain legitimacy. In the Nigerian context, the PPA (2007) and BPP directives represent coercive pressures compelling MDAs to adopt e- procurement even where internal capacity is lacking. Normative pressures emerge from professional standards, while mimetic pressures arise from organizations imitating successful peers. Together, these frameworks explain both the drivers and limitations of e-procurement adoption and efficiency in the Rivers State context.

2.4. Challenges of E-Procurement Implementation

Key implementation challenges include inadequate ICT infrastructure, limited staff competence, security concerns, poor system integration, and weak institutional support (Tutu et al., 2019; Angeles & Nath, 2007). Azanlerigu and Akay (2015) identified employee incompetence and inadequate legal frameworks as further barriers in the African context. In Nigeria, resistance to change, high implementation costs, and low technical capacity have impeded progress at both federal and state levels (Uzochukwu et al., 2021). Notably, Croom and Brandon-Jones (2016) observed that even where e-procurement is mandated, compliance enforcement remains difficult, leading users to seek workarounds that undermine system integrity.

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2.5. Gaps in Literature

Although e-procurement has been widely studied in Nigeria, most existing work focuses on the federal level, with limited sub-national empirical analysis, particularly in Rivers State (Odediran, 2021; Odia & Ogolo, 2020). Many studies emphasise transparency and anti-corruption outcomes while neglecting operational efficiency indicators such as cycle time and cost savings (OECD, 2016; World Bank, 2019). Additionally, the moderating role of ICT infrastructure, staff competence, and institutional quality remains under-explored (Agaba & Shipman, 2019). This study addresses these gaps by providing empirical evidence on three specific efficiency indicators within a sub-national public sector context.

3.0. MATERIALS AND METHOD

3.1 Materials

Primary data collection instruments comprised: structured questionnaires (5-point Likert scale); completed questionnaire responses as raw data; computer systems for data entry, analysis, and report writing; Statistical Package for Social Sciences (SPSS) version 23 for descriptive statistics and multiple regression analysis; and Microsoft Excel and Word for data coding and documentation.

3.2 Study Area and Research Design

The study was conducted in Rivers State, located in the South-South geopolitical zone of Nigeria, with Port Harcourt as the capital. Rivers State is one of Nigeria's largest contributors to national revenue, driven primarily by oil and gas, generating a high volume of public procurement transactions. Seven MDAs were purposively selected based on functional relevance to procurement processes and degree of e-procurement involvement: the Bureau of Public Procurement, Ministry of Budget and Economic Planning, Ministry of Finance, Ministry of Health, Ministry of Urban Development, Ministry of Works, and the ICT Department.

A quantitative cross-sectional survey design was employed, enabling the collection of numerical data at a single point in time to describe relationships between e-procurement adoption, ICT infrastructure, organizational policy, human capacity, and procurement efficiency without variable manipulation. This design is appropriate for testing the linear relationships specified in the study's hypotheses.

3.3 Population, Sampling, and Data Collection

A total of 150 structured questionnaires were administered to procurement-related staff across the seven selected MDAs, of which 149 were retrieved and 147 validated for analysis (two excluded due to incomplete responses). The sample size of 109 was determined using Yamane's (1967) formula for finite populations:

$n = N / [1 + N(e)^2]$ (1) *Where*
n = sample size, N = population (149), and e = margin of error (0.05), yielding n = 109.

Proportional allocation across strata was then applied using Bowley's formula. Table 1 presents the distribution of recovered questionnaires across MDAs.

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Table 1: Distribution of questionnaires across sampled MDAs

S/No	Ministry/ Department	Questionnaires Recovered
1	Bureau of Public Procurement	18
2	Ministry of Budget and Economic Planning	19
3	Ministry of Finance	22
4	Ministry of Health	26
5	Ministry of Urban Development	17
6	Ministry of Works	23
7	ICT Department	24
	Grand Total	**149**

Source: Researcher's Field Survey (2025)

The questionnaire was structured into six sections: Section A (demographics), Section B (e-procurement adoption), Section C (procurement efficiency indicators), Section D (e-procurement–efficiency relationship), Section E (organizational and infrastructural factors), and Section F (strategies for enhancement). Content validity was confirmed through expert review by supervisors and procurement specialists. Cronbach's Alpha reliability coefficients ranged from 0.75 to 0.89 for individual constructs, with an overall scale alpha of 0.91, confirming strong internal consistency.

3.4 Method of Data Analysis and Model Specification

Data were analyzed using descriptive statistics (frequencies, means, standard deviations) and inferential statistics (multiple linear regression, ANOVA, and T-tests). The regression model was specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \qquad \text{Equation (2)}$$

Where Y = procurement efficiency (cycle time, cost reduction, or transparency); X_1 = e-procurement adoption; X_2 = ICT infrastructure; X_3 = organizational policy; X_4 = human capacity; and ε = error term. The null hypothesis was rejected where $p \leq 0.05$.

4. PRESENTATION OF RESULTS AND DISCUSSION

4.1 Demographic Profile of Respondents

Of the 147 valid respondents, 58% were male and 42% female, indicating a relatively balanced gender representation compared with historically male-dominated procurement studies (Thai & Chong, 2008). Age distribution was skewed towards seniority: 17% were below 30 years, 25% aged 30–39, 28% aged 40–49, and 31% above 50 years, with 58.5% aged 40 and above. This distribution is consistent with Ifinedo and Onyia (2014), who observed top-heavy age structures in African public sectors. Regarding education, 37% held a Bachelor's degree, 32% a Master's degree, and 31% a Doctorate, confirming the cognitive capacity of respondents to engage meaningfully with e-procurement systems.

The pattern in work experience was similarly weighted towards senior staff: 26% had fewer than 5 years' experience, 29% had 5–10 years, and 45% had more than 10 years. By ministry, respondents comprised 12% (BPP), 13% (Budget and Economic Planning), 15% (Finance), 18% (Health), 11% (Urban Development), 15% (Works), and 16% (ICT Department).

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4.2 Descriptive Analysis of Study Variables

Table 2 presents the descriptive statistics for all study variables. All means exceeded the neutral midpoint of 2.50, indicating general agreement. ICT infrastructure recorded the highest mean (3.23), suggesting it is the most strongly perceived enabler of e-procurement. Among efficiency indicators, procurement cycle time had the highest mean (3.13), followed by cost reduction (3.09), while transparency recorded the lowest mean (2.87) with a relatively high standard deviation (1.33), indicating polarized perceptions. E-procurement adoption scored a mean of 2.96, suggesting partial rather than full adoption across the sampled MDAs.

Table 2: Descriptive statistics of study variables

Variable	Mean	Std. Dev	Variance
Procurement Cycle Time	3.13	1.29	1.66
Cost Reduction	3.09	1.36	1.84
Transparency	2.87	1.33	1.78
E-procurement Adoption	2.96	1.41	1.98
ICT Infrastructure	3.23	1.29	1.66
Organizational Policy	3.10	1.33	1.77

Source: Researcher's Field Survey (2025).

4.3. Hypothesis Testing

Table 3 provides a summary of the regression models across all three efficiency indicators. Full regression coefficient results are presented in Tables 4, 5, and 6.

Table 3: Summary of regression results across efficiency indicators

Efficiency Indicator	R^2	F Value	Beta (Adoption)	Significance
Cycle Time	0.294	7.845	4.75	0.000
Cost Reduction	0.218	5.690	3.81	0.000
Transparency	0.093	3.658	3.00	0.003

Source: Researcher's Field Survey (2025)

4.3.1 H_{01}: E-procurement has no significant impact on procurement cycle time

The model for cycle time ($R = 0.542$, $R^2 = 0.294$) was statistically significant ($F = 7.845$, $p = .000$), with the four predictors collectively accounting for 29.4% of variance in cycle time. E-procurement adoption was the sole significant predictor ($B = 0.482$, $\beta = 0.475$, $t = 4.918$, $p = .000$). ICT infrastructure, organizational policy, and human capacity were non-significant. H_{01} is rejected.

Table 4: Multiple regression and T-test analysis: Cycle Time (R^2=0.294, F=7.845, p=.000)

Variable	B	STD Error	Beta	T	Sig.	Lower 95%	Upper 95%
(Constant)	1.210	0.325	-	3.723	0. 000	0.568	1.852
Adoption	0.482	0.098	0.475	4.918	0.000	0.288	0.369
Infrastructure	0.175	0.098	0.172	1.785	0.077	-0.019	0.369
Policy	-0.021	0.090	0.021	-0.233	o.816	-0.199	0.157
Capacity	-0.021	0.095	0.104	1.105	o.272	-0.083	0.293

Source: Researcher's Field Survey (2025).

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These findings confirm that cycle time reduction is the most immediate and tangible efficiency benefit of e-procurement in Rivers State MDAs. The automation of approval workflows substantially reduces the time required to complete procurement cycles. This aligns with Mbah (2008), who reported a 40–50% reduction in procurement processing time attributable to e- procurement, and is consistent with TAM's prediction that perceived usefulness in terms of speed and efficiency drives adoption and sustained usage among procurement staff.

4.3.2 H_{02}: E-procurement has no significant effect on procurement cost reduction

The cost reduction model (R = 0.467, R^2 = 0.218) was significant (F = 5.690, p = .000), explaining 21.8% of variance. Both e-procurement adoption (B = 0.395, β = 0.381, t = 3.835, p = .000) and ICT infrastructure (B = 0.215, β = 0.208, t = 2.089, p = .039) were significant predictors. Organisational policy and human capacity were non-significant. H_{02} is rejected.

