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E-PROCUREMENT TECHNIQUES AND SUPPLY CHAIN PERFORMANCE IN SELECTED MANUFACTURING COMPANIES IN RUBAGA DIVISION, KAMPALA, UGANDA

SSEKAJJA Ronald *, MAKANGA Christopher Neil and SSENDAGI Muhamad

School of Postgraduate Studies and Research, St. Lawrence University, Kampala, Uganda.
* Corresponding Author

ORCID Details
Ronald SSEKAJJA1: https://orcid.org/0009-0003-6242-4482
Christopher Neil MAKANGA2: https://orcid.org/0009-0008-7208-0974
Muhamad SSENDAGI3: https://orcid.org/0009-0002-6971-8208

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ABSTRACT

This study examined the relationship between e-procurement techniques, namely e-sourcing, e-ordering, and e-invoicing, and supply chain performance among selected manufacturing companies in Rubaga Division, Kampala, Uganda. It was motivated by persistent procurement challenges, including paper-based documentation, manual or partially automated procurement processes, delayed supplier payments, and limited integration of digital procurement systems. A mixed-methods descriptive correlational design was used. Quantitative data came from 125 valid questionnaires (89.9% response rate) and qualitative evidence from 16 key informant interviews (88.9%), analysed using descriptive statistics, Pearson correlation, simple and multiple regression, and thematic analysis. Respondents agreed that e-sourcing ($M = 3.82$, $SD = 0.36$), e-ordering ($M = 3.94$, $SD = 0.36$), and e-invoicing ($M = 3.91$, $SD = 0.26$) were in use, and that e-procurement had improved supply chain performance ($M = 3.90$, $SD = 0.25$). Supply chain performance correlated strongly and positively with e-sourcing ($r = 0.755$), e-invoicing ($r = 0.692$), and e-ordering ($r = 0.626$), all $p < 0.001$. Jointly, the three techniques explained 66.7% of the variance in supply chain performance ($R = 0.817$, adjusted $R^2 = 0.659$, $F(3, 121) = 80.92$, $p < 0.001$). E-sourcing made the largest unique contribution ($\beta = 0.459$, $p < 0.001$), followed by e-invoicing ($\beta = 0.302$, $p < 0.001$) and e-ordering ($\beta = 0.178$, $p = 0.011$). All three null hypotheses were rejected. The study concludes that e-sourcing, e-ordering, and e-invoicing are complementary capabilities that strengthen supply chain performance, and recommends integrated e-procurement platforms, supplier portals, and clear electronic process standards.

Keywords: e-Procurement techniques; e-Sourcing; e-Ordering; e-Invoicing; Supply Chain Performance; Manufacturing companies

1 INTRODUCTION

Global supply chains have become increasingly complex as organisations operate within interconnected markets characterised by heightened competition, supply uncertainty, technological disruption, and growing customer expectations [1]. The rapid diffusion of digital technologies has transformed procurement from a predominantly transactional function into a strategically oriented organisational capability, enabling organisations to improve information visibility, streamline supplier interactions, and reduce transaction costs [2,3]. Within this transformation, e-procurement techniques, notably e-sourcing, e-ordering, and e-invoicing, have emerged as the digital channels through which firms identify suppliers, place and track orders, and settle supplier obligations [4,5].

E-sourcing is the use of online platforms and databases to identify, evaluate, and select suppliers [6]; e-ordering is the electronic creation, approval, transmission, and tracking of requisitions and purchase orders [7]; and e-invoicing is the electronic generation, submission, verification, and processing of invoices in structured digital formats [8,9]. Together they span the upstream, midstream, and downstream stages of the procurement cycle and are associated with shorter cycle times, fewer errors, lower transaction costs, stronger compliance, and greater visibility [5,10]. Their significance is pronounced in manufacturing, where production continuity depends on reliable suppliers, accurate orders, and prompt payment [11].

In developing-country contexts, however, these benefits may be constrained by inadequate digital infrastructure, limited technological capabilities, inadequate employee competencies, and incomplete integration of procurement and financial systems [12]. Uganda's manufacturing sector operates within such a transitional environment, in which organisations increasingly adopt digital technologies while retaining elements of conventional and manual procurement. This creates an important empirical question: whether investments in e-sourcing, e-ordering, and e-invoicing translate into measurable improvements in supply chain performance.

Manufacturing companies in Rubaga Division, Kampala, provide a relevant context, since procurement efficiency, supplier responsiveness, cost control, product quality, and compliance are critical to their continuity and competitiveness [13]. Empirical evidence on the contribution of individual e-procurement techniques to supply chain performance in this context remains limited [14]. Accordingly, this study investigated the relationship between e-sourcing, e-ordering, and e-invoicing and supply chain performance among selected manufacturing companies in Rubaga Division, Kampala, Uganda.

1.1 Statement of the Problem

Manufacturing companies in Rubaga Division play a significant role in Uganda's industrial development, yet their supply chains face procurement-related challenges. Manufacturing contributes approximately 15% of Uganda's gross domestic product [15], but Uganda ranked 96th out of 139 economies on the World Bank's Logistics Performance Index, with an overall score of 2.5 out of 5 [16]. As a landlocked economy, Uganda also faces logistics and procurement costs believed to account for 25% to 40% of total product costs, compared with a global average of about 10% [16], which undermines the price competitiveness of Ugandan manufacturers [13].

Despite the availability of digital procurement technologies, many manufacturers continue to rely on manual or partially automated processes involving paper-based documentation, fragmented supplier communication, and prolonged approvals [14], and delayed access to raw materials remains a persistent challenge in Kampala [13]. Slow sourcing and approval can extend lead times, resulting in input stockouts, production stoppages, and unfulfilled customer orders, while limited automation may raise transaction costs [2]. At the payment stage, paper-based invoice handling, repeated manual verification, and physical approvals delay payment authorisation and weaken supplier confidence [17], and inadequate system integration further weakens visibility and agility [11].

These limitations have contributed to supply chain performance deficiencies among manufacturing firms in Rubaga Division, particularly in responsiveness, cost management, and quality assurance [18,19]. Consequently, firms may experience delayed order fulfilment, increased operational costs, inconsistent product quality, and compliance challenges, undermining customer satisfaction and competitiveness in regional markets [13].

Although e-sourcing, e-ordering, and e-invoicing can address some of these constraints, limited evidence exists on their individual and combined contributions among private manufacturing companies in Rubaga Division. Much of the literature treats digital procurement as a single construct, without isolating each technique's unique contribution when the others are considered simultaneously [20]. This study addressed that gap by examining the relationship between each technique and supply chain performance, and by assessing each technique's unique contribution within a combined model.

1.2 Research Objectives

1.2.1 General Objective

The study examined the relationship between e-procurement techniques and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.

1.2.2 Specific Objectives

- To investigate the relationship between e-sourcing and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.
- To assess the relationship between e-ordering and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.
- To determine the relationship between e-invoicing and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.

1.3 Research Hypotheses

The study tested the following null hypotheses:

- H_{01}: There is no significant positive relationship between e-sourcing and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.
- H_{02}: There is no significant positive relationship between e-ordering and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.
- H_{03}: There is no significant positive relationship between e-invoicing and supply chain performance in selected manufacturing companies in Rubaga Division, Kampala, Uganda.

2 LITERATURE REVIEW AND THEORETICAL FOUNDATION

2.1 Concept of E-Procurement Techniques

E-procurement refers to the use of electronic and web-based systems to conduct procurement activities throughout the procurement cycle. Techniques such as e-sourcing, e-ordering, and e-invoicing streamline procurement processes, accelerate order processing, shorten cycle times, and reduce transaction costs. These improvements contribute to more efficient and responsive supply chains [4,21], while also enhancing agility and visibility under conditions of uncertainty [11,22]. This study focuses on three techniques that collectively cover the supplier-selection, transaction, and payment stages of the procurement cycle.

E-sourcing involves the use of digital platforms to identify, evaluate, and communicate with potential suppliers, thereby improving procurement efficiency and creating strategic value [6]. Cloud-based request-for-quotation platforms, supplier databases, and automated supplier scoring enhance spend visibility and expose organisations to a wider range of competitive supplier options [23]. E-ordering, in turn, automates routine procurement activities, reducing administrative burdens, minimising human error, and improving responsiveness [7]. E-invoicing represents the downstream, transactional dimension of e-procurement, whereby supplier invoices are received, verified against purchase orders and delivery records, approved, and settled [5,9].

Evidence increasingly highlights the performance relevance of each stage. Upstream sourcing capabilities shape downstream performance [24], while the transaction stage offers immediate cost and time savings [25]. The invoicing and payment stages further generate savings by reducing paper handling and manual verification [17]. Frederico [26] argued that these benefits are cumulative across procurement stages, and Bals et al. [12] emphasised that process integration is essential because partially digitised processes limit the realisation of benefits. These arguments justify examining e-sourcing, e-ordering, and e-invoicing together as an integrated set of e-procurement techniques.

2.2 Concept of Supply Chain Performance

Supply chain performance refers to the extent to which an organisation's supply chain achieves its desired operational and strategic outcomes. In this study, it is conceptualised as a multidimensional construct comprising supply chain efficiency, responsiveness, cost reduction, and quality and compliance [27]. Efficiency concerns the effective use of resources to minimise waste and delays; responsiveness reflects the ability to adapt quickly to changes in demand and supply conditions; cost reduction involves lowering operational expenditure without compromising quality; and quality and compliance refer to meeting required standards and regulations [27,28].

E-procurement techniques may influence supply chain performance through interconnected mechanisms. [19]. Faster supplier identification and broader supplier competition can shorten lead times and reduce prices; automated order generation and tracking can minimise errors and improve delivery reliability; and electronic invoice matching and approval can accelerate payments while strengthening internal controls and regulatory compliance [11,19].

2.3 Empirical Review

2.3.1 E-Sourcing and Supply Chain Performance

Empirical evidence links e-sourcing with better supplier selection and lower procurement costs. Zope et al. [6] reported that electronic sourcing platforms improve sourcing effectiveness in manufacturing organisations, and Alhasawi et al. [23] found that automated supplier scoring and spend visibility support cost reduction and better-informed decisions. Dubey et al. [29] showed that strong digital sourcing capabilities lower procurement costs, and Schiele et al. [30] observed better supplier selection quality. In East Africa, Awuor et al. [31] associated e-sourcing with improved supplier performance among manufacturers, and Chen and Liu [32] added that linking supplier evaluation to performance analytics strengthens resilience.

2.3.2 E-Ordering and Supply Chain Performance

E-ordering has been associated with faster and more accurate order processing. Okumu and Nderui [7] found that electronic ordering increases processing speed and accuracy and minimises errors in manufacturing firms; Gunasekaran et al. [25] identified electronically confirmed orders as a key source of immediate time and cost savings; and Van Weele and Van Raaij [17] identified order accuracy and order-cycle time as direct determinants of operational performance. Komukyeya [19] reported that automating order processing shortens cycle times and lowers administrative costs in Ugandan manufacturers, although the benefits are greater when e-ordering is integrated with inventory, production, and supplier-management systems [33].

2.3.3 E-Invoicing and Supply Chain Performance

E-invoicing is associated with reduced administrative costs, faster payment processing, improved visibility, and stronger compliance through accurate electronic documentation and audit trails [5]. Wamba and Queiroz [33] emphasised that electronic document exchange reduces transaction costs and strengthens compliance, while Quartey et al. [27] and Gwiriza and Mpundu [34] linked well-documented electronic processes with accountability and traceability. Timely settlement of supplier obligations can reinforce supplier confidence and continuity of supply [11], yet the independent influence of e-invoicing on supply chain performance remains insufficiently established in developing-country manufacturing [20].

2.3.4 Combined Effect of E-Procurement Techniques

Studies examining several techniques together report that their benefits overlap and reinforce one another. Bag et al. [10] found that e-procurement adoption and digital capabilities jointly improved supply chain performance in an emerging economy, Iqbal et al. [21] reported improved procurement performance across manufacturing firms, and Nakamya et al. [14] observed fewer manual errors and shorter lead times in Ugandan public-sector and manufacturing settings. Yet most studies report a single composite score or only bivariate associations, so the relative weight of each technique, after the others are accounted for, is seldom established. The multiple regression in this study was designed to address this gap.

2.4 Theoretical Foundation

The study was anchored in the Technology Acceptance Model (TAM) and the Resource-Based View (RBV).

2.4.1 Technology Acceptance Model

Davis [35] developed the Technology Acceptance Model (TAM) to explain users' acceptance of information technology based on perceived usefulness and perceived ease of use. In e-procurement, TAM suggests that procurement, finance, and warehouse personnel are more likely to adopt electronic sourcing, ordering, and invoicing systems when they see them as useful for reducing delays, errors, and manual work, and as easy to use. Effectiveness therefore depends not only on the availability of technology but also on the willingness and ability of employees and suppliers to use it in daily activities [36].

2.4.2 Resource-Based View

Barney [37] argues that organisations achieve sustained competitive advantage when they possess valuable, rare, difficult-to-imitate, and non-substitutable resources and capabilities. The Resource-Based View (RBV) complements TAM, which has been criticised for giving limited attention to the organisational resources required for successful

implementation [38]. Applied to e-procurement, RBV suggests that technology alone may not generate superior outcomes; organisations also need reliable ICT infrastructure, functional websites and supplier portals, competent personnel, integrated procurement and accounting systems, and managerial support. Together, the two theories suggest that e-sourcing, e-ordering, and e-invoicing generate meaningful supply chain benefits when users find them useful and usable and the organisation has the resources to deploy them effectively [38].

2.5 Conceptual Framework

Figure 1 presents the conceptual framework guiding the study. The independent variable, e-procurement techniques, comprises e-sourcing, e-ordering, and e-invoicing, while the dependent variable, supply chain performance, comprises efficiency, responsiveness, cost reduction, and quality and compliance. Each e-procurement technique is hypothesised to have a positive relationship with supply chain performance (H_{01} to H_{03}). The three techniques are examined jointly to determine the unique contribution of each technique while controlling for the effects of the others.

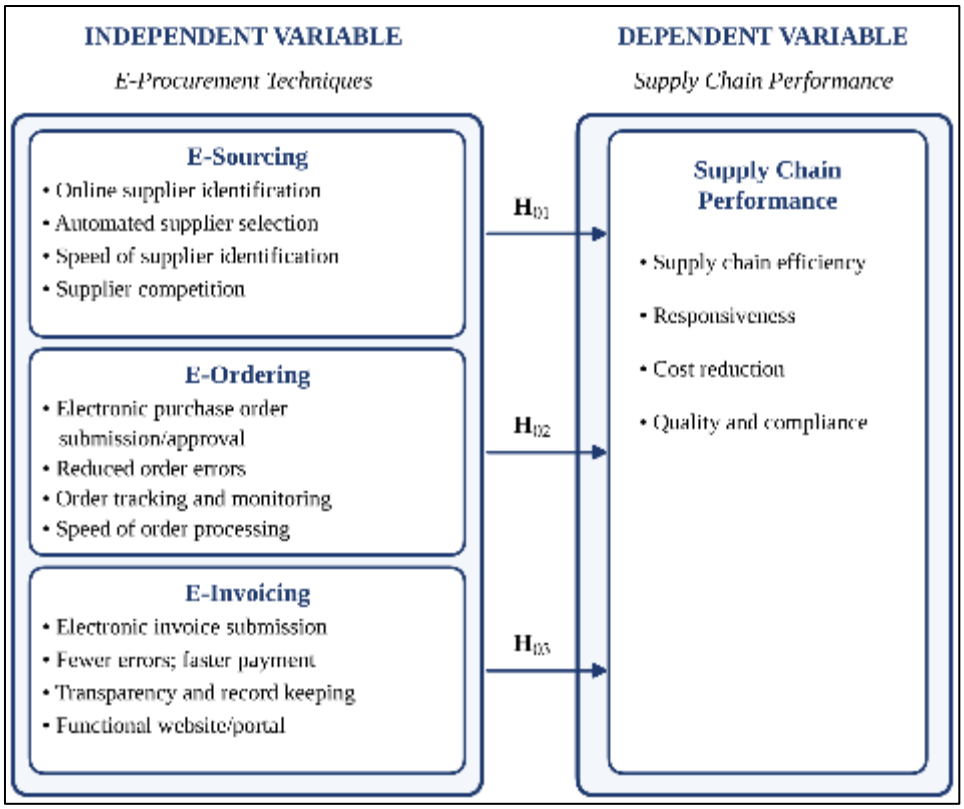


Figure 1: Conceptual Framework

Source: Author's conceptualisation (2026)

2.6 Research Gap

The study examined existing empirical literature on e-procurement and supply chain performance and identified key research gaps.

2.6.1 Conceptual gap

Previous studies have generally treated e-procurement as a single technological innovation or examined its individual components separately, rather than estimating the unique contribution of each technique while controlling for the others [20,23].

2.6.2 Contextual and geographical gap

Most East African e-procurement studies have focused on government institutions, leaving limited evidence on private manufacturing firms in Rubaga Division, Kampala, where timely raw-material procurement is critical to production [14,39].

2.6.3 Sectoral gap

Manufacturing firms differ from public-sector and service organisations because they rely on effective procurement systems to maintain production schedules, control inventory, and ensure product quality; therefore, findings from other sectors may not be directly transferable [13]. This study addressed these gaps by estimating the unique contributions of e-sourcing, e-ordering, and e-invoicing to supply chain performance in selected manufacturing companies in Rubaga Division, Kampala.

3 METHODOLOGY

3.1 Research Design

The study employed a mixed-methods descriptive correlational design, combining quantitative and qualitative approaches to provide a comprehensive understanding of the relationship between e-procurement techniques and supply chain performance [40]. This design was appropriate for examining the strength and direction of associations in a real-world setting without manipulating the variables.

Quantitative data were collected through structured questionnaires, while qualitative data were obtained through key informant interviews. The two data sources enabled triangulation and provided contextual insights into how e-sourcing, e-ordering, and e-invoicing were implemented and experienced in the selected manufacturing companies.

3.2 Study population

The study was conducted in nine selected manufacturing companies in Rubaga Division, Kampala. From a target population of 230 procurement and supply chain employees, 18 key informants comprising nine human resource managers and nine procurement managers were purposively selected. A sample of 139 respondents was drawn from the remaining 212 employees using Yamane's [41] formula at a 95% confidence level and a 5% margin of error.

The survey yielded 125 valid questionnaires (89.9% response rate), while 16 of 18 planned key informant interviews were completed (88.9%). Both response rates exceeded the 70% benchmark considered very good. Purposive sampling was used for key informants, while simple random sampling was used for production, supply chain, warehouse, finance and accounts, and ICT staff. The participating companies were Aponye Uganda Limited, Bukoola Chemical Industries Ltd, Mandela Millers Limited, MBS Fruit Agencies Limited, Nile Plastic Industries Limited, Nova Recycling Industries Limited, Ntake Bakery and Company Limited, Old Continent Group Africa Limited, and Prayosha Enterprises. The respondent profile is presented in Table 1.

3.3 Measurement of Variables

E-sourcing was measured using four indicators: online supplier identification, automated supplier selection, speed and efficiency of supplier identification, and supplier competition and selection outcomes. E-ordering was measured using four indicators: electronic purchase order submission and approval, reduction in order errors, order tracking and monitoring, and speed of procurement transactions. E-invoicing was measured using five indicators: electronic invoice submission, reduction in invoice-processing errors, speed of supplier payments, transparency and record keeping, and a functional e-invoicing website.

Supply chain performance was measured using 16 items covering efficiency, responsiveness, cost reduction, and quality and compliance. Responses were recorded on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree), using items adapted from the e-procurement literature [5]. The wider instrument also included e-tendering, which was outside the scope of this article. The key informant interviews explored the implementation of e-sourcing, e-ordering, and e-invoicing, their perceived benefits, operational challenges, and organisational factors influencing their effectiveness.

Content validity was established through expert review and a pilot test involving five respondents from non-selected firms. The individual Content Validity Indices ranged from 0.76 to 0.85, with an average of 0.80, exceeding the 0.70 acceptable threshold. Reliability was assessed using Cronbach's alpha, with values of 0.70 or above considered acceptable. The e-procurement techniques scale (17 items in the full instrument) recorded an alpha of 0.790, while the supply chain performance scale (16 items) recorded 0.729.

3.4 Data Collection Procedures

Questionnaires were self-administered and distributed and collected in person from procurement, finance, production, supply chain, and information technology personnel directly involved in procurement activities. This approach enabled the collection of standardised responses from a large group and supported a high response rate. Semi-structured

interviews were conducted at respondents' workplaces with human resource and procurement managers. To protect participants' identities, they were assigned codes from KII1 to KII16. The interviews provided qualitative insights to complement the questionnaire data.

3.5 Data Analysis

Quantitative data were analysed using SPSS Version 26. Descriptive statistics (frequencies, means, and standard deviations) summarised the responses; mean scores of 3.41–4.20 were interpreted as agreement and 4.21–5.00 as strong agreement, while standard deviations of 0.50 or below indicated high consensus. Pearson correlation coefficients were interpreted using Cohen's conventions [42], whereby $r \approx 0.10–0.29$ indicates a small (weak) relationship, 0.30–0.49 a medium (moderate) relationship, and 0.50 or above a large (strong) relationship. Simple linear regression estimated the individual effect of each technique, and multiple regression their joint and unique contributions [43], with the model summary and analysis of variance (ANOVA) examined before the coefficients. Multicollinearity was assessed using tolerance and variance inflation factor (VIF) statistics, and significance was assessed at the 0.05 level. Interview data were analysed thematically and integrated with the quantitative findings [40].

3.5.1 Regression Model Specification

The multiple regression model was specified as: $SCP = \beta_0 + \beta_1(ES) + \beta_2(EO) + \beta_3(EI) + \varepsilon$, where SCP is supply chain performance, ES is e-sourcing, EO is e-ordering, EI is e-invoicing, β_0 is the constant, β_1 to β_3 are the regression coefficients, and ε is the error term. Standardised coefficients (β) compared the relative contribution of the techniques, and the squared semi-partial correlation (β^2 divided by the variance inflation factor) estimated the share of variance each technique uniquely explained. The null hypothesis for each technique was rejected where the p-value of its coefficient was below 0.05.

3.6 Ethical Considerations

Respondents were informed of the purpose of the study and the intended use of the findings, and informed consent was obtained from each respondent. Participation was voluntary, and respondents could decline or withdraw at any stage without penalty. Access to the data was restricted and used solely for academic purposes; findings were presented in aggregate form, no personally identifiable information was required, and interviewees were identified only by codes. Institutional approval and company permission were obtained before data collection.

3.7 Limitations of the Study

Organisational confidentiality requirements limited access to procurement and supplier information; this was addressed through formal permission and assurances of anonymity. The study covered nine companies in one division of Kampala, with respondents randomly selected rather than firms; therefore, findings should be generalised cautiously. Suppliers, whose participation is central to e-procurement, were not interviewed. Reliance on self-reported perceptions may introduce response bias, which was minimised through triangulation of survey and interview data. In addition, the supply chain performance scale showed acceptable but modest internal consistency ($\alpha = 0.729$), and the correlational design establishes associations rather than causation.

4 RESULTS AND FINDINGS

4.1 Response Rate and Respondent Profile

Table 1: Response Rate and Background Characteristics of Respondents

No.	Category	Item	Frequency (*f*)	Percentage (%)
1	Response rate	Questionnaires ($n = 139$)	125	89.9
		Interviews ($n = 18$)	16	88.9
2	Gender	Male	79	63.2
		Female	46	36.8
3	Age	Below 25 years	6	4.8
		25–34 years	47	37.6
		35–44 years	60	48.0
		45–54 years	12	9.6

4	Education	Diploma	17	13.6
		Bachelor's degree	96	76.8
		Postgraduate	12	9.6
5	Position	Production officers	30	24.0
		Supply chain officers	25	20.0
		Warehouse officers	18	14.4
		Finance and accounts staff	40	32.0
		IT technicians	12	9.6
6	Years in company	Less than 1 year	23	18.4
		1–4 years	79	63.2
		5–10 years	23	18.4

Source: Primary Data (2026). Respondent profile: N = 125 (100%).

Table 1 shows that 125 of the 139 questionnaires were returned (89.9%) and 16 of the 18 planned interviews were completed (88.9%). Most respondents were male (63.2%), nearly half were aged 35–44 years (48.0%), and most held a bachelor's degree (76.8%). Finance and accounts staff formed the largest group (32.0%), followed by production officers (24.0%) and supply chain officers (20.0%), and 63.2% had worked in their companies for one to four years. The respondents were therefore well placed to give informed views on sourcing, ordering, and invoicing practices.

4.2 Descriptive Findings

Table 2: Descriptive Statistics for E-Sourcing

No.	E-sourcing indicator	*N*	Min.	Max.	Mean	Std. Dev.
1	The company uses online platforms to identify potential suppliers.	125	3	5	4.03	0.22
2	The company has automated the supplier selection process.	125	2	5	3.43	0.89
3	E-sourcing has improved the speed and efficiency of supplier identification.	125	2	5	4.06	0.45
4	E-sourcing has improved supplier competition and selection outcomes.	125	2	5	3.74	0.69
	Overall Mean	125	-	-	3.82	0.36

Source: Primary Data (2026).

Table 2 indicates a favourable assessment of e-sourcing (overall $M = 3.82$, $SD = 0.36$). Respondents acknowledged the use of online platforms to identify potential suppliers ($M = 4.03$, $SD = 0.22$) and improved supplier identification efficiency ($M = 4.06$, $SD = 0.45$). KII1 and KII3 confirmed that "*online platforms had reduced supplier identification time from weeks to hours".* Supplier competition and selection also received positive ratings ($M = 3.74$, $SD = 0.69$). However, automation of supplier selection recorded the lowest mean ($M = 3.43$, $SD = 0.89$), indicating partial automation. KII2 noted that *"the system automatically scores and ranks suppliers against established evaluation criteria, while the procurement committee conducts the final negotiations and site inspection manually."*

Table 3 indicates a high level of agreement on the adoption and benefits of e-ordering (overall $M = 3.94$, $SD = 0.36$). Respondents acknowledged faster electronic submission and approval of purchase orders ($M = 4.04$, $SD = 0.30$) and improved procurement processing speed ($M = 4.06$, $SD = 0.39$). Supporting this, KII9 reported that "*electronic approvals had reduced order processing time from up to one week to the same day".* Respondents also recognised reduced ordering errors ($M = 3.90$, $SD = 0.72$), with KII10 noting that *"the system automatically retrieves item codes and quantities from approved requisitions, reducing the frequency of orders for incorrect materials compared with the past."* Order tracking and monitoring were similarly rated favourably ($M = 3.78$, $SD = 0.73$), while KII12 reported "*an approximate 50% reduction in material delivery times".*

Table 3: Descriptive Statistics for E-Ordering

No.	E-ordering indicator	*N*	Min.	Max.	Mean	Std. Dev.
1	Purchase orders are submitted and approved electronically within the company.	125	2	5	4.04	0.30
2	E-ordering has reduced order errors within the company.	125	2	5	3.90	0.72
3	E-ordering systems enable effective tracking and monitoring of order progress.	125	2	5	3.78	0.73
4	E-ordering has improved the speed of processing procurement transactions.	125	2	5	4.06	0.39
	Overall Mean	125	-	-	3.94	0.36

Source: Primary Data (2026).

Table 4: Descriptive Statistics for E-Invoicing

No.	E-invoicing indicator	*N*	Min.	Max.	Mean	Std. Dev.
1	Suppliers submit invoices electronically to the company.	125	2	5	3.91	0.46
2	E-invoicing has reduced invoice processing errors.	125	2	5	3.86	0.62
3	E-invoicing has improved the speed of supplier payment processing.	125	2	5	3.86	0.59
4	E-invoicing has improved transparency and record keeping.	125	2	5	3.91	0.60
5	The company has a functional website to support e-invoicing activities.	125	2	5	3.99	0.20
	Overall Mean	125	-	-	3.91	0.26

Source: Primary Data (2026).

Table 4 indicates a generally high level of agreement regarding the adoption and perceived benefits of e-invoicing (overall $M = 3.91$, $SD = 0.26$). The availability of functional websites recorded the highest mean ($M = 3.99$, $SD = 0.20$), although KII16 observed that *"full integration with the accounting and procurement systems remains necessary."* Respondents also acknowledged electronic invoice submission by suppliers and improved transparency and record keeping (both $M = 3.91$). Furthermore, e-invoicing was perceived to reduce processing errors and accelerate payments ($M = 3.86$ for both). Supporting this, KII15 reported that "e*lectronic invoice verification and approval had reduced supplier payment periods from approximately two months to two weeks, thereby improving supplier cooperation"*.

Table 5: Descriptive Statistics for Supply Chain Performance

No.	Dimension	Items	Range of item means	Dimension mean	Std. Dev.
1	Supply chain efficiency	4	3.55 – 4.14	3.90	0.29
2	Supply chain responsiveness	4	3.60 – 3.97	3.87	0.28
3	Cost reduction	4	3.63 – 4.67	4.09	0.31
4	Quality and compliance	4	3.32 – 4.00	3.74	0.39
	Overall	16	3.32 – 4.67	3.90	0.25

Source: Primary Data (2026). The overall standard deviation (0.25) is for the 16-item composite (N = 125).

Table 5 indicates that respondents generally agreed that e-procurement had improved supply chain performance (overall $M = 3.90$, $SD = 0.25$). Cost reduction recorded the highest mean ($M = 4.09$), largely driven by reduced paperwork-related administrative costs ($M = 4.67$). Quality and compliance recorded the lowest mean ($M = 3.74$), particularly due to the limited perceived reduction in compliance-related incidents ($M = 3.32$, $SD = 0.92$), suggesting that cost and efficiency benefits were more evident than compliance improvements.

The interviews identified four complementary themes: improved operational speed, through faster supplier identification, order approvals and payments; greater accuracy and control, through automated data retrieval, document matching and prevention of duplicate payments; enhanced transparency and traceability, through electronic records and audit trails; and persistent implementation constraints, including partial automation, off-system urgent transactions, limited accounting-system integration and uneven supplier readiness. These constraints highlight the importance of system integration in achieving the full benefits of e-procurement.

4.3 Pearson Correlation between E-Procurement Techniques and Supply Chain Performance

Table 6: Pearson Correlation Matrix of E-Procurement Techniques and Supply Chain Performance

No.	Variable	1	2	3	4
1	1. Supply chain performance	1.000	0.755**	0.626**	0.692**
2	2. E-sourcing	0.755**	1.000	0.598**	0.626**
3	3. E-ordering	0.626**	0.598**	1.000	0.574**
4	4. E-invoicing	0.692**	0.626**	0.574**	1.000

Source: Primary Data (2026). **Correlation is significant at the 0.01 level (2-tailed); all p < 0.001; N = 125.

Pearson correlation analysis (Table 6) revealed strong, positive, and statistically significant relationships between supply chain performance and all three e-procurement techniques, with coefficients exceeding the 0.50 threshold for a large (strong) relationship [42]. E-sourcing had the strongest association (r = 0.755, r^2 = 0.569, p < 0.001), followed by e-invoicing (r = 0.692, r^2 = 0.479, p < 0.001) and e-ordering (r = 0.626, r^2 = 0.392, p < 0.001).

Given that correlation does not establish causality, these results were interpreted as associations rather than causal effects. Furthermore, inter-correlations among the techniques ranged from 0.574 to 0.626, below the r > 0.90 threshold identified by Field [44] as an indication of potentially problematic multicollinearity among predictors. In addition, VIF values below 5 and tolerance values above 0.10 indicated that multicollinearity was not a serious concern [43], thereby supporting the inclusion of all techniques in the multiple regression model.

4.4 Simple Linear Regression Results

Table 7: Simple Linear Regression of Supply Chain Performance on Each Technique

No.	Predictor	Constant	*B*	*SE*	*β*	*t*	*p*	R^2	Adj. R^2	*F*(1, 123)
1	E-sourcing	1.870	0.531	0.042	0.755	12.756	< 0.001	0.569	0.566	162.72
2	E-ordering	2.160	0.440	0.050	0.626	8.898	< 0.001	0.392	0.387	79.17
3	E-invoicing	1.318	0.660	0.062	0.692	10.631	< 0.001	0.479	0.475	113.01

Source: Primary Data (2026). Dependent variable: Supply chain performance. Each model contains one predictor.

Simple linear regression (Table 7) showed that all three techniques were strong, positive, and statistically significant predictors of supply chain performance. E-sourcing explained 56.9% of the variance (B = 0.531, t = 12.756, p < 0.001), followed by e-invoicing (B = 0.660, t = 10.631, p < 0.001), which explained 47.9%, and e-ordering (B = 0.440, t = 8.898, p < 0.001), which explained 39.2%. KII8 supported the e-invoicing findings, " *the system does not release payment without matching invoices, delivery notes, and purchase orders improves policy compliance and payment reliability, although some urgent transactions remain outside the system".*

4.5 Multiple Regression Results

The model summary indicates a strong positive relationship between the combined e-procurement techniques and supply chain performance (R = 0.817). E-sourcing, e-ordering, and e-invoicing jointly explained 66.7% of the variance (R^2 = 0.667), leaving 33.3% attributable to other factors. The adjusted R^2 (0.659) confirms the model's explanatory strength, while the standard error of the estimate (0.146) indicates a relatively small prediction error. The ANOVA further confirmed that the model was statistically significant, F (3, 121) = 80.92, p < 0.001 (regression sum of squares = 5.173; residual sum of squares = 2.578; total sum of squares = 7.751). Accordingly, the null hypothesis that the three techniques do not jointly predict supply chain performance was rejected.

Table 8 shows that all three e-procurement techniques made statistically significant unique contributions to supply chain performance. E-sourcing contributed the most (B = 0.323, β = 0.459, t = 6.338, p < 0.001), uniquely explaining

approximately 11.0% of the variance, followed by e-invoicing (B = 0.289, β = 0.302, t = 4.262, p < 0.001), accounting for 5.0%, and e-ordering (B = 0.125, β = 0.178, t = 2.574, p = 0.011), accounting for 1.8%. Holding the other techniques constant, a one-unit increase in e-sourcing, e-invoicing, and e-ordering was associated with increases of 0.323, 0.289, and 0.125 units in supply chain performance, respectively. The estimated regression model was: SCP = 1.044 + 0.323(ES) + 0.125(EO) + 0.289(EI).

Table 8: Multiple Regression Coefficients for E-Procurement Techniques and Supply Chain Performance

No.	Predictor	*B*	*SE*	*β*	*t*	*p*	95% *CI* for *B*	*Tol.*	*VIF*
1	(Constant)	1.044	0.200	-	5.210	< 0.001	-	-	-
2	E-sourcing	0.323	0.051	0.459	6.338	< 0.001	[0.222, 0.424]	0.523	1.911
3	E-ordering	0.125	0.048	0.178	2.574	0.011	[0.029, 0.220]	0.577	1.734
4	E-invoicing	0.289	0.068	0.302	4.262	< 0.001	[0.155, 0.423]	0.546	1.831

Source: Primary Data (2026). Dependent variable: Supply chain performance. R^2 = 0.667; adjusted R^2 = 0.659; F (3, 121) = 80.92, p < 0.001. Tol. = tolerance.

Collectively, the three techniques uniquely explained approximately 17.8% of the variance, while 48.9% of the explained variance was shared. The smaller coefficients in the multiple regression compared with the simple regressions (e.g., e-invoicing B = 0.660 versus 0.289) reflect their shared variance, with inter-correlations ranging from 0.574 to 0.626. However, tolerance values (0.523–0.577) and VIF values (1.734–1.911) confirmed that multicollinearity was not a concern [43]. Accordingly, simple regression captures each technique's overall relationship with performance, whereas multiple regression establishes its independent contribution.

4.6 Hypothesis Decisions

Table 9: Summary of Hypothesis Decisions

No.	Hypothesis	Technique	Simple *β (p)*	Multiple *β (p)*	Decision
1	H_{01}	E-sourcing	0.755 (< 0.001)	0.459 (< 0.001)	Null rejected
2	H_{02}	E-ordering	0.626 (< 0.001)	0.178 (0.011)	Null rejected
3	H_{03}	E-invoicing	0.692 (< 0.001)	0.302 (< 0.001)	Null rejected

Source: Primary Data (2026). Decisions are based on p < 0.05 in both the simple and multiple regression models.

All three null hypotheses were tested at the 0.05 level using both regression models. Each technique was a statistically significant positive predictor of supply chain performance, alone and with the other techniques controlled (Table 9). Because the p-values were below 0.05 in both models, H_{01}, H_{02}, and H_{03} were rejected and the alternatives accepted, confirming significant positive relationships between each technique and supply chain performance.

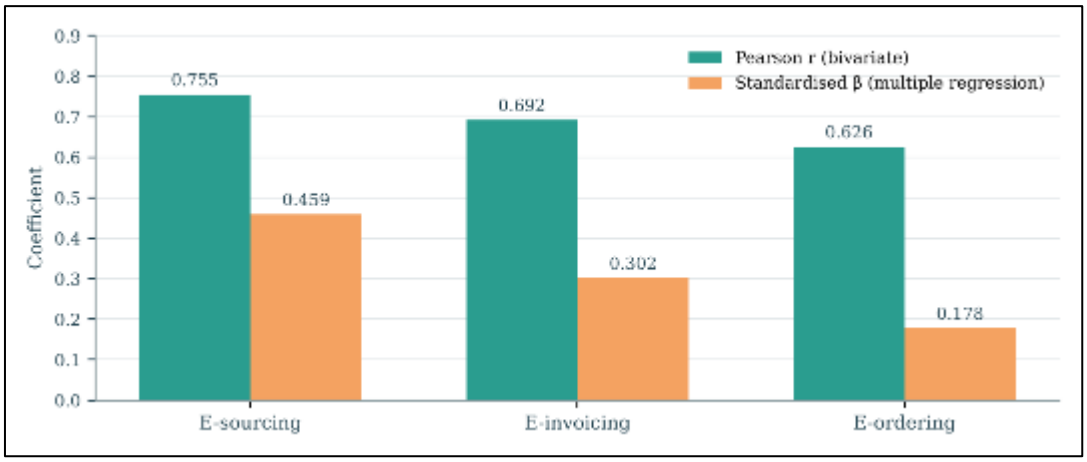


Figure 2: Bivariate Correlations and Standardised Regression Coefficients

Source: Primary Data (2026)

Figure 2 compares the bivariate correlation and the standardised regression coefficient for each technique. The ranking is the same under both measures, but the coefficients shrink in the combined model, most sharply for e-ordering, because the techniques share variance.

5 DISCUSSION OF FINDINGS

5.1 E-Sourcing and Supply Chain Performance

E-sourcing demonstrated the strongest relationship with supply chain performance (r = 0.755) and the largest unique contribution (β = 0.459). This supports previous studies showing that digital sourcing enhances procurement efficiency, transparency, cost performance, supplier selection, price discovery, and sourcing-cycle efficiency [10,25,29,30].

As the foundation of electronic procurement, effective sourcing influences downstream delivery reliability, product quality, and cost performance [24]. In Uganda, online sourcing platforms can reduce information asymmetry and dependence on personal networks, enabling systematic supplier evaluation and faster quotation acquisition, with interviewees reporting turnaround times of one day compared with several weeks.

5.2 E-Ordering and Supply Chain Performance

E-ordering showed a strong bivariate relationship with supply chain performance (r = 0.626) and retained a significant, though smaller, unique contribution (β = 0.178). This is consistent with Gunasekaran et al. [25], Okumu and Nderui [7], and Van Weele and Van Raaij [17], who linked electronic ordering with immediate time and cost savings, faster and more accurate order processing, and better order accuracy and order-cycle time. Interviewees reported same-day order approval and delivery times cut by about half, which illustrates the mechanism.

5.3 E-Invoicing and Supply Chain Performance

E-invoicing was strongly related to supply chain performance (r = 0.692) and made the second-largest unique contribution (β = 0.302). This is consistent with Van Weele and Van Raaij [17], who observed that the invoicing and payment stages generate measurable savings by reducing paper handling, manual verification, and payment delays, with Wamba and Queiroz [33] on lower transaction costs and stronger compliance, and with Frederico [26], who argued that later-stage efficiencies reinforce earlier gains.

The finding underscores the importance of timely supplier payments for reliable supplier relationships: interviewees reported payment cycles shortened from about two months to two weeks. This supports PwC's [11] argument that supply chain reliability depends not only on the physical movement of goods but also on the timely exchange of financial information and prompt settlement of obligations.

5.4 Interpretation through TAM and RBV

The findings support TAM [35], as respondents perceived e-procurement techniques as useful and relatively easy to use, although inconsistent system utilisation highlights the need for continuous user and supplier engagement [36]. They also support RBV [37], demonstrating that effective e-procurement depends on complementary resources, including functional websites, skilled personnel, and integrated systems. The techniques operate as complementary capabilities, while each contributes uniquely to supply chain performance [26].

5.5 Relative Contributions of the Three Techniques

The consistent ranking of unique contributions places e-sourcing first, followed by e-invoicing and e-ordering, highlighting their different levels of contribution to supply chain performance. E-sourcing shapes supplier selection, cost, and quality, while ordering and invoicing ensure efficient execution of procurement decisions [24]. Although e-ordering had a smaller unique contribution, its strong correlation (r = 0.626) confirms its importance and highlights the need to integrate all three techniques [33].

6 CONCLUSION

The study concludes that e-sourcing, e-ordering, and e-invoicing are each significantly and positively associated with supply chain performance among the selected manufacturing companies in Rubaga Division, Kampala, and that together they explain about two-thirds of its variance (R^2 = 0.667). E-sourcing is the strongest predictor (β = 0.459), followed by e-invoicing (β = 0.302) and e-ordering (β = 0.178), and all three made significant unique contributions after controlling for each other, so all null hypotheses were rejected.

Respondents reported favourable experiences with online supplier identification, electronic order approval and tracking, and electronic invoice submission and payment, although supplier selection remained only partially automated, some urgent transactions bypassed the systems, and compliance benefits were less evident than speed and cost benefits. The evidence supports the view of the three techniques as complementary capabilities across the sourcing, ordering, and payment stages, whose benefits are likely to be fuller when integrated within an interoperable system.

Recommendations

- Prioritise and Deepen E-Sourcing

E-sourcing had the largest unique contribution (β = 0.459), although supplier selection remained only partially automated (M = 3.43). Companies should invest in electronic supplier databases, online prequalification, and automated evaluation and scoring tools to strengthen supplier selection and procurement efficiency [6,23].

- Integrate Ordering Systems

Companies should integrate e-ordering with inventory, production planning, and supplier-management systems to improve coordination and order processing. Automated validation, approval workflows, and real-time order tracking should also be introduced to enhance operational efficiency [33].

- Integrate Invoicing and Develop Supplier Portals

Companies should link e-invoicing systems with purchase orders, goods-received notes, and electronic payment systems to facilitate automated three-way matching and invoice approval [8]. They should also develop supplier portals that enable suppliers to submit invoices, track payment status, and receive payment notifications.

- Set Standards and Monitor Performance

Management should establish clear electronic procurement standards covering payment timelines, exception-handling procedures, and escalation mechanisms. Regular monitoring of sourcing lead times, order-cycle times, invoice-processing periods, timely payments, and compliance incidents will help sustain performance improvements.

- Build User and Supplier Capacity

Management should strengthen the capacity of procurement, finance, and warehouse staff through regular training and ensure consistent use of electronic procurement systems, with documented exceptions where necessary. Suppliers should also receive onboarding, technical guidance, and continuous support to improve their readiness and adoption of e-procurement systems [36].

- Provide Enabling Industry and Policy Support

Industry associations, regulators, and technology agencies should promote common electronic document standards, shared supplier-verification services, and e-invoicing platforms. They should also support digital skills development among procurement and finance professionals to make e-procurement adoption more affordable and accessible, particularly for small and medium-sized manufacturers [8,13].

- Contribution of the Study

The study contributes local empirical evidence from private manufacturing firms in Rubaga Division, an area that has received limited research attention, as previous East African studies have focused mainly on government institutions [14]. It distinguishes e-sourcing, e-ordering, and e-invoicing, evaluates their individual contributions to supply chain performance, and demonstrates the complementary application of TAM and RBV [20,38].

Practically, the study guides managers to integrate the three e-procurement techniques and prioritise investment in e-sourcing [26]. Methodologically, it demonstrates how correlation and regression analyses can distinguish the overall relationships from the unique contributions of each technique, providing an approach applicable to other manufacturing sectors and settings.

- Areas for Further Research

Unexplained Variance: Investigate other factors accounting for the remaining 33.3% of unexplained variation in supply chain performance, including management support, staff digital competence, ICT infrastructure, cybersecurity, and regulatory factors.

Supplier Digital Readiness: Examine how suppliers' digital readiness influences the adoption and effectiveness of e-procurement techniques.

Mediating and Moderating Factors: Investigate the roles of supply chain integration, supplier collaboration, organisational agility, accounting-system integration, and supplier portals.

Methodological Improvements: Adopt longitudinal mixed-methods approaches involving procurement managers, suppliers, and ICT personnel, using objective indicators such as processing cycle times and error rates.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

Authors' Contribution

- SSEKAJJA Ronald: Conceptualization, research design and methodology, data collection, data analysis, writing of the original manuscript, and final approval of the manuscript.
- Dr. MAKANGA Christopher Neil: Supervision, validation of the methodology and findings, critical review and editing of the manuscript, and final approval of the manuscript.
- Dr. SSENDAGI Muhamad: Technical expertise, validation of the methodology and findings, critical review and editing of the manuscript, and final approval of the manuscript.

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