

UNIVERSITY OF EDUCATION, WINNEBA

**AN INVESTIGATION INTO THE ROLE OF ELECTRONIC
PROCUREMENT ON SUPPLY CHAIN PERFORMANCE IN THE PUBLIC
SECTOR: A CASE STUDY OF ENVIRONMENTAL PROTECTION AGENCY**



BETTY AKYEA AMAKYE

MASTER OF BUSINESS ADMINISTRATION

2023

UNIVERSITY OF EDUCATION, WINNEBA

**AN INVESTIGATION INTO THE ROLE OF ELECTRONIC
PROCUREMENT ON SUPPLY CHAIN PERFORMANCE IN THE PUBLIC
SECTOR: A CASE STUDY OF ENVIRONMENTAL PROTECTION AGENCY**



**A dissertation in the Department of Procurement and Supply Chain
Management, School of Business, submitted to the School of
Graduate Studies in partial fulfillment
of the requirements for the award of the degree of
Master of Business Administration
(Procurement and Supply Chain Management)
in the University of Education, Winneba**

NOVEMBER, 2023

DECLARATION

Student's Declaration

I, Betty Akyea Amakye, declare that this dissertation, with the exception of quotations and references contained in published works, has all been identified and acknowledged. I hereby declare that this dissertation is the result of my original research and that no part of it has been presented for another degree at this University or elsewhere.

Signature:

Date:

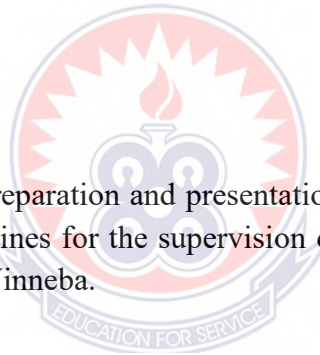
Supervisor' Declaration

I hereby declare that the preparation and presentation of the work were supervised in accordance with the guidelines for the supervision of a dissertation laid down by the University of Education, Winneba.

Mr. Alhassan Bawah (Supervisor)

Signature:

Date:



DEDICATION

First and foremost, I dedicate this work to the Almighty for the knowledge, health, and guidance that He extended to me, leading to the completion of this study. Also, I dedicate this work to my parents for their unwavering love and support; it would not have been possible without you. Additionally, I want to thank everyone who has supported me. May the Lord continue to bless you all. Finally, I want to dedicate this work to myself for the determination, resilience, and unwavering belief in the pursuit of knowledge that has brought me this far!



ACKNOWLEDGMENTS

First, I want to acknowledge my Supervisor, Mr Alhassan Bawah, the HoD, Procurement and Supply Chain Management, for his useful suggestions. I also want to thank Dr Mawuko Dza, Mr Evans Kyeremeh and the entire staff of the School of Business for taking the time to impart knowledge to me, which aided me in carrying out this work. Again, to the team at the Environmental Protection Agency, many thanks for your assistance.



TABLE OF CONTENTS

Table	Page
DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
ABSTRACT	x
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the study	1
1.2 Problem Statement	4
1.3 Research Objectives	8
1.4 Research Questions	8
1.5 Scope of the Study	9
1.6 Significance of the study	9
1.7 Organisation of the Study	9
CHAPTER TWO: LITERATURE REVIEW	11
2.1 Introduction	11
2.2 Electronic Procurement	11
2.3 Supply Chain Management in the Public Sector	12
2.4 Electronic Procurement and Supply Chain Performance	15
2.5 Practice of Electronic Tendering	17
2.5.1 Electronic Order Processing	20
2.5.2 Electronic Material Management	22



2.5.3 Electronic Supplier Management	24
2.6 Challenges of Electronic Procurement	27
2.6.1 Technological Infrastructure	27
2.6.2 Data Security and Privacy	29
2.6.3 System Integration	31
2.6.4 Cost Consideration	34
2.7 Conceptual Framework	36
2.8 Empirical Review	37
2.9 Theoretical Framework	42
2.9.1 Transaction Cost Theory	42
2.9.2 Resource-Based View	45
2.9.3 Institutional Theory	47
2.9.4 Diffusion of Innovation Theory	49
2.10 Chapter Summary	52
CHAPTER THREE: RESEARCH METHODOLOGY	54
3.1 Introduction	54
3.2 Research Approach	54
3.3 Population	54
3.4 Sampling Technique and Sample Size	55
3.5 Sources of Data	56
3.6 Data Analysis	56
CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION	58
4.1 Introduction	58
4.2 Socio-Demographics	58

4.2.1 Gender Distribution	58
4.2.2 Age of respondents	59
4.2.3 Educational Background	59
4.2.4 Length of tenure	60
4.3 Electronic Procurement Practices	60
4.4 Supply Chain Performance	65
4.5 Challenges	69
4.6 Relationship between Electronic Procurement Practices and Supply Performance in Ghana's Public Sector	72
4.7 Effects of Electronic Procurement on Supply Chain Performance in Ghana's Public Sector	73
CHAPTER FIVE: SUMMARY, CONCLUSION, AND RECOMMENDATIONS	76
5.1 Introduction	76
5.2 Summary of Findings	76
5.3 Conclusion	77
5.4 Recommendation	77
REFERENCES	80
APPENDIX A: QUESTIONNAIRE	86



LIST OF TABLES

Table	Page
4.1: Gender	58
4.2: Age Distribution	59
4.3: Level of Education	59
4.4: Duration of work	60
4.5: Electronic Procurement Practices	61
4.6: Supply Chain Performance	66
4.7: Challenges	70
4.8: Correlation	73
4.9: Regression	74



ABSTRACT

The study investigated the impact of electronic procurement (e-procurement) on supply chain performance in Ghana's Public Sector, with a special focus on the Environmental Protection Agency (EPA). Adopting e-procurement technology is crucial for transforming procurement practices, enhancing efficiency, and achieving organizational goals. The study explored the various effects of e-procurement on supply chain dynamics, analyzing its influence on procurement procedures, organizational efficiency, and overall performance. The study used a quantitative approach to examine the relationship between electronic procurement practices and supply chain performance. The study assessed the impact of electronic tendering, order processing, material management, and supplier engagement practices in Ghana's public sector. The study highlighted the obstacles faced when implementing e-procurement systems, including staff resistance, technical limitations, data security concerns, and compatibility issues with existing systems. In addition, the study brought to light the importance of overcoming these challenges to fully maximise electronic procurement's potential advantages in improving supply chain performance. The findings revealed a strong connection between efficient e-procurement practices and improved supply chain performance, highlighting the significant impact of a streamlined procurement process. Despite the clear advantages, the study acknowledged the necessity of strategic interventions to tackle obstacles and guarantee smooth integration. Ultimately, this study emphasized the importance of implementing focused interventions to improve staff expertise, overcome technical challenges, strengthen data protection, address cultural obstacles, promote collaboration between departments, and strengthen ongoing evaluation methods. These recommendations will ensure a smooth and efficient integration of electronic procurement practices within Ghana's Public Sector, thus resulting in improved efficiency and transparency in procurement processes.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

E-procurement is a part of the larger information technology concept, which has allowed businesses several opportunities to operate beyond their physical borders. Specifically, e-procurement has increased the professionalism of procurement staff by encouraging greater use of information technology systems, enabling them to apply more efficient methods to deliver significant value to organisations (Yu et al., 2020). Michael Porter, one of the most notable proponents of internet-based business strategies, emphasised in 2003 that their business models must adopt and accept more effective and efficient internet-based business methods for firms to remain competitive. In addition, he argues that the internet will only become a substantial source of competitive advantage if it is included in an organisation's overall strategy. Nonetheless, this adoption has positively and negatively affected their business relationships and e-procurement implementation (Knudsen, 2019). Businesses have felt obliged to streamline their inter- and intra-organizational procurement procedures due to e-procurement. Negatively, organisations that have chosen to overlook e-procurement's benefits or have implemented the technology only partially continue to duplicate inefficient and unnecessary effort (Yu et al., 2020).

E-procurement has been defined in numerous ways by various scholars. For instance, Hassan et al. (2017) define E-Procurement as utilising information technology to facilitate the commercial procurement of products and services. It uses Internet commerce to identify potential sources of supply, acquire goods and services, transfer funds, and connect with suppliers. E-Auction, E-Procurement, E-Marketing, E-Purchasing, and E-Commerce are all E-Procurement solutions.

Supply Chains gained popularity in the early nineties, and academics and industry professionals have grown increasingly interested in supply chain performance in recent times. Supply chain performance is defined as integrating essential business activities from the end user to the original suppliers who give products, services, and information that bring value to customers and other stakeholders (Mugabi, 2018). Fisher et al., 2019, is of the opinion that decisions made in the areas of facilities (location, number, and capacity), inventory (economies of scale, ability to meet demand), and transportation (modal, networks), influence supply chain performance and have become a crucial factor in ensuring the survival of organisations.

Supply Chain has considerably contributed to more effective organisational change management by mitigating the adverse effects of business politics. Supply chain performance aims to streamline a company's supply process while enhancing its strategic standing. To thrive in today's fast-paced, globally competitive business environment, businesses must use new tactics to boost customer loyalty, cut costs, and improve products and services. Many corporations and organisations, particularly those in the supply chain management industry, focus on reducing procurement costs (Song et al., 2019). The Information Technology (IT) revolution significantly impacts purchasing and selling processes to overcome the challenges mentioned earlier. From its onset, e-procurement has enabled establishing requisition, approving and controlling the purchase order, and accounting or financial strategy using an internet-based protocol, according to Podlogar. When undertaken online, e-procurement can access markets that were previously inaccessible to conventional procurement techniques. Organisations can communicate, transact, and engage more efficiently and speedily to complete tasks and execute projects (Sreedevi & Saranga, 2017).

Supply chain management involves purchasing raw materials, their intermediate processing into completed items, and their final delivery to clients through an interconnected network of suppliers, manufacturers, assembly facilities, distribution centres, and logistics providers (Fatorachian & Kazemi, 2021). A professional organisation in the United States also claims that supply chain management covers sourcing, purchasing or procurement, conversion, and logistics management responsibilities (University of Derby, 2018).

In essence, supply chain management blends the management of internal supply and demand with the satisfaction and fulfilment of end-user or customer requirements. Supply chain management focuses on streamlining supply-side business processes, such as moving products, services, and information, on maximising customer value and achieving competitive advantages in the market (Adam & Somer, 2022). The Organization for Economic Cooperation and Development (OECD) estimated in 2004 that more than 80 per cent of global exports of products and commercial services consisted of procurement. Public procurement accounts for 50-70 per cent of total government expenditure in Ghana, 14 per cent of the country's Gross Domestic Product (GDP), and 24 per cent of imports. Therefore, the country's inability to spend will have enormous consequences. This will contribute to a lack of foreign currency and a sharp drop in local currencies. These difficulties may be caused by a lack of transparency in the procurement process resulting from antiquated practices. A system that electronically monitors and automates all actions must be implemented to optimise the procurement process. Despite the increasing prevalence of e-procurement as a result of technological advancements, globalisation, and progress, certain organisations continue to employ manual procurement procedures. The majority of procurement processes in the public sector continue to be carried out manually, with

the internet being predominantly utilised for web browsing and email correspondence (PPA, 2013). The underlying assumption of this study is that the Public Sector has a troubled and extensive history of inefficient technology development, distribution, and utilisation. However, it is unclear whether prior research on e-procurement has investigated the impact of e-procurement on supply chain performance, particularly within the public sector. Analysing the effects of electronic tendering, electronic order processing practices, electronic material management, and electronic supplier management practices, this study seeks to close this knowledge gap by proposing methods by which E-procurement can improve supply chain performance in the public sector.

1.2 Problem Statement

Manual systems have been a significant cause of inefficiency in Ghana's procurement regulation and operations. Therefore, it is necessary to apply ICT to ensure the procurement system's proper operation. To solve the present operational issues, technical institutions are turning to ICT to enhance services for suppliers and other consumers, thereby reducing operating costs and improving performance. The performance of the procurement function is influenced by online communication, online advertising of bids, and a computerised bidding procedure. Information Technology enables a more streamlined and accelerated process flow, effective information sharing, decentralisation of duties and decisions, enhanced transparency, and improved control (Cox, 2022).

The high cost of procurement activities in Ghana can be partly attributed to the use of manual procurement processes by most public sectors. Using manual procurement processes to acquire products, services, or works for the benefit of all departments

within an organisation presents a difficulty in getting these items at the proper time, price, place, quantity, and quality. Due to the efficiency and effectiveness of the procurement process, the Ghana government continues to lose millions of Ghana Cedis to fraud in government-mainstream procurement activities (Osei-Tutu et al., 2019). The operations of parastatals have grown inefficient and unprofitable, partly because of the proliferation of objectives, the stifling of private sector efforts, and the failure of joint ventures, which have forced the government to incur substantial procurement costs (Vaidya & Campbell, 2016).

Despite the growing popularity of e-procurement due to globalisation, technical change, and progress, some businesses still carry out some procurement processes manually. According to the PPA (2013), most public sector procurement processes are still manually conducted, and the internet is mainly used for web browsing and e-mails. The government has adopted a policy of mandating the use of the Ghana Integrated Financial Management Information System (GIFMIS) by some government procuring entities to integrate critical functions such as procurement and accounting; streamline and increase transparency in the management of public funds; and provide a framework for standardised reporting.

According to (Adjei-Bamfo et al., 2020; Nani & Ali, 2020; Walker & Harland, 2008), the technical infrastructure accessible to the public sector in Ghana appears to be adequate. Most respondents agreed that the study organisation has the technology/infrastructure to facilitate e-procurement. This comprised gear and software, Internet access, and technical knowledge. Thirty per cent of respondents disagreed that the technology infrastructure was insufficient to support electronic procurement. They ascribed this to a lack of scanners and poor internet. The

respondents agreed that Internet connectivity, inadequate network coverage, and system failures are obstacles to the public sector's use of e-procurement. The respondents disagreed with internal electronic communication on procurement-related issues using technologies other than e-mail, such as instant messaging and video conferencing, and further strongly disagreed with allowing suppliers direct access to internal systems such as Enterprise Resource Planning Systems and the technological integration of the e-procurement system. Most respondents ranked the security of data and information as the most crucial aspect of procurement. Numerous research has been conducted to comprehend the notion of e-procurement and its advantages. For instance, research has been conducted on the implementation of e-procurement; the problems of e-procurement deployment; and the benefits of e-procurement. Studies have also found a correlation between e-procurement and operational and overall organisational performance. Other aspects of Procurement and Supply Chain Management were the focus of that research in Ghana. Osei-Tutu, Kissi, & Desmond, (2019) examined the critical factors for implementing e-procurement in Ghana. Ofori & Fuseini (2019) studied the Electronic government procurement adoption in Ghana: essential success factors: methodology, 2020. Sarpong, Du, Antwi, Udimal, Musah, & Khan (2017) retrospectively examined e-procurement adoption barriers: a structural equation analysis of Ghanaian Hospitals (British Journal Of Interdisciplinary Research). Many studies have investigated the relationship between e-procurement and supply chain performance, with lip-service being paid to the public sector.

The public procurement system in Ghana is critical to the country's fiscal responsibility; however, a recent examination has uncovered a concerning trend of irregularities that affect statutory institutions, Ministries, Departments and agencies, and other entities. Asare (2022) states that the procurement process is a complex

network where committees and critical decision-makers comprise the entities involved. These entities have diverse compositions and roles, which have a substantial impact on both transparency and effectiveness. Upon dissecting procurement irregularities, an extensive array of catalysts was revealed. The presence of lax internal enforcement mechanisms, insufficient audit systems, and a conspicuous lack of political determination to enforce rigorously are critical factors that sustain these irregularities. A significant revelation emerged as a result of this analysis. The deficiencies in the Public Procurement Authority's (PPA) governance and the severe absence of stringent enforcement provisions specified in the Public Procurement Authority Act 2016 (Act 914) form the foundation of these irregularities. Nevertheless, within these obstacles exist prospects for reform. The empirical examination has yielded recommendations that emphasise the efficient utilisation of the GHANEPS platform to strengthen governance functions and enhance transparency in procurement processes. Furthermore, it is recommended that the PPA and the Office of the Chief Justice work together to establish a Financial Administration Court, which would serve as a fundamental element in enhancing accountability and compliance with procurement regulations.

Ghana has recently adopted the electronic procurement concept. Complete public sector adoption of the Ghana Electronic Procurement System (GHANEPS), introduced in 2019, is still several years away (Maryan, 2019). This demonstrates the relative novelty of the electronic procurement concept within Ghanaian public sector institutions. According to Maryan (2019), as of December 2020, the transition of electronic procurement transactions to the Ghana Electronic Procurement System (GHANEPS) was planned for a mere 220 public entities. In contrast, there are only a

few public entities as of December 2019. The Ghana Health Service was one of the few public entities that participated in the pilot trial phase of the GHANEPS (ibid).

This research is driven by the premise that the Public Sector has a long and troubled history of ineffective development, distribution, and use of technology. But whether or not previous e-Procurement research has examined how e-procurement affects Supply Chain performance is unclear, especially in the public sector. This research aims to close this knowledge gap by suggesting ways E-procurement can enhance supply chain performance in the public sector by analysing the effects of electronic tendering, the impact of electronic order processing practices, electronic material management, and electronic supplier management practices.

1.3 Research Objectives

The study's main objective is to determine the impact of electronic procurement methods on the supply chain performance in the Public Sector of Ghana.

Other Objectives

1. To determine the relationship between Electronic Procurement Practices and Supply Performance in Ghana's Public Sector;
2. To assess the effects of Electronic Procurement on Supply Chain Performance in Ghana's Public Sector; and
3. To determine the challenges of Electronic Procurement integration in the Public Sector in Ghana.

1.4 Research Questions

1. What is the relationship between Electronic Procurement Practices and Supply Chain Performance in Ghana's Public Sector?

2. What is the effect of Electronic Procurement on Supply Chain Performance in Ghana's Public Sector?
3. What are the challenges of Electronic Procurement integration in the Public Sector in Ghana?

1.5 Scope of the Study

The study focused on the public sector in Ghana for ease of data collection for the research. The study employs electronic tendering, order processing, material, and supplier management in order to answer the research questions. The scope was chosen because e-procurement functions continuously in their activities, which suggests that e-procurement methods are increasingly widespread to facilitate their continuous operation.

1.6 Significance of the Study

The purpose of the research findings is to provide information for future research into the public sector and make recommendations that would assist in overcoming its obstacles. Regarding e-procurement and supply management, the study would contribute to the existing literature and scholarly works. Therefore, it would give a framework and pave the way for future empirical research into Ghana's e-procurement and supply chain management. Lastly, the study would be a valuable resource for students, academicians, institutions, corporate managers, and individuals interested in learning more about inventory management systems.

1.7 Organisation of the Study

This study is divided into five chapters. The background of the study, the problem statement, the objectives of the research, the research questions, the study's scope, and its organisation are presented in the first chapter. The second chapter of the

research examines the literature review that offers the theoretical framework and the foundation for empirical studies. The research technique is explained in Chapter Three. This chapter describes the research methodology, sample procedure, and procedures, as well as the data gathering and data sources. The fourth chapter of the study presents the analysis of the field data obtained for the research. The fifth chapter of the study concludes with a summary of the significant research findings and suggestions based on those findings. It also offers the study's concluding notes.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the study's literature, applicable theories, empirical review, conceptual framework, criticism, research gaps, and conclusion. Periodicals, books, working papers, reports, and periodicals were reviewed. The literature review will assist the researcher in gaining an understanding of extant theoretical issues and previous studies on E-procurement and its impact on supply chain performance. This chapter provides an exhaustive literature review on the role of electronic procurement in improving supply chain performance in the Ghanaian public sector.

2.2 Electronic Procurement

The use of electronic technologies and platforms to facilitate the procurement process is referred to as electronic procurement or e-procurement. It entails automating and digitising diverse procurement processes, including sourcing, requisitioning, tendering, contracting, and payment. E-procurement systems may range from simple online purchase requisition systems to more sophisticated integrated platforms that connect consumers, suppliers, and other stakeholders transparently and efficiently (Reunis et al., 2019).

Multiple studies have emphasised the prospective advantages of electronic procurement. Specifically, (Sreedevi & Saranga, 2017) discovered that e-procurement could improve operational efficiency, reduce transaction costs, increase transparency, and boost competition. Likewise, (Mugabi, 2018) highlighted the potential for e-procurement to minimise procurement cycle time and enhance decision-making processes. In addition, electronic procurement can improve supplier collaboration,

expedite inventory management, and boost the overall performance of the supply chain (Yu et al., 2020).

Various academics have defined e-procurement in multiple ways. For instance, (Song et al., 2019) define e-procurement as the utilisation of information technology to facilitate business purchase transactions for materials and services. This research acknowledges the expansive nature of e-procurement. It employs the definition by (Osei-Tutu et al., 2019) “Here e-procurement is referred to as business-to-business purchasing practises that utilise electronic commerce to identify potential sources of supply, to purchase goods and services, to transfer payments, and to interact with suppliers. (Singh & Chan, 2022) state that many businesses have adapted the use of the internet to improve their supply chain performance in internal and external processes and beyond their borders.

2.3 Supply Chain Management in the Public Sector

The coordination of activities related to acquiring, storing, and distributing products and services within government organisations constitutes supply chain management in the public sector. Public sector supply chains face unique challenges, including regulatory requirements, budgetary constraints, and the requirement for accountability and transparency (Adam & Somer, 2022). Public sector supply chain management research has highlighted the significance of efficient and effective procurement practices. For instance, Adjei et al. (2018) discovered that procurement performance substantially affects the overall performance of the supply chain in the Ghanaian public sector. Moseley et al. (2019) emphasised the need for enhanced procurement processes and systems to improve service delivery and public value. Although supply

chain management is frequently associated with the private sector, its principles and practises are equally pertinent to the public sector.

Effective supply chain management is crucial in the public sector for ensuring the availability of essential products and services, supporting public service delivery, and optimising public resource use. Public sector organisations such as government agencies, municipalities, and public healthcare institutions rely on supply chains to acquire and deliver vast goods and services, such as office supplies, equipment, construction materials, pharmaceuticals, and public infrastructure projects.

To ensure timely availability and avoid stockouts, organisations in the public sector must accurately predict and anticipate the demand for products and services. Demand planning involves analysing historical data, considering external factors such as population growth or policy changes, and collaborating with stakeholders to determine future needs. The procurement process in the public sector includes sourcing, bidding, contracting, and acquiring products and services. Procurement activities aim to ensure transparency, equity, and cost-effectiveness in the procurement procedure. The procurement activities are governed by procurement regulations and policies that ensure compliance with legal and ethical standards.

Maintaining adequate stock levels while minimising excess inventory requires effective inventory management. Public sector organisations must monitor and manage their inventory to prevent stockouts, reduce transport costs, and ensure that essential supplies are readily available when required (Langley et al., 2020). Logistics includes the planning, implementing, and managing the physical flow of products and services. Logistics activities in the public sector entail transportation, storage, and

distribution to deliver goods and services to the appropriate locations. Effective logistics administration is required for on-time and cost-efficient delivery.

A well-functioning public sector supply chain requires developing and maintaining solid supplier relationships. Supplier relationship management comprises selection, evaluation, contract management, and collaboration. Public sector organisations endeavour to cultivate partnerships with suppliers to secure dependable supplies, high-quality goods, and advantageous terms. Monitoring and measuring supply chain performance is essential for identifying improvement opportunities and achieving intended results. Public sector organisations evaluate their supply chain operations' efficiency, effectiveness, and consumer satisfaction using key performance indicators (KPIs) (Fatorachian & Kazemi, 2021). Continuous improvement initiatives are implemented based on performance evaluation results to optimise supply chain processes. Due to regulatory requirements, budgetary constraints, and the need for transparency and accountability, supply chain management in the public sector confronts unique challenges compared to the private sector (Sreedevi & Saranga, 2017). However, technological advancements and best practices from the private sector present opportunities to improve public sector supply chain performance. To enhance public sector supply chain management, strategies include embracing digital transformation, utilising data analytics, and adopting efficient procurement and inventory management systems.

Effective supply chain management in the public sector can result in cost reductions, enhanced service delivery, decreased waste, and increased accountability. It ensures the efficient use of public resources, supports effective governance and contributes to the socioeconomic development of a country or region.

2.4 Electronic Procurement and Supply Chain Performance

The connection between electronic procurement and supply chain performance has garnered considerable attention in the literature. Several studies have examined the effect of e-procurement on various aspects of supply chain performance, such as cost reduction, process efficiency, supplier relationship management, and consumer satisfaction. Al-Tarawneh et al. (2017) conducted a study in the Jordanian public sector and discovered that e-procurement positively impacts cost reduction and process efficacy. Similarly, Adebajo et al. (2020) found that electronic procurement substantially improves supplier relationship management in the Nigerian public sector. Despite the literature's general support for the positive impact of electronic procurement on supply chain performance, several studies have identified implementation challenges and obstacles. Among these obstacles is resistance to change, a lack of technological infrastructure, and limited supplier adoption (Angeles et al., 2018). When analysing electronic procurement's function in the Ghanaian public sector context, it is essential to consider the abovementioned factors.

The relationship between electronic procurement and supply chain performance is significant, as adopting and effectively using electronic procurement systems can positively influence multiple dimensions of supply chain performance (Knudsen, 2019). Electronic procurement streamlines and automates the purchasing process, increasing operational efficiency. Businesses can reduce manual errors, eliminate paperwork, and improve process efficiency by digitising methods such as requisitioning, tendering, and contracting. Electronic procurement systems facilitate real-time monitoring of inventory levels and automated replenishment processes, minimising stockouts and optimising inventory management. These operational efficiencies contribute to the overall performance of the supply chain by decreasing

lead times, increasing resource utilisation, and enhancing cost-effectiveness (Besada & Golla, 2023). Electronic procurement improves process efficiency by enhancing visibility, transparency, and control of procurement activities. It allows organisations to trace and monitor procurement processes in real-time, ensuring compliance with internal policies and regulations. Electronic procurement systems facilitate precise recordkeeping, documentation, and audit traces, reducing the likelihood of fraud and corruption. The availability of detailed and real-time data enables organisations to identify bottlenecks, optimise processes, and enhance overall process effectiveness.

Electronic procurement systems enhance organisations' collaboration and communication with their suppliers. Organisations can share procurement requirements, exchange documents, and receive electronic bids via e-procurement platforms. This streamlined communication facilitates improved supplier evaluation, monitoring, and selection. Suppliers can respond to procurement requests more swiftly, reducing lead times and ensuring on-time delivery of goods and services. Enhanced supplier collaboration cultivates stronger relationships, fosters trust and promotes long-term partnerships, enhancing supplier and supply chain performance (Yang et al., 2014).

Electronic procurement systems can save costs through increased price transparency, competition, and more efficient procurement processes. Electronic platforms allow businesses to compare prices, negotiate more favourable terms, and choose the most cost-effective suppliers. In addition, procurement process automation reduces administrative expenses, reduces manual errors, and streamlines workflows, resulting in cost savings. These benefits enhance supply chain performance by optimising resource allocation and maximising the value obtained from procurement activities.

The advantages of electronic procurement, such as shortened procurement cycle times, precise delivery of products and services, and increased transparency, contribute to increased customer satisfaction. Effective procurement procedures enabled by electronic procurement systems guarantee on-time delivery that meets the requirements and expectations of both internal and external customers. Transparent procurement procedures foster confidence and trust among stakeholders, thereby increasing consumer satisfaction. Electronic procurement's capacity to facilitate improved service delivery and responsiveness to consumer needs improves the overall performance of the supply chain (Ashiagbor et al., 2022).

Adoption and efficient use of electronic procurement systems positively affect supply chain performance by improving operational efficiency, process effectiveness, supplier collaboration, cost savings, and customer satisfaction. By leveraging the benefits of electronic procurement, organisations can optimise their supply chain operations, achieve better results, and increase the value they provide to stakeholders.

2.5 Practice of Electronic Tendering

Electronic tendering, also known as e-tendering or electronic bidding, refers to using digital platforms and technologies to facilitate the entire tendering process. Electronic tendering replaces traditional paper-based methods of submitting and evaluating tenders with online platforms that streamline and automate the various stages of the tendering process (Goswami et al., 2020). Procurement departments are pressured to reduce costs while maintaining timeliness and quality. Inconsistent procurement policies can lead to project cancellation, cost overruns and delays, staff dissatisfaction, and legal action. The procurement policies of the organisation in question must reflect its requirements. After establishing procurement policies,

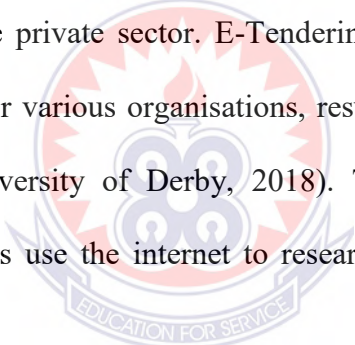
selecting the appropriate electronic tendering tools and techniques through meticulous analysis can help you overcome procurement obstacles. In recent years, organisations in the public and private sectors have been under intense scrutiny to better their procurement procedures. Inconsistent procurement policies have led to project cancellations, cost overruns and delays, staff discontent, and litigation (Sunmola & Shehu, 2020).

Stakeholders, shareholders, and the general public increasingly demand greater accountability from organisations. Electronic tendering is an online process that administers the entire tendering cycle, from posting the notice to awarding the contract. It provides a centralised process to help organisations increase efficiency and accountability while decreasing traditional tendering costs and boosting supply chain performance (Al-Yahya & Panuwatwanich, 2018). Customers who approach suppliers directly have typically already decided to purchase. They need not invest time and resources in locating potential customers. They now have a brand-new sales channel with minimal effort and expense. Customers can allow suppliers to investigate on their behalf. Businesses that respond to the e-Tender will provide details about their products and services, pricing, and any other information the consumer may need to purchase. Typically, they will provide a link to their website and any relevant customer testimonials. Instead of searching the internet for this information, the customer fills out a simple web form, and the suppliers handle the remainder (Mustafa & Waheed, 2019).

According to Waheed, 2019, E-tendering is sending Request For Invoices (RFIs) and Request For Purchases (RFPs) to suppliers and obtaining their online responses, thus enhancing supply chain performance. Typically, e-tendering is supported by an e-

tendering system, which frequently also facilitates the analysis and evaluation of responses. E-tendering does not include concluding a contract with a vendor. E-tendering streamlines a significant portion of the tactical purchasing procedure without concentrating on the spending category of that procedure. An electronic process in which the entire tendering procedure, from advertising to obtaining and submitting information, is conducted online. This enables firms to be more efficient in their supply chains as paper-based transactions are reduced or eliminated, allowing for a more rapid exchange of information and, consequently, improved supply chain performance (Timans et al., 2019).

Government agencies and the public sector have traditionally utilised E-tendering more frequently than the private sector. E-Tendering is becoming a successful and efficient sales channel for various organisations, resulting in a more efficient supply chain performance (University of Derby, 2018). This is because many business customers and consumers use the internet to research products and services before purchasing.

The logo of the University of Education, Winneba, is a circular emblem. It features a central sunburst design with rays emanating from a central point. Below the sunburst, there are three stylized human figures or symbols. The entire emblem is encircled by a banner that reads "EDUCATION FOR SERVICE".

In the modern era, security is a top priority in nearly every aspect of businesses and organisations. Utilising web-based computer systems, most businesses are shifting towards remote transactions. E-Tendering has become the most prominent and efficient method for remotely managed businesses. This procedure involves a web-based computer system, a vendor, a buyer, and a mediator. Public Key Infrastructure is implemented for the comprehensive security of e-Tendering, and providing a secure web-based environment ensures the dependability of the entire system. It also employs asymmetric encryption and decryption for a highly protected environment (Malik, 2019). The buyer and the bidder are the main players in the E-tendering

process. When this process commences, the buyer and bidder must be registered to access the E-tendering web portal. Without registration, neither the buyer nor the bidder can publish a tender or submit a proposal. According to Malik (2019), to implement E-Tendering, the Registration process, the Submission process, and the Bid evaluation process are required.

2.5.1 Electronic Order Processing

The use of electronic systems and technologies to manage and process orders in a digital format is referred to as electronic order processing. It involves the automation of order placement, fulfilment, and monitoring, as opposed to traditional paper-based methods (Ahoa et al., 2020). According to Ahoa (2020), an online ordering system is an e-commerce function that enables customers to order products or services via a company's website. Since the internet is thriving, having an online ordering system can help increase sales by making it easier for consumers to place orders for the company's services. People can place orders from home if they have a computer or laptop with an Internet connection, enhancing supply chain performance.

Ordering for Sales and Purchases may appear simple, but it poses a significant challenge for consumers and sellers. The reliance on paper, fax, email, and phone-based ordering necessitates manual intervention, which is not only sluggish but also susceptible to rekeying errors, which could improve the performance of the supply chain (Acquah et al., 2019). Order processing is a fundamental component of order fulfilment and the initial phase of the fulfilment cycle. Order processing, utilising various procedures, is the foundation of all logistics systems, making it a crucial aspect of logistics operations. Order processing begins with receiving the customer's purchase request or order confirmation. We can receive orders through various

channels, including fax, phone, electronic file transmission (EDI), and even manual data entry. The preferred method for receiving orders is via file transfer at predetermined daily intervals, typically once in the morning and again in the afternoon. The files are in a predetermined format that can be automatically uploaded into the supplier's system without manual data manipulation or entry. This method eliminates human error and streamlines the complete order cycle, making it more efficient and less time-consuming (Bienhaus & Haddud, 2018).

By deploying an Electronic Purchase Order Requisition system with an Accounts Payable automation solution, internal control over expenses, payables, disbursements, and vendors can be strengthened. By eradicating many manual tasks typically associated with purchase order requisition, going electronic enables a significantly more efficient payables process. Using Smart Routing technology, PO Requisition technology enables the generation of purchase orders and their online routing for approval. In an efficient paperless process, POs can be electronically invoiced directly from suppliers upon approval. When the invoice arrives, the PO and invoice are matched automatically to validate the price, quantity, line amount, and items ordered. To account for blanket orders or partial payment against an order, all matched invoices will be tracked until the order is closed. Matching rules can be configured to ensure invoices and purchase orders are correctly matched based on your existing business rules.

Moreover, tolerances can be applied to the entire PO or individual line items. When the invoice arrives, the PO and the invoice are matched automatically. In the case of a comprehensive PO or partial payment against a PO, all invoices will be tracked with the PO. Matching rules can ensure that invoices are appropriately matched to

purchase orders. In addition, tolerances can be applied to the complete PO or to any line item detail (Bienhaus & Haddud, 2018). E-ordering permits the exchange of EDI documents between Network Members and their Suppliers: Electronic transmission of Purchase Orders, Acknowledgments, Advanced Shipment Notifications, and Invoices. (Sunmola & Shehu, 2020) notes that some of the earliest e-procurement solutions centred on establishing ordering routines and reducing transaction costs related to operating resource purchasing for typically maintenance, repair, and operating (MRO) supplies by automating the requisitioning to payment cycle. E-business in procurement enables organisations to order products through online catalogues or desktop purchasing systems that electronically verify the authorisation of the requisitioner. The order information undergoes various electronic checks, such as authorisation by relevant managers or directors, and, once cleared, can be aggregated with other orders to the same destination and transmitted electronically to the supplier. This process flow reduces operational costs, improves process efficiency, provides greater centralised control over purchasing, and may increase negotiating leverage with suppliers by consolidating orders (Suleman et al., 2023).

2.5.2 Electronic Material Management

Electronic material management, also known as e-material management or electronic inventory management, is the use of digital systems and technologies to govern and control a company's materials or inventory (Arnold, 2020). It automates various material procurement, storage, tracking, and replenishment duties and processes. With the introduction of concepts such as JIT (Just in Time) and VMI (vendor-managed inventory), best practice organisations implementing lean supply chain management must practice identifying and cultivating strong suppliers.

Through a network of distributors, warehouses, and retailers, Distribution ensures that these finished goods reach the final consumers. Effectively managing these flows can influence the vast majority of the e-material supply chain, resulting in profitable policies for continuous improvements in data accuracy, material quality, lead time reduction, and operational complexity reduction (Vegter et al., 2023). The purpose of planning tools for supply chain management is to incorporate resource planning activities within a company or organisation. Material requirement planning (MRP), manufacturing resources planning (MRPII), and enterprise resource planning (ERP) are among the most common planning instruments. An MRP is a tool that enables an organisation to schedule production activities based on the bill of materials, inventory levels, and master production schedule to meet specific deadlines. MRPII is an enhancement of MRP tools that incorporates manufacturing capabilities and capacities with MRP's benefits. An ERP tool enables the organisation to integrate all information processing duties related to the entire value chain. Typically, this system encompasses order management, inventory fulfilment, production planning, financial planning, and customer service. E-procurement facilitates JIT and enables purchasing managers to make informed decisions regarding EOQ, reorder points, and inventory levels (Xie et al., 2022).

Materials management is a crucial function that increases project productivity. Therefore, material utilisation and administration significantly impact a company's profit and can prevent delays. Technology can aid in the improvement of material monitoring and delivery. Consider how GPS, JIT, and EOQ can be implemented in E-material management process management (De Angelis et al., 2018). Vendor-managed inventory and continuous replenishment programmes are methods in which organisation integrate their efforts with suppliers and customers expanding their

boundaries. Real-time transfer of point-of-sale data from the consumer to the supplier enables automatic replenishment. Some companies can even delegate inventory management responsibilities to their suppliers. Supplier integration goes beyond supplier partnership and emphasises supply chain alignment with all critical suppliers (De Angelis et al., 2018).

Available tracking technologies include the internet, RFID (radio frequency identification), GIS (geographic information system), GPS (global positioning system), and tracking technology. IT can alter a culture's structure to achieve a specific goal by lowering functional barriers. Information Technology also provides excellent opportunities for communication between parties and activities. Electronic data interchange (EDI) and Electronic funds transfer (EFT) are two additional IT technologies that allow a retailer to perform transactions like placing purchase orders, paying invoices, and performing credit checks electronically. On-site positioning and tracking technologies allow for the timely delivery of materials of the appropriate quality and quantity to a construction job site while keeping the work-in-progress inventory to a minimum.

Radio frequency-based information and communication technologies, such as the global positioning system (GPS), radio frequency identification (RFID) tags, and Bluetooth, have matured and become commercially available to support resource positioning and tracking, and automated data collection in the construction industry.

2.5.3 Electronic Supplier Management

Electronic supplier management, also known as e-supplier or electronic vendor management, is the application of digital systems and technologies to expedite and automate supplier management and collaboration processes. It uses digital platforms

and tools to improve supplier communication, performance evaluation, collaboration, and relationship management. (Ali et al., 2023)

Electronic supplier management systems provide a central repository for storing and administering supplier data and documentation. These systems enable businesses to maintain supplier profiles, including contact information, certifications, contracts, and other pertinent documents. Electronic platforms facilitate access to supplier data, reducing bureaucracy and ensuring data accuracy. Electronic supplier management systems facilitate supplier qualification and enrollment. Organisations can use these systems to automate the supplier registration procedure, acquire the necessary data, and assess the qualifications of suppliers. The systems may contain predefined qualification criteria and workflows to facilitate the evaluation and certification of new suppliers (Liu et al., 2022). This allows organisations to efficiently enrol suppliers while ensuring compliance with internal and regulatory requirements. Electronic supplier management systems enable organisations to evaluate and monitor supplier performance effectively.

These systems offer a structure for defining key performance indicators (KPIs) and metrics for evaluating supplier performance. Organisations can collect information regarding quality, delivery timeliness, pricing, and customer service, among other factors. The systems automate the accumulation of performance information, generate performance reports, and facilitate data-driven supplier management decisions (Zheng et al., 2022). Electronic supplier management systems facilitate seamless supplier communication and collaboration. These systems provide a platform for exchanging communications, collaborating on projects or placing orders, and sharing documents. Organisations can utilise electronic systems to communicate requirements, provide

feedback, and resolve problems in real time with suppliers. The systems facilitate open and effective communication, reducing response times and enhancing collaboration between organisations and vendors. Electronic supplier management systems facilitate the administration of supplier relationships as a whole (Özbilgin & Imamoğlu, 2021).

These systems allow businesses to comprehensively view their supplier base, monitor past interactions, and manage contract terms and renewals. Supplier scorecards, supplier performance dashboards, and contract management capabilities may be included in electronic systems. This enables organisations to manage supplier relationships proactively, identify development opportunities, and foster long-term partnerships. Electronic supplier management systems aid organisations in managing supplier-related risks and ensuring supplier conformance. These systems may include modules for monitoring supplier adherence to regulatory requirements, certifications, and ethical practices. The systems may also allow for evaluating and mitigating supplier risks, such as financial stability, geopolitical factors, and supply chain disruptions. Electronic platforms facilitate data analysis and reporting to identify compliance gaps and reduce supplier-related risks.

Adopting electronic supplier management systems offers numerous advantages, including increased efficiency, enhanced communication, enhanced supplier performance, and decreased compliance risks. It facilitates supplier management processes, improves supplier performance visibility, and strengthens supplier collaboration. Using electronic supplier management, businesses can optimise their supplier relationships, generate cost savings, and improve supply chain performance.

2.6 Challenges of Electronic Procurement

While electronic procurement offers numerous benefits, there are several challenges that organisations may encounter when implementing and managing electronic procurement systems.

2.6.1 Technological Infrastructure

Technological infrastructure refers to the hardware, software, and network components that support an organisation's electronic systems and processes. A robust and dependable technological infrastructure is essential for the successful implementation and operation of electronic procurement systems in the context of electronic procurement (Argyroudis et al., 2022). Organisations must evaluate and invest in suitable hardware resources to facilitate electronic procurement. This may include computers, servers, data storage devices, and peripherals like scanners and printers. The hardware should have adequate processing power, storage capacity, and connectivity options to accommodate the volume of procurement transactions and data.

To facilitate various procurement procedures, electronic procurement systems require specialised software applications. An assortment of software solutions, such as procurement management software, e-procurement platforms, and enterprise resource planning (ERP) systems with procurement modules, are available to organisations. The software should be able to perform tasks like supplier administration, order processing, contract management, and analytics. Electronic procurement requires a reliable network infrastructure for seamless communication and data exchange. Organisations must maintain a secure and stable network environment, which includes local area networks (LANs), wide area networks (WANs), and internet

connectivity (Chaffey et al., 2019). Bandwidth and network capacity adequate for transmitting procurement-related data, documents, and communications are indispensable.

Electronic procurement entails managing and storing sensitive procurement data, including supplier information, pricing information, and contract terms. Organisations must implement suitable data storage systems, such as on-premises servers or cloud-based solutions. Implement data security measures, such as encryption, access controls, and routine backups, to safeguard procurement data against unauthorised access, loss, and breaches (Argyroudis et al., 2022).

Infrastructure technological should facilitate integration with other organisational systems. Integration with existing ERP systems, financial systems, inventory management systems, and supplier databases are included. Integration permits data synchronisation, reduces manual data entry, and enhances the precision and efficacy of procurement processes. The technological infrastructure must be scalable and adaptable to accommodate future expansion and fluctuating business requirements. As the organisation's procurement needs evolve, the infrastructure must accommodate increased transaction volumes, accommodate additional users, and adapt to new technologies or system enhancements. Organisations should ensure high system availability and minimise system failure and outage risks. Redundancy measures, such as secondary power supplies, redundant servers, and failover mechanisms, can aid in maintaining system dependability and minimising disruptions to electronic procurement operations (Schuk et al., 2022).

Users involved in the procurement process should have access to user-friendly interfaces and accessibility options provided by the technological infrastructure. This

includes simple access to the electronic procurement system via various devices and operating systems (computers, tablets, and smartphones). Users should have access to adequate technical support to resolve their questions, system issues, and troubleshooting requirements. Integrating electronic procurement systems with external platforms or third-party systems may be necessary. This may encompass supplier portals, e-commerce platforms, payment gateways, and logistics systems. The technological infrastructure should support secure and seamless integration with these external platforms to facilitate end-to-end procurement processes.

Organisations must evaluate their existing technological infrastructure to effectively support electronic procurement, identify gaps or limitations, and make necessary investments or enhancements. Engaging IT professionals or technology consultants can aid in evaluating infrastructure needs, selecting appropriate solutions, and ensuring the technological infrastructure supporting electronic procurement's scalability, dependability, and security (Senyo et al., 2021).

2.6.2 Data Security and Privacy

Electronic procurement involves transmitting and storing sensitive procurement-related information, including supplier details, pricing, and contract terms. Data security and privacy are crucial to protect against unauthorised access, breaches, and fraud. Organisations must implement robust security measures to safeguard procurement data, including encryption, access controls, and secure authentication mechanisms. Due to the sensitive nature of procurement-related information and the potential risks associated with unauthorised access, data breaches, and data misuse, data security, and privacy pose significant challenges for electronic procurement (Polverini et al., 2018).

E-procurement systems require storing and transmitting sensitive supplier data, including contact information, financial data, and proprietary information. Maintaining the confidentiality of this information is essential for protecting the interests of suppliers and preserving their confidence. Any violation of supplier data can have severe repercussions, such as harmed supplier relationships and possible legal issues. Electronic procurement systems manage pricing data, proposal specifics, and contract terms. Protecting this information is crucial to preventing unauthorised access, manipulation, or disclosure of sensitive pricing and contractual information. Breach of pricing information can give competitors an unwarranted advantage or compromise negotiating positions (Mavidis & Folinis, 2022).

Cybersecurity threats like cyberattacks, malware attacks, and phishing attempts risk e-procurement systems. These hazards can result in unauthorised system access, data breaches, or the theft of sensitive data. To protect e-procurement systems from cyber threats, organisations must implement robust security measures, such as firewalls, encryption, intrusion detection systems, and regular security audits. E-procurement systems may collect and process the personal information of individuals, such as employees or suppliers. Organisations must adhere to data protection regulations, such as the General Data Protection Regulation (GDPR), to ensure personal data's privacy and lawful use. The failure to safeguard personal data may have legal and reputational repercussions. Electronic procurement systems must implement robust authentication mechanisms to prevent unauthorised access. Implementing secure user authentication, such as multi-factor authentication and password policies, protects the system from unauthorised access. In addition, access control measures should be implemented to ensure that users' privileges correspond to their duties and responsibilities.

Electronic procurement entails exchanging sensitive data between buyers, suppliers, and other stakeholders. To prevent data interception or modification during transmission, organisations must implement encryption protocols and secure communication channels (e.g., secure file transfer protocols, virtual private networks). E-procurement systems must adhere to jurisdiction-specific data protection regulations. Organisations must comprehend and comply with applicable laws and regulations, including the GDPR, regarding acquiring, storing, processing, and transferring personal data. Compliance includes obtaining the appropriate consent, implementing data protection policies, and ensuring that the rights of data subjects are respected (Aminah et al., 2018).

Educating employees and stakeholders on data protection best practices, identifying potential risks, and adhering to security protocols are necessary to ensure data security and privacy in e-procurement. Regular training programmes and awareness campaigns can help improve data security practices and reduce risks associated with human error. Organisations must implement comprehensive data security and privacy measures, undertake regular risk assessments, and remain current on the evolution of cybersecurity threats and data protection laws. By addressing these obstacles, organisations can reduce the risks associated with data security and privacy in e-procurement and establish trust with procurement process stakeholders (Karale, 2021).

2.6.3 System Integration

Due to the intricacy of connecting and harmonising diverse systems and technologies, system integration presents several challenges in e-procurement. Different technologies and platforms must be compatible to integrate e-procurement systems

with existing organisational strategies, such as ERP, financial, or inventory management systems. Different data formats, protocols, and system architectures can lead to incompatibility problems. Customisation or integration middleware may be required to ensure seamless data flow and system interoperability. E-procurement systems rely on precise and current data from various sources, such as suppliers, inventory databases, and financial systems (Guntupalli et al., 2022). Maintaining consistent and synchronised data across multiple systems can be difficult, mainly when updates or modifications occur in one system but not in others. Inadequate data synchronisation can result in procurement process errors, discrepancies, or delays. Complex integration scenarios may involve multiple systems, stakeholders, and organisational processes. For example, integrating e-procurement with supplier management, order fulfilment, or logistics systems may necessitate coordination and alignment across functions. Multiple integration points, varying data flows, and dependencies can complicate integration efforts (Osborne & Dempsey, 2023).

Successful system integration in e-procurement requires technical expertise and resources. Organisations require knowledgeable IT professionals or integration specialists who can design and implement integration solutions and understand the complexities of various systems. Inadequate internal knowledge or resources can impede the integration process and result in delays or suboptimal integration outcomes. E-procurement system integration can be a time and resource-intensive process. Organisations must allocate enough time, money, and resources for integration activities such as system analysis, mapping data structures, developing integration interfaces, and testing. Integration initiatives may necessitate the purchase of additional software, middleware, or consulting services, which can increase the total cost (Bhookya et al., 2022).

System integration frequently necessitates modifying an organisation's processes, duties, and responsibilities. Employees could be required to adjust to new workflows, data entry procedures, or system interfaces. Lack of user adoption or resistance to change can impede the successful integration of systems. Effective change management strategies, such as communication, training, and stakeholder engagement, are crucial for overcoming resistance and ensuring a seamless transition. After successfully integrating systems, organisations must guarantee ongoing maintenance and compatibility. Upgrading, patching, or modifying a system may necessitate corresponding changes in integrated systems to maintain compatibility. Organisations must establish mechanisms for monitoring, troubleshooting, and updating integration interfaces to prevent disruptions and data inconsistencies. When e-procurement systems involve third-party vendors or service providers, securing their support and cooperation for system integration can be difficult. Vendors may have their own integration protocols, application programming interfaces (APIs), or limitations that must be addressed. Organisations should establish clear communication channels and contracts with their vendors to ensure seamless integration and prompt support (Ali et al., 2023).

To overcome these obstacles, organisations should conduct comprehensive system analysis, define integration requirements, and develop a comprehensive integration strategy. Using seasoned integration partners, integration middleware or platforms, and best practises for data mapping, synchronisation, and testing can help surmount e-procurement system integration obstacles.

2.6.4 Cost Consideration

Due to numerous factors associated with its implementation, administration, and maintenance, electronic procurement faces a significant cost obstacle. Implementing e-procurement systems requires a substantial initial investment. Organisations must invest in hardware, software licences, infrastructure setup, and system customisation or configuration to meet their procurement requirements. Costs at the outset can be substantial, particularly for smaller organisations with limited financial resources. Integrating e-procurement systems with existing organisational systems, such as enterprise resource planning (ERP) can incur additional expenses. There may be a need for the customisation or development of integration interfaces, middleware, or consulting services, resulting in higher integration costs (Goel et al., 2020).

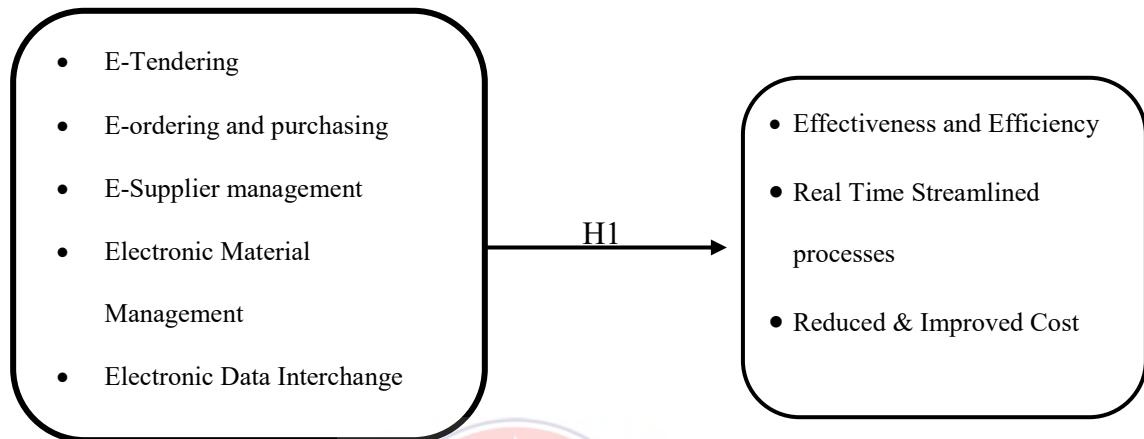
Complex integration scenarios involving multiple systems and stakeholders can add to the cost. Training employees and constituents on how to use e-procurement systems effectively is essential for successful implementation and adoption. Costly are training programmes, workshops, and the hiring of external trainers to enlighten users on system capabilities and best practises. Inadequate training can result in system underutilisation, errors, and inefficiencies, which can reduce the overall cost-effectiveness of e-procurement. Electronic procurement systems need ongoing maintenance, support, and periodic updates to ensure optimal performance and security. This includes expenses associated with system monitoring, problem fixes, system upgrades, and technical support availability. The costs may vary based on the system's complexity, the degree of customisation, and the availability of technical expertise in-house (Bhookya et al., 2022).

E-procurement depends on a robust technological infrastructure of servers, storage, network infrastructure, and data centres. Investing in acquiring, maintaining, and upgrading the necessary infrastructure can be costly for businesses. Additionally, organisations may need to allocate funds for IT personnel, such as system administrators, developers, and technical support, to guarantee the efficient operation and management of the e-procurement system. Implementing e-procurement may require suppliers to be onboarded and trained in electronic procurement processes. This may necessitate additional resources, such as undertaking supplier training programmes, offering technical assistance, and facilitating the integration of suppliers' systems with the e-procurement platform. Costs associated with supplier enrollment can vary depending on the number of suppliers and their technological maturity. Software vendors or service providers may charge subscription or licencing fees for using electronic procurement systems. The costs can vary based on variables such as the scale of the organisation, the number of required users, and the required level of functionality (Agyekum et al., 2021).

Implementing e-procurement necessitates implementing organisational change to facilitate adoption of new processes and systems. Consider the costs of change management efforts, such as communication, training, and stakeholder engagement. These expenses could include the creation of change management strategies, the employment of external consultants, or the allocation of internal resources to manage the change process. Organisations must evaluate the total cost of ownership of e-procurement systems, including initial and ongoing expenses. This includes evaluating the return on investment (ROI) and cost savings realised via process efficiencies, reduced documentation, improved supplier management, and improved procurement outcomes (Hong et al., 2018). Organisations should execute a thorough

cost-benefit analysis to determine the long-term cost-effectiveness of e-procurement. Organisations should thoroughly evaluate the benefits and costs of e-procurement implementation to address cost issues.

2.7 Conceptual Framework



ELECTRONIC-PROCUREMENT **SUPPLY CHAIN PERFORMANCE**

Independent Variable

Dependent Variable

The incorporation of electronic procurement represents a paradigm shift within public sector operations. This research concentrates on the potential outcomes of electronic procurement within the Environmental Protection Agency (EPA) and its effect on the agency's supply chain performance. Fundamentally, electronic procurement comprises integrating digital platforms and tools at every stage of the procurement process. This transition holds the potential for enhanced transparency, streamlined processes, and procurement strategies that may be more cost-effective. The changes constitute the independent variable being examined.

On the contrary, the effectiveness of the supply chain performance is considered the dependent variable. It encompasses the efficiency and effectiveness of the supply chain operations. This performance metric is influenced by various factors, including but not limited to cost reduction, process efficacy, supplier relationships, compliance,

and environmental impact. The underlying hypothesis that motivates this research is that the proficient implementation and successful integration of electronic procurement procedures will benefit and enhance the efficiency of the EPA's supply chain. Recognising the distinct intricacies of the public sector, specifically within the environmental protection agency (EPA), the study considers electronic procurement practices. This variable is anticipated to substantially impact the supply chain's performance outcomes.

Therefore, the study hypothesises that adopting and implementing electronic procurement practices positively influences supply chain performance in the public sector.

2.8 Empirical Review

With the advent of technology, e-procurement has become increasingly prevalent worldwide. In the United States, accelerated growth of e-procurement was reported at the beginning of 2000, just before the recession. Findings indicate that e-procurement is gaining traction in Kenya, with most private and public organisations embracing technology. Barasa and Namusonge (2017) concluded that the County Government of Kakamega had a limited number of websites to facilitate e-procurement, which may have a negative impact on their procurement efficacy. In addition, relatively few orders for supplies were placed online within the County Government of Kakamega. In addition, the County Government of Kakamega had less access to and application of e-procurement platforms and e-ordering practices, which ultimately hindered their performance of the procurement function. Using regression analysis to determine the effect of E-ordering on the efficacy of the Kakamega County government, the study found a positive correlation between E-ordering and efficiency.

According to Waniani, Namusonge, and Lagat (2016), the technological infrastructure at Nzoia Sugar Company was deemed adequate. Most respondents (66.9%) agreed that the company has the technological infrastructure to facilitate e-procurement. This included hardware and software, Internet access, and technical knowledge. 33.1 per cent of respondents disagreed that the technological infrastructure was insufficient to support electronic procurement. The result confirms Lysons and Gillingham's (2019) assertion that firms implementing an electronic integration system have realised substantial gains. The respondents concurred that Internet connectivity, inadequate network coverage, and system failures are obstacles to the Nzoia Sugar Company's e-procurement implementation and that the company has already acquired the necessary ICT infrastructure to support e-procurement. They disagreed on internal electronic communication on procurement-related issues using technologies other than email, such as instant messaging and video conferencing, and they strongly disagreed on allowing suppliers direct access to internal systems, such as Enterprise Resource Planning Systems, and on the technological integration of the e-procurement system with other internal systems. Most respondents ranked the confidentiality of data and information as the most crucial aspect of procurement.

(Timans et al., 2019) reveals that some large-scale manufacturing companies in Nairobi have implemented e-procurement. For example, it was determined that most large-scale manufacturing companies have an information system allowing their departments to share data. This information exchange is one of the preliminary e-procurement pillars. The majority of companies have a centralised procurement system made feasible by information technology, according to the study. The results further demonstrate that most companies engage in online internal procurement. This

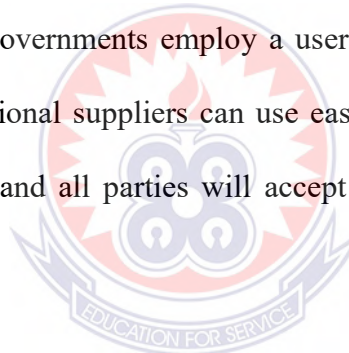
implies that internal procurement activities are made possible by the adoption and implementation of electronic procurement.

According to (Flynn et al., 2021), e-procurement is a comprehensive phenomenon encompassing strategic initiatives and can be used to reorganise the purchasing procedure. A well-implemented e-Procurement system can directly connect businesses and their processes with their suppliers while managing all interactions. Khanapuri, Nayak, Soni, Sharma, and Soni (2020) assert that adopting an e-procurement system is contingent on several conditions. They consist of technology, objectives, information, personnel, and abilities. The abovementioned requirements pose some obstacles to the adoption process, including Compatibility, Integration, Adoption, and regular use by employees, as well as a lack of capacity among minor suppliers.

(Flynn et al., 2021) contend that SC and information exchange are two crucial e-Procurement factors. Thus, e-Procurement can be viewed as facilitating information flows and action coordination among supply chain actors (Chang, Hsin, et al., 2018). Using interpretive structural modelling (ISM), Flynn has developed a model for the benefits of e-Procurement. According to them, the most significant advantage of e-Procurement is the incorporation of information shared between organisations. Thus, the key to successful e-Procurement is the integration of information sharing to enhance other benefits and produce overall cost savings in the procurement process. Flynn notes that when e-Procurement and thus the integration of shared information is implemented, additional benefits will be realised. E-Procurement enables companies to streamline processes and automate transactions. This will result in a faster tempo in

sourcing processes, a more efficient purchasing process, and increased operations volume.

Effect of e-procurement practices on the efficiency frontier of Kakamega county government, Nafula and Namusonge (2017), found that the availability of websites to facilitate e-procurement within the County Government of Kakamega was low, and this may have affected their procurement efficiency. In addition, relatively few orders for supplies were placed online within the County Government of Kakamega. In addition, the County Government of Kakamega had less access to and application of e-procurement platforms and e-ordering practices, which ultimately hindered their performance of the procurement function. The study recommends that procurement departments in county governments employ a user-friendly information system that all tech-savvy and traditional suppliers can use easily. This will reduce bias against electronic procurement, and all parties will accept its implications for procurement personnel qualifications.



Ngeno and Kinoti (2017) investigated the impact of e-procurement on the supply chain management process in the Kenyan energy sector. This study aimed to determine the impact of e-procurement on the supply chain management process in Kenya's energy sector. The study employed a research design that combined qualitative and quantitative methods. The purpose of the research was to compile and collect information from respondents. The sample size of 152 respondents was determined using a stratified random sampling technique from a total target population of 246 in the energy sector. All variables, namely electronic data interchange, e-tendering, and supply chain integration, were discovered to affect the energy sector's effective supply chain management process.

Nyile and Shale (2016) discovered in their study, the role of Sustainable Procurement Practices on Supply Chain Performance of the Manufacturing Sector in Kenya: A Case Study of East African Portland Cement Company, that the use of e-procurement systems has facilitated the prompt payment of suppliers, the vast majority of whom are small and medium-sized enterprises. 34.7% strongly concurred, and 26.5% strongly agreed that using e-procurement has facilitated prompt payment. This implies a positive relationship between EAPCC and its suppliers, as one of the factors that cause discord between an organisation and its suppliers has been eliminated. Using e-procurement systems is also considered to reduce ordering expenses. 20.4% of respondents concurred to a very large degree with the statement, while 32.7% and 34.7% agreed to a large and moderate degree, respectively. This is because electronic procurement systems reduce stationery costs and other administrative expenses, such as phone calls and supplier visits.

(Arnold, 2020; Hassan et al., 2017; Waters, 2021) evaluated the impact of e-procurement on hospital procurement efficiency. The study's objectives were to assess the degree to which e-procurement had improved the quality of goods in public hospitals, to determine the degree to which e-procurement had reduced the price charged for goods purchased in public hospitals, and to determine the degree to which e-procurement had ensured the best value for money in public hospitals procurement. The study determined the hospital uses e-tendering, e-quotations, and e-sourcing as the primary e-procurement applications and that the most significant challenges encountered when using an e-market provider were inadequate funding, the organisation's inability to handle change management, and a lack of employee training on how to use the system. The study concluded that public hospitals had

implemented some e-procurement applications despite the challenges associated with adoption.

In a 2016 study, Effect of Electronic Supplier Management Practises on the Implementation of Preference Regulations on State Corporations in Ghana (Acquah et al., 2019; Agyekum et al., 2021; Osei-Tutu et al., 2019) discovered that employees search for new products on the market via electronic means. Electronic supplier prequalification and verification of new suppliers' references are performed. In addition, evaluations of marginalised groups are conducted electronically, although it is uncertain whether new suppliers are sought electronically. In addition, it was not entirely determined whether new suppliers are evaluated electronically, whether employees interact with new suppliers, whether employees categorise new consumers electronically, whether employees conduct E-auctions electronically, or whether employees conduct location searches electronically.

2.9 Theoretical Framework

The theoretical review investigates pertinent existing theories and conceptual frameworks. It lays the groundwork for comprehending the connection between electronic procurement and supply chain performance in the public sector.

2.9.1 Transaction Cost Theory

According to the transaction cost theory, the choice of procurement method is affected by the transaction costs associated with various procurement modalities. The theory suggests that using electronic platforms can reduce transaction costs in the context of electronic procurement by facilitating information exchange, reducing search and negotiation costs, and increasing process efficacy (Alaghehband et al., 2021). Less expensive transactions can result in cost savings and enhanced supply

chain performance. Economist Oliver Williamson devised the transaction cost theory to explain the costs associated with economic transactions and the selection of various governance structures. According to transaction cost theory, economic activities can be organised within a firm's boundaries (hierarchy) or through market transactions (market). According to the theory, transaction costs are crucial in determining the optimal governance structure for a particular transaction. Direct transaction costs include contractual agreements, monitoring, and enforcement, while implicit transaction costs include information asymmetry, uncertainty, and opportunism (Liang et al., 2021).

The theory of transaction costs identifies three primary categories of transaction costs. **Costs for Search and Information:** These expenses are incurred while searching for and procuring information regarding potential suppliers, products, or markets. It consists of expenses associated with acquiring data, evaluating alternatives, and conducting market research. Through electronic databases, supplier directories, and online marketplaces, which provide simple access to information about suppliers, products, and prices, search and information costs can be reduced in e-procurement (Schmidt & Wagner, 2019).

Contracting and Negotiation Costs: Contracting, drafting, and enforcing contracts between customers and suppliers are known as contracting costs. It includes fees for legal counsel, contract drafting, and negotiations. In e-procurement, electronic contracting and e-signature technologies can assist in streamlining the contracting procedure, reducing documentation, and accelerating negotiations, thereby reducing contracting costs (Özbilgin & Imamoğlu, 2021).

Monitoring and Enforcement Costs: costs associated with monitoring and enforcing parties' compliance to a transaction with their contractual obligations. It includes tasks like performance monitoring, quality control, and conflict resolution. E-procurement systems can facilitate monitoring and enforcement via automated tracking of order status, delivery confirmation, and electronic payment systems, eliminating manual oversight and reducing monitoring and enforcement costs. E-procurement can facilitate cost savings by streamlining procurement processes, reducing paperwork, and eliminating manual duties (Alalwan, 2020). Automating duties, such as purchase requisition, order processing, and invoice reconciliation, decreases administrative burdens and improves process efficiency, thereby reducing transaction costs. By providing visibility into supplier selection, pricing, and contract terms, e-procurement systems promote transparency in the procurement process. This transparency reduces information asymmetry, facilitates improved decision-making, and reduces search costs by making supplier information easily accessible.

E-procurement systems enable organisations to maintain a centralised database of suppliers, monitor supplier performance, and assess supplier relationships. This reduces transaction costs associated with supplier selection, qualification, and oversight. Establishing long-term relationships with dependable suppliers, negotiating improved terms, and mitigating the risks associated with opportunistic behaviour are all possible for organisations.

Through features such as electronic messaging, online catalogues, and collaborative workspaces, e-procurement systems facilitate collaboration and communication between consumers and suppliers. Better collaboration reduces communication costs, improves coordination, and fosters better trading partner relationships. However, it is

essential to note that implementing e-procurement systems entails additional expenses, such as initial investments, system maintenance, and training. Organisations should conduct a comprehensive cost-benefit analysis to ascertain the global impact of e-procurement on transaction costs and evaluate its feasibility and value proposition in their particular context.

2.9.2 Resource-Based View

The resource-based perspective highlights the significance of organisational resources and competencies in attaining a competitive advantage. In electronic procurement, the theory proposes that e-procurement systems can function as valuable assets that enable organisations to improve supply chain performance. (Farrukh et al., 2019) These systems can provide access to real-time information, enhance decision-making processes, and foster supplier collaboration, resulting in increased operational efficiency and customer satisfaction. The Resource-Based View (RBV) is a strategic management framework that concentrates on an organisation's internal resources and capabilities as sources of competitive advantage. The RBV suggests that a firm's valuable, uncommon, difficult-to-imitate, and irreplaceable resources can contribute to its sustained competitive advantage and outstanding performance.

According to the RBV, a company's resources can be tangible or intangible, such as physical assets, human capital, organisational knowledge, brand reputation, stakeholder relationships, and technological capabilities. This creates a competitive advantage by enabling firms to develop and deploy capabilities difficult for competitors to replicate. The RBV emphasises that enterprises have diverse resources and capabilities. Each organisation possesses a distinct combination of resources that vary in quality, quantity, and characteristics. This resource heterogeneity causes

variations in firm performance and competitive advantage. According to the RBV, resources can be immobile or difficult to transfer or replicate across enterprises (Nandi et al., 2023). This immobility creates imitation barriers and enables businesses to maintain their competitive advantage. Immobile resources include firm-specific knowledge, reputation, culture, and stakeholder relationships developed over time and are difficult for competitors to replicate. The RBV stresses that the combination and coordination of resources and capabilities can produce synergistic effects. Resources and capabilities should be complementary, i.e. reinforcing and improving one another's efficacy (Zhang et al., 2023). Combining resources to generate distinctive capabilities can create an enduring competitive advantage.

The RBV acknowledges the significance of dynamic capabilities: a company's adaptability, innovation, and capacity to learn over time. Dynamic capabilities allow businesses to detect environmental changes, seize opportunities, and reconfigure their resources and capabilities to maintain competitive advantage in swiftly changing markets. The Resource-Based Perspective has a number of implications for strategic management and decision-making. The RBV encourages businesses to conduct a comprehensive internal analysis to identify and evaluate their distinctive resources and capabilities. This analysis assists businesses in understanding their strengths and limitations and identifying potential competitive advantage sources. The RBV guides firms' resource allocation decisions by emphasising the significance of allocating resources to areas that can leverage and improve the firm's competitive advantage. It encourages companies to invest in developing and acquiring scarce and valuable resources that align with their strategic goals. The RBV suggests that businesses should actively acquire and cultivate resources and capabilities that can contribute to their competitive advantage. This may involve investing in employee training,

research and development, strategic partnerships, or mergers and acquisitions to access valuable resources and capabilities (Suleman et al., 2023). The RBV emphasises the need for businesses to perpetually develop and safeguard their unique resources and capabilities to maintain a competitive advantage. Firms should regularly assess their resources' value, scarcity, imitability, and substitutability and modify their strategies accordingly. By applying the principles of the Resource-Based View, businesses can identify and capitalise on their unique resources and capabilities to establish a sustainable competitive advantage and achieve superior performance in their respective industries.

2.9.3 Institutional Theory

The institutional theory posits that institutional pressures and norms influence the actions and behaviours of organisations. Institutional theory suggests that external pressures, such as government policies, regulations, and international standards, may influence adopting and implementing e-procurement systems in the public sector. (Farrukh et al., 2019) These institutional pressures can shape organisations' decisions to implement electronic procurement practices and impact their supply chain performance.

Institutional theory is a sociological and organisational theory that focuses on organisations' and individuals' conformity, adoption, and response to institutional pressures and norms within a given social context. It investigates how institutional rules, regulations, norms, and beliefs influence and shape organisational behaviour and practises. Institutions provide organisations with a broader social context in which to operate. Institutional standards, regulations, norms, and values guide and shape organisational behaviour (Peters, 2022). These institutions include government

regulations, industry standards, professional associations, cultural norms, and societal expectations. There are three primary categories of institutional pressures on organisations: coercive, mimetic, and normative. Coercive pressures refer to using sanctions or rewards to influence organisational behaviour by external forces, such as regulatory bodies. Organisations that imitate the practices of others in their industry or sector generate mimetic pressures (Suleman et al., 2023). The influence of societal or professional norms and values on organisational behaviour and decision-making is the source of normative pressures. Isomorphism refers to the process by which organisations become similar or implement similar practices due to institutional pressures.

An institutional theory emphasises the significance of organisations' legitimacy. Legitimacy is the perception that an organisation's actions, behaviours, and practices are appropriate, correct, and in line with societal or institutional norms. Organisations pursue legitimacy to acquire support, resources, and acceptance from stakeholders such as customers, employees, investors, and the general public. The institutional theory also acknowledges that institutions and their pressures do not remain static over time but evolve. External disruptions, societal value shifts, or political and economic context shifts can change institutions. To preserve their legitimacy and efficacy, organisations must adapt and respond to institutional change (Peters, 2022). Organisations must align their practises and behaviours with institutional norms and expectations to gain legitimacy and acceptability. This may entail adhering to industry standards, regulations, and professional codes of conduct. mIt may be necessary for organisations to modify their structures, processes, and practises in response to institutional pressures or institutional environment adjustments. Understanding the institutional context, anticipating institutional pressures, and aligning internal

practices with external expectations are required for managing organisational change (Hwang et al., 2019). Organisations employ strategies to increase legitimacy, including symbolic actions, alliances or partnerships with reputable organisations, and corporate social responsibility initiatives. These strategies seek to increase the organisation's perceived legitimacy and align it with institutional expectations. An institutional theory emphasises the significance of organisational identity, which is how an organisation presents itself to stakeholders and is perceived by them. Organisations can align their identities with institutional norms and values, emphasising their compatibility with the prevalent institutional context (Y. Zhang et al., 2021).

By comprehending and navigating institutional pressures, organisations can adapt to their institutional environment, increase their legitimacy, and obtain a competitive edge. The institutional theory explains how organisations conform to institutional pressures, isomorphism mechanisms, and the dynamics of institutional change.

2.9.4 Diffusion of Innovation Theory

The diffusion of innovation theory explains how new technologies and practices are adopted within organisations. In electronic procurement, this theory suggests that adopting and implementing e-procurement systems in the public sector depend on various factors, including perceived benefits, system compatibility, complexity, and trialability. Al-Tarawneh et al. (2017) state that the effective diffusion of electronic procurement practices can improve supply chain performance by enabling organisations to leverage the benefits of advanced technological solutions. Everett Rogers' Diffusion of Innovation theory examines how individuals or organisations adopt new ideas, technologies, products, or practices within a social system. The

theory provides insights into the adoption process, factors influencing adoption decisions, and adopter characteristics (Oyelana et al., 2021).

An innovation is any new idea, technology, product, or practice that individuals or organisations perceive as novel. Innovations can range from incremental enhancements to revolutionary advances. They can be tangible items, like new software or machinery, or intangible practices, like new management techniques or social norms. Adoption is the acceptance and utilisation of an innovation by an individual or organisation. Adoption has multiple stages: awareness, interest, evaluation, trial, adoption, and rejection. Different individuals or organisations can adopt an innovation at various times, resulting in a diffusion pattern (Branstad & Solem, 2020).

Diffusion is the social system-wide dissemination of innovation. It describes how innovation is communicated to and adopted by various communities, organisations, or market members. Multiple channels, including interpersonal communication, mass media, social networks, and organisational structures, can facilitate diffusion. The Diffusion of Innovation theory divides adopters into distinct categories based on their adoption timing. These include the innovators, the early adopters, the early majority, the late majority, and the laggards. Regarding adopting innovations, each group has distinctive characteristics, attitudes, and conduct. In general, innovators and early adopters are more daring, risk-taking, and receptive to new ideas, whereas the majority and laggards adopt innovations more slowly (Kwon et al., 2021).

Several factors influence the adoption of innovations, including perceived relative advantage (the degree to which an innovation is perceived to be superior to existing alternatives), compatibility (the degree to which an innovation is perceived to be

consistent with existing values, experiences, and needs), complexity (the degree to which an innovation is perceived to be difficult to understand and use), trialability (the degree to which an innovation can be tested or experimented with), and scalability (the degree to which an innovation can be scaled up or down) (Kwon et al., 2021). The Diffusion of Innovation theory emphasises the significance of communication channels in promoting the propagation of innovations. Different channels, including mass media, interpersonal communication, and online platforms, contