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The impact of EPS on procurement performance: the mediating role of supplier relationship quality in Ghana

Isaac Asampana[1], Felix Acquah Baiden[2]
[1]Department of Information Technology, Faculty of Information Technology and Communication Studies, University of Professional Studies, Accra, Ghana
[2]Public Procurement Authority, Accra, Ghana

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ABSTRACT

This study examines the effect of e-procurement systems on procurement performance (PP) in Ghana, highlighting the mediating role of supplier relationship quality (SRQ). A quantitative, cross-sectional survey of 370 procurement professionals from public and private organisations was conducted to assess four dimensions of e-procurement: system integration, data transparency, user-friendliness, and automation. Results indicate that all four dimensions significantly enhance PP, with system integration and user-friendliness emerging as the strongest predictors. Mediation analysis further reveals that SRQ, characterised by trust, communication, and collaboration, partially strengthens the relationship between e-procurement and procurement outcomes. Nonetheless, challenges such as inadequate staff training, limited supplier digital skills, weak infrastructure, and insufficient managerial support hinder optimal system effectiveness. Grounded in the resource-based view (RBV) and transaction cost economics (TCE), the study demonstrates the importance of combining technological and relational capabilities. Recommendations include enhancing digital skills training, strengthening supplier engagement, improving system design, and fostering institutional support.

Corresponding Author:

Isaac Asampana
Department of Information Technology, Faculty of Information Technology and Communication Studies
University of Professional Studies
East Legon, Accra, Greater Accra, Ghana
Email: isaac.asampana@upsamail.edu.gh

1. INTRODUCTION

E-procurement has become a cornerstone of modern supply chains, with public and private organisations increasingly adopting digital systems to cut costs, enhance efficiency, and strengthen supplier relationships [1], [2]. As part of the wider e-commerce landscape, particularly business-to-business (B2B) transactions, e-procurement digitises organisational purchasing by automating sourcing, ordering, and inventory management [3], [4]. For example, distributors can procure directly from manufacturers under negotiated pricing, reducing transaction inefficiencies. The integration of such systems promotes transparency, coordination, and improved supply chain interactions. In developing economies, e-procurement has been instrumental in improving governance and limiting corruption. For instance, Kenya and India have leveraged such systems to increase transparency [5], [6]. Ghana followed suit with the launch of the Ghana electronic procurement system (GHANEPS) in 2019, which has already reduced procurement cycle times by 30% and cut costs by about 10% [7], [8].

Despite this progress, private sector adoption in Ghana remains uneven due to infrastructural and capacity challenges, with urban centres such as Accra and Kumasi leading uptake while rural areas lag behind [9], [10]. One factor influencing the effectiveness of these systems is supplier relationship quality (SRQ), defined by trust, communication, and collaboration [11]. In Ghana, where informal networks often shape business practices, strong supplier ties can amplify e-procurement's benefits [12]. Evidence shows that effective supplier relations reduce delays, increase procurement accuracy, and improve responsiveness [13]. This study, therefore, examines how e-procurement adoption, in combination with SRQ, influences procurement performance (PP) across Ghana's public and private sectors.

– Problem statement

Although e-procurement promises efficiency and transparency, many Ghanaian organisations report mixed outcomes. Some even experience limited or negative results in resource-constrained contexts [14]. Existing frameworks often ignore relational factors such as trust and collaboration [15], creating challenges for SMEs that lack the capacity to integrate these dimensions. Moreover, most existing studies are drawn from developed economies, leaving a gap in empirical understanding for developing countries like Ghana. This research seeks to address these gaps by evaluating i) the level of e-procurement adoption in Ghana, ii) its effect on PP, iii) the mediating role of SRQ, and iv) the challenges hindering adoption. The study contributes practical insights for managers and policymakers while enriching academic debates on digital procurement within emerging economy contexts.