Table 5: Multiple regression and T-test analysis :Cost Reduction (R^2 = 0.218, F = 5.690, p = .000)

Variable	B	STD Error	Beta	T	Sig.	Lower 95%	Upper 95%
(Constant)	1.325	0.340	-	3.897	0.000	0.653	1.997
Adoption	0.395	0.103	0.381	3.835	o.000	0.191	0.599
Infrastructure	0.215	0.103	0.208	2.089	0.039	0.011	0.419
Policy	0.095	0.094	0.092	1.011	0.314	-0.091	0.281
Capacity	0.005	0.099	0.005	0.051	.959	-0.191	0.201

Source: Researcher's Field Survey (2025).

The dual significance of adoption and ICT infrastructure indicates that cost savings are contingent on both platform uptake and reliable supporting technology. These findings are consistent with Gunasekaran and Hashim (2015), who demonstrated that e-procurement reduces transaction costs by up to 30% through minimized manual interventions, reduced paperwork, fewer procurement errors, and enhanced supplier price competition.

4.3.3 H_{03}: E-procurement has no significant relationship with transparency

The transparency model (R = 0.306, R^2 = 0.093) was significant (F = 3.658, p = .008), though explaining only 9.3% of variance — considerably less than the preceding models. E-procurement adoption was the sole significant predictor (B = 0.320, β = 0.300, t = 2.990, p = .003). ICT infrastructure, organizational policy, and human capacity were non-significant. H_{03} is rejected, but the relationship is substantively weak.

Table 6: Multiple regression and T-test analysis :Transparency (R^2 = 0.093, F = 3.658, p = .008)

Variable	B	STD Error	Beta	T	Sig.	Lower 95%	Upper 95%
(Constant)	1.105	0.355	-	0.355	.002	0.404	1.806
Adoption	0.320	0.107	0.300	2.990	.003	0.108	0.532
Infrastructure	0.100	0.107	0.095	0.934	.352	-0.112	0.312
Policy	0.080	0.098	0.075	0.816	.416	-0.114	0.274
Capacity	0.010	0.104	0.010	0.096	.924	-0.196	0.216

Source: Researcher's Field Survey (2025).

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The relatively low R^2 and the high standard deviation of transparency scores (1.33) indicate polarized perceptions and constrained governance impact. While e-procurement provides the technical infrastructure for transparency — through audit trails and reduced human discretion — institutional weaknesses, weak enforcement, and cultural factors limit its full realization. This finding is consistent with Okonkwo and Eze (2021), whose study in Rivers State reported an R^2 of 0.15 for transparency, and aligns with Institutional Theory: coercive adoption of technology without accompanying governance reform yields limited transparency gains in developing country contexts.

4.4. Summary of Findings

Across all three hypotheses, e-procurement adoption was the universal and most critical predictor of efficiency. The progression from strongest (cycle time: $R^2 = 0.294$) through moderate (cost reduction: $R^2 = 0.218$) to weakest (transparency: $R^2 = 0.093$) effect sizes follows a logical pattern: operational improvements from automation are more directly attributable to e-procurement than governance improvements, which require broader institutional reforms. ICT infrastructure was a co-significant enabler of cost reduction only, while organizational policy and human capacity did not achieve significance in any model, suggesting they function as background conditions rather than direct performance drivers.

5.0. CONCLUSIONS AND RECOMMENDATIONS

This study provides empirical evidence that e-procurement adoption significantly enhances procurement efficiency in Rivers State MDAs across all three efficiency dimensions. The findings validate TAM's prediction that perceived operational utility drives adoption and usage, and confirm the Institutional Theory argument that technology-only adoption without governance reform yields limited transparency outcomes. E-procurement adoption emerges as the universal and most critical determinant of efficiency across all models.

Based on the findings, the following recommendations are made. First, policymakers should enforce full platform integration by mandating that all procurement activities above a defined threshold be conducted exclusively via e-procurement platforms, thereby closing the partial adoption gap. Second, the government should invest in robust ICT infrastructure including reliable internet connectivity, high-capacity servers, and backup power systems given ICT infrastructure's co-significance as a predictor of cost reduction. Third, to bridge the gap between technical and perceived transparency, MDAs should establish real-time public dashboards for bid tracking, conduct open procurement hearings, and enforce strict anti-corruption measures moving beyond "technical transparency" (digital records) to "perceived transparency" (public trust). Fourth, sustained capacity-building programmes focused on advanced system features should be institutionalized, not limited to basic usage training. Fifth, an independent monitoring and evaluation (M&E) framework should be established to continuously track performance against cycle time, cost, and transparency benchmarks, enabling evidence-based system refinement.

This study makes a key empirical contribution as one of the few sub-national analyses of e-procurement effectiveness in Nigeria, providing Rivers State-specific evidence for policymakers and practitioners. Its theoretical contribution lies in demonstrating that, in developing country contexts, operational utility (speed and cost savings) may drive adoption independently of governance utility

(transparency and trust) — a distinction warranting integration into future applications of TAM and Institutional Theory in public procurement research. Future research should employ longitudinal designs to track efficiency gains over time and examine the moderating role of anti-corruption reforms on e-procurement transparency outcomes.

Conflict of Interest

The authors declare that no conflict of interest exist in this manuscript.

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