– Literature review

The research is anchored in the resource-based view (RBV) and transaction cost economics (TCE). RBV argues that sustainable competitive advantage comes from resources that are valuable, rare, difficult to imitate, and not easily substituted [16], [17]. E-procurement represents such a technological resource, helping firms cut costs and streamline workflows [4]. When paired with relational resources such as trust and supplier collaboration, the system can significantly improve procurement outcomes [18], [11]. TCE, initially proposed by Coase [19] and expanded by Williamson [20], highlights the expenses linked with searching, negotiating, and monitoring contracts. In procurement, these costs often emerge from information asymmetry and opportunistic behaviour. E-procurement mitigates such issues by standardising processes, automating tasks, and improving transparency [14]. However, TCE also stresses the importance of relational governance, since trust and cooperation help to reduce uncertainty and strengthen adoption [15].

Evidence from Sub-Saharan Africa suggests that while awareness of e-procurement is high, actual implementation is restricted by poor infrastructure, limited finance, and gaps in technical skills. Ghanaian small and medium-sized enterprises (SMEs), for example, recognise their potential but face affordability and capacity barriers [9]. Comparable results across East Africa point to cultural resistance and fragmented policy frameworks [21]. In advanced economies, however, research highlights major improvements in procurement speed, cost reductions, and governance accountability [2], [6]. Still, institutional support, leadership, and cultural readiness are essential to realise these benefits.

SRQ is increasingly viewed as a crucial factor in unlocking the full potential of e-procurement. Its main features are trust, communication, collaboration, and commitment directly strengthen PP while also mediating the link between technology adoption and outcomes. Ahmed and Siddiqui [11] found that SRQ enhances coordination and partly explains how e-procurement improves results. Similarly, Bensaou and Venkatraman [15] stressed the long-term benefits of trust-based partnerships. In Ghana, stronger supplier relations have been associated with greater accuracy and efficiency in procurement [7], [22]. Conversely, weak supplier ties often limit the returns from technological investments [2].

Nonetheless, adoption challenges remain significant. Financial constraints, fragile Information and communication technology (ICT) infrastructure, and limited technical know-how slow progress [9], [7]. Broader issues, such as weak policy enforcement, reluctance to change, cybersecurity threats, and low supplier onboarding, add further obstacles [21], [10]. Rural communities, in particular, struggle with inadequate internet access and low digital literacy, leading to underutilisation [22].

The conceptual framework, as shown in Figure 1, built on RBV and TCE, suggests that e-procurement improves PP by enhancing efficiency, responsiveness, and cost-effectiveness, while SRQ acts as a mediating factor. In Ghana's context, relational qualities such as trust, communication, and collaboration help firms translate digital procurement adoption into measurable performance benefits. Operational definitions are: i) e-procurement systems: digital platforms for procurement activities such as requisitioning, tendering, ordering, and supplier communication, measured by automation, transparency, ease of use, and integration; ii) PP: effectiveness and efficiency of procurement, assessed via cost reduction, cycle time, and supplier responsiveness; iii) SRQ: collaboration strength between firms and suppliers, measured by trust, communication, commitment, and dispute resolution; iv) top management support: leadership involvement in e-procurement implementation, covering resource allocation, training, and monitoring; v) user competency: staff knowledge and skills in system use, including information and communication technology (ICT) training, software familiarity, and ease of use.

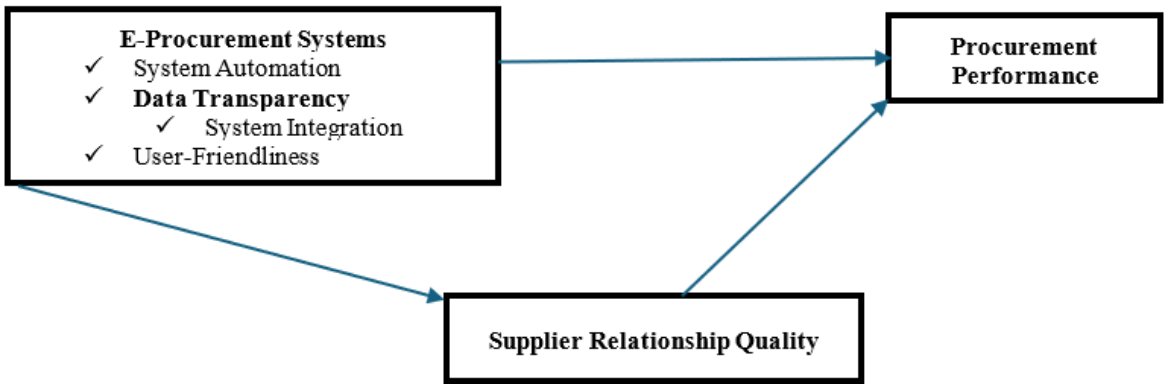

Figure 1. Conceptual framework

2. METHOD

The study adopted a quantitative research approach to examine how e-procurement influences PP, with SRQ as a mediator. This method was suitable for testing hypotheses, quantifying relationships, and drawing generalisable conclusions across Ghanaian organisations [23]. Rooted in positivism, the study assumed that reality is measurable, objective, and best studied through empirical, replicable techniques [24]. Structured, closed-ended questionnaires ensured standardised data collection across industries and regions, while enabling mediation modelling to evaluate SRQ.

A descriptive survey design supported the identification of organisational practices and trends [25]. The use of pre-structured questionnaires allowed for efficient data collection from geographically dispersed respondents and facilitated statistical analyses such as regression and mediation, consistent with positivist rigour. The target population comprised about 5,000 procurement professionals, including officers, managers, clerks, and administrative staff from both public and private organisations in sectors such as health, education, construction, manufacturing, logistics, and public administration. This population was chosen for its practical experience with e-procurement and supplier relationships. Inclusion of diverse sectors and regions strengthened validity, representativeness, and national applicability [23].

The appropriate sample size was determined using the (1) [26]:

$$n = \frac{N}{(1+N_e{}^2)} = \frac{5000}{(1+5000(0.05)^2)} = \frac{5000}{(1+12.5)} = 370 \quad (1)$$

where:
n= sample size
N= population size (5,000)
e= margin of error (0.05 at 95% confidence level)

Thus, a sample size of 370 respondents was deemed statistically adequate for robust analyses such as multiple regression and mediation testing, which require moderate-to-large samples for accuracy and statistical power [27]. This sample size conformed to accepted norms in social science research and ensured representativeness across organisational types and regions.

A stratified random sampling strategy was applied to guarantee proportional representation of industries and roles, with random selection within each stratum to minimise bias and capture Ghana's diverse procurement perspectives [24]. A total of 370 respondents were selected, with 70% from Accra (259) and 30% from Tema (111), reflecting the actual industrial distribution in both cities, as shown in Table 1. Healthcare received the largest share ($n = 92$), while logistics had the smallest ($n = 56$). This proportional allocation minimised sampling bias and improved representativeness [28]. The stratification also addressed potential response bias by balancing sectoral differences between the two locations [29]. Consequently, the design enhanced methodological rigour, external validity, and the precision of estimates, making findings more generalisable [30].

This improved accuracy and supported the positivist stance on objectivity. Data were obtained through a structured questionnaire adapted from prior studies [11]. The tool covered procurement systems, performance, SRQ, management support, and user competency. Responses were captured on a 5-point Likert scale, and clarity was ensured through expert reviews and a pilot with 20 professionals, which guided revisions to wording and layout.

Instrument strength was confirmed statistically. Exploratory factor analysis (EFA) indicated construct validity, supported by Kaiser-Meyer-Olkin (KMO) > 0.70 and a significant Bartlett's Test. Items loaded appropriately, and Cronbach's Alpha exceeded 0.70, demonstrating reliability [27]. These steps secured both psychometric soundness and contextual relevance. Data were collected over four weeks through a hybrid approach combining in-person distribution and email-based forms to reach both physically accessible and remote participants.

Table 1. Stratified sample distribution by industry and geographic location

Industry	Industry weights used (%)	Calculated sample size (n), total (≈100%)	Sample size, Accra (≈70% of n)	Sample size, Tema (≈30% of n)
Public administration	20	74	52	22
Healthcare	25	92	64	28
Logistics	15	56	39	17
Construction	20	74	52	22
Manufacturing	20	74	52	22
Total	100	370	259	111

Note: in applying the proportions to split industry and geographical location, we rounded the values to the nearest respondent

3. RESULTS AND DISCUSSION

Data collection spanned four weeks using both in-person and email surveys, supported by trained assistants who followed ethical standards. Confidentiality was ensured, and reminders improved participation, yielding 370 valid responses. Data were coded, cleaned, and analysed with SPSS v27, using descriptive and inferential statistics at a 95% confidence level ($\alpha = 0.05$). The study assessed e-procurement adoption, performance impacts, supplier relationship mediation, and challenges. Findings, presented in tables and linked to existing literature, provide evidence-based insights for practice and policy. Overall, the process ensured reliability and robust analysis.

3.1. Demographics of the respondents

The demographic characteristics of the 370 respondents are presented in Table 2. The survey sample showed a fairly balanced gender mix, with slightly more males (55.7%) than females (44.3%). Most respondents were in the 20–39 age range, representing early to mid-career professionals, while older groups were fewer. Educationally, the majority held bachelor's or master's degrees, indicating a highly educated workforce. Work experience was varied, with many having 3–10 years, alongside both less experienced and seasoned staff. Participants came from diverse departments, notably information technology (IT), logistics, administration, procurement, and finance, providing a broad perspective on e-procurement adoption.

Table 2. Demographics of the respondents' source

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	206	55.7
	Female	164	44.3
Age group	20–29	132	35.7
	30–39	138	37.3
	40–49	76	20.5
	50+	24	6.5
Education level	Diploma	36	9.7
	Bachelor's	188	50.8
	Master's	133	35.9
	PhD	13	3.5
Years of experience	< 3 years	75	20.3
	3–5 years	99	26.8
	6–10 years	116	31.4
	11+ years	80	21.6
Department	Procurement	64	17.3
	Logistics	78	21.1
	Finance	61	16.5
	IT	85	23.0
	Administration	82	22.2

3.2. Factor analysis and reliability results

To verify that the measurement tool accurately measured the intended concepts (construct validity) and was consistent in its measurements (reliability), an EFA was conducted using SPSS (version 27). Before

starting the analysis, we verified that the data were suitable for factor analysis. The KMO value was above the acceptable level of 0.70, and Bartlett's Test of Sphericity was significant ($p < 0.001$), indicating the data were suitable for this type of analysis. Factors were extracted using principal axis factoring with varimax rotation. Items were kept if their factor loadings were 0.50 or higher, their communalities were above 0.40, and they didn't load strongly on multiple factors. The six constructs exhibited distinct loading patterns that aligned with the expected theoretical structure.

The measurement model was assessed using the partial least squares (PLS) method in SmartPLS 3.3.3. Construct reliability was evaluated through Cronbach's alpha and composite reliability (CR). Except for data transparency's Cronbach's alpha of 0.685, which remains acceptable for exploratory research, all measured Cronbach's alpha and CR values exceeded the 0.7 benchmark suggested by Fornell and Larcker [31], confirming internal consistency. Convergent validity was assessed using the average variance extracted (AVE) and factor loadings, with thresholds of 0.5 recommended by [27]. The AVE values ranged from 0.514 to 0.642, meeting the criteria outlined by [27]. Thus, both reliability and convergent validity were achieved. The detailed results are shown in Table 3.

Table 3. Factor analysis and reliability results

Construct items/constructs	Factor loading	Cronbach's alpha	CR	AVE
SI1	0.721			
SI2	0.877			
SI3	0.818			
SI4	0.782			
System integration		0.767	0.877	0.642
DT1	0.662			
DT2	0.662			
DT3	0.636			
DT4	0.854			
DT5	0.782			
Data transparency		0.685	0.845	0.524
UF1	0.811			
UF2	0.626			
UF3	0.882			
UF4	0.845			
UF5	0.677			
UF6	0.669			
UF7	0.670			
UF8	0.702			
UF9	0.762			
User-friendliness		0.877	0.916	0.552
SA1	0.737			
SA2	0.699			
SA3	0.785			
SA4	0.658			
SA5	0.699			
SA6	0.719			
System automation		0.732	0.864	0.514
PP1	0.743			
PP2	0.832			
PP3	0.674			
PP4	0.759			
PP5	0.78			
PP6	0.633			
PP7	0.784			
PP8	0.666			
PP		0.725	0.904	0.543
SRQ1	0.638			
SRQ2	0.876			
SRQ3	0.881			
SRQ4	0.838			
SRQ5	0.702			
SRQ6	0.646			
SRQ7	0.805			
SRQ8	0.739			
SRQ		0.831	0.92	0.595

The confirmatory factor analysis (CFA) results in Table 4 indicate that the measurement model demonstrates an acceptable fit to the data. The Chi-square/df ratio is below 3.0, suggesting a good fit relative

to model complexity. Both comparative fit index (CFI) (0.94) and Tucker-Lewis index (TLI) (0.92) exceed the recommended threshold of 0.90, demonstrating good incremental fit. The root mean square error of approximation (RMSEA) (0.056) and standardized root mean square residual (SRMR) (0.041) fall within the acceptable cut-off values of 0.08, indicating low approximation and residual errors. Together, these results confirm that the measurement model adequately represents the observed data [32], [33].

Table 4. Model fit indices

Fit index	Recommended threshold	Study value
Chi-square/df	< 3.00	2.15
CFI	≥ 0.90	0.94
TLI	≥ 0.90	0.92
RMSEA	≤ 0.08	0.056
SRMR	≤ 0.08	0.041

3.3. Current level of e-procurement systems (EPS) adoption in Ghana

To assess the level of EPS adoption in Ghana, four core dimensions of digital procurement were evaluated: system integration, data transparency, user-friendliness, and system automation. Each item was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Descriptive statistics, including means and standard deviations, were computed to determine the level of adoption across the indicators Table 5.

Table 5. Current level of EPS adoption

E-procurement feature	Mean	Standard deviation	Interpretation
System integration	4.1	1.09	High
Data transparency	3.35	0.75	Moderate
User-friendliness	3.1	0.91	Moderate
System automation	2.85	0.93	Low

Adoption of e-procurement in Ghana shows progress but remains uneven. System integration is relatively advanced ($M = 4.10$), enabling stronger links with financial and logistics systems, while transparency ($M = 3.35$) and user-friendliness ($M = 3.10$) are moderate, suggesting gaps in real-time access and usability. Automation lags ($M = 2.85$), showing that repetitive tasks are still largely manual. These findings echo Ofori *et al.* [7], who noted that although adoption intentions are high, actual implementation is hindered by skills and infrastructure constraints.

3.4. Impact of EPS on PP in Ghana

The second objective of this study was to assess the impact of EPS on PP amongst organisations in Ghana. A multiple linear regression analysis was conducted to determine the predictive power of each e-procurement feature on procurement outcomes. The results, summarized in Table 5, reveal that the regression model is statistically significant: F (4, 365) = 150.303, $p < .001$, with an R^2 of 0.622, indicating that approximately 62.2% of the variance in PP can be explained by the combined effect of the four e-procurement components. This is presented in Table 6.

Table 6. EPS and PP

Model	Unstandardised coefficients		Standardized coefficients	T	Sig.	95.0% CI for B	
	B	Std. error	Beta			Lower bound	Upper bound
Constant	5.828	0.688		8.468	0.000	4.474	7.181
System Automation	0.180	0.088	0.080	2.043	0.042	0.007	0.353
Data transparency	0.147	0.057	0.105	2.587	0.010	0.035	0.258
System integration	0.282	0.046	0.250	6.068	0.000	0.191	0.373
User-friendliness	0.208	0.038	0.240	5.501	0.000	0.134	0.283
R = 789[a]	R^2 = 0.622	Adjusted R^2 =0.618	F (4, 365) = 150.303		P= 0.000		

Dependent variable: PP
Note: CI = confidence interval

Regression results confirm that e-procurement significantly enhances PP ($R^2 = 0.622$). System integration ($\beta = 0.250$) and user-friendliness ($\beta = 0.240$) emerge as the strongest drivers, reinforcing earlier claims that seamless connectivity and intuitive design drive efficiency [4]. Automation ($\beta = 0.080$) and transparency ($\beta = 0.105$) also contribute positively but less strongly. Similarly, Ahmed and Siddiqui [11] found that while automation boosts efficiency, its benefits depend on institutional readiness.

3.5. Mediating role of SRQ

The third objective of the study sought to examine the mediating effect of SRQ on the relationship between EPS and PP. To evaluate this, Hayes' PROCESS Model 4 was employed using SPSS, with a bootstrap sample of 5,000 and a 95% confidence level. The mediating role of SRQ and the indirect effect of EPS on PP are shown in Tables 7 and 8, respectively.

Table 7. Mediating role of SRQ

Path	Outcome variable	Predictor	B	SE	T	P	95% CI (LLCI–ULCI)
A	SRQ	EPS	0.1043	0.0057	18.37	0.000	[0.0931, 0.1154]
B	PP	SRQ	0.2108	0.0571	3.69	0.0003	[0.0985, 0.3232]
c′	PP	EPS	0.1245	0.0086	14.45	0.000	[0.1075, 0.1414]
C	PP	Total effect (EPS without SRQ)	0.1464	0.0063	23.15	0.000	[0.1340, 0.1589]

a) R^2 for path A (SRQ~EPS) = 0.478, F (1, 368) = 337.48, $p < .001$
b) R^2 for path B & c′ (PP~EPS+SRQ) = 0.607, F (2, 367) = 283.90, $p < .001$
c) R^2 for total effect model (PP~EPS) = 0.593, F (1, 368) = 535.81, $p < .001$

Table 8. Indirect effect of EPS on PP

Mediator	Indirect effect	Boot SE	95% CI (Boot LLCI – Boot ULCI)
SRQ	0.0220	0.0060	[0.0099, 0.0337]

SRQ partially mediates the link between e-procurement and performance. The analysis shows that EPS significantly predicts SRQ ($B = 0.1043, p < .001$), indicating that the adoption of EPS enhances the quality of supplier relationships. In turn, SRQ positively predicts PP ($B = 0.2108, p < .001$). Even after accounting for SRQ, EPS still exerts a strong direct effect on PP ($B = 0.1245, p < .001$). The indirect effect through SRQ ($B = 0.0220, 95\%$ CI $[0.0099, 0.0337]$) confirms partial mediation, showing that trust and collaboration enhance technology's value. This aligns with Ahmed and Siddiqui [11], who highlight transparency and coordination as essential mediators. Strong supplier ties transform digital efficiency into sustained performance gains.

From a practical perspective, this finding suggests that technology alone is not sufficient to guarantee procurement success. The efficiency gains from e-procurement, such as faster transactions and greater transparency, are maximised when suppliers also perceive the relationship as trustworthy, collaborative, and mutually beneficial. For example, in the Ghanaian public procurement context, an agency that uses e-procurement to automate tendering but neglects supplier engagement may still face delays, compliance issues, or poor service delivery. Conversely, when procurement officers build trust and open communication with suppliers, such as by providing timely feedback on bid outcomes or ensuring fair dispute resolution, suppliers are more willing to share critical information, adjust to unforeseen disruptions, and offer innovative solutions.

This highlights that EPS are most effective when complemented by strong relational practices. Policymakers should therefore design capacity-building programmes that not only train procurement officers on digital platforms but also emphasise negotiation, conflict management, and supplier development. For practitioners, the implication is that fostering supplier trust transforms the "cold efficiency" of digital systems into sustainable performance gains such as reduced lead times, better quality inputs, and stronger compliance with procurement regulations.

3.6. Challenges hindering the effectiveness of EPS in Ghana

The fourth objective of this study sought to identify the major challenges affecting the effective implementation and utilisation of EPS in Ghana. As shown in Table 9, respondents evaluated ten potential challenges using a five-point Likert scale. The results reveal a broad spectrum of hindrances, with most challenges rated at moderate to high levels, reflecting systemic constraints within Ghana's digital procurement environment.

The main challenges are human-capital related, with inadequate staff training ($M = 4.13$) and low supplier digital skills ($M = 4.01$) ranked highest. Connectivity issues ($M = 3.82$) and cybersecurity concerns ($M = 3.79$) also constrain system use, reflecting infrastructural and security weaknesses common in developing contexts [5]. Organisational barriers, such as limited managerial support and poor technical assistance, further hinder adoption. Without addressing these skills and infrastructure gaps, Ghana risks underutilising its e-procurement investments.

Table 9. Challenges hindering the effectiveness of EPS

Challenges	Mean	Standard deviation	Minimum	Maximum
Insufficient staff training	4.13	1.18	1	5
Low supplier digital skills	4.01	0.91	1	4
Internet connectivity issues	3.82	1.1	2	4
Cybersecurity concerns	3.79	0.77	2	4
Lack of technical support	3.64	0.73	2	5
Limited top management support	3.64	0.86	2	4
Lack of ICT infrastructure	3.32	0.61	1	4
Resistance to change	3.02	0.71	2	4
Poor system integration	3.02	0.71	2	5
Budget constraints	2.88	0.78	2	5

4. CONCLUSION

This study found that EPS, particularly system integration, user-friendliness, automation, and transparency, significantly improve PP in Ghana. System integration and user-friendliness were the most influential, highlighting the need for strong technology and intuitive design. SRQ partially mediates the link between e-procurement and performance, as trust-based networks enhance collaboration, reduce misunderstandings, and boost responsiveness. However, systemic challenges limit the full benefits of e-procurement, requiring technological upgrades, capacity building, and stakeholder engagement. Key recommendations include continuous training for procurement staff and suppliers; improved system integration and user experience; stronger supplier engagement; investment in internet reliability, cybersecurity, and technical support; and the development of national e-procurement standards and incentives. Limitations include the cross-sectional design, focus on the service sector, and exclusion of factors like organisational culture or technological readiness. Future research should adopt longitudinal methods, conduct sector-specific comparisons, and explore additional contextual variables for a deeper understanding of PP in Ghana.

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Isaac Asampana	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Felix Acquah Baiden	✓		✓	✓		✓	✓	✓		✓	✓		✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [IA], upon reasonable request.

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BIOGRAPHIES OF AUTHORS

Isaac Asampana is a senior lecturer in the Information Technology Studies Department, University of Professional Studies, Accra, Ghana. He has a Ph.D. degree in Computer Science, specializing in Information Systems. His current research interests are in the areas of data analytics, m-commerce, m-banking, e-learning, distance learning, cyber security, cloud computing, project management, and enterprise systems. He can be contacted at email: isaac.asampana@upsamail.edu.gh.

Felix Acquah Baiden is a procurement and accounting professional with expertise in e-procurement, auditing, and financial management. He holds advanced qualifications, including a Master's in procurement management, and serves as GHANEPS Coordinator at Ghana's Public Procurement Authority. He specialises in procurement oversight, capacity building, and research on digital procurement's impact on organisational performance. He can be contacted at email: baidenacquahfelix@gmail.com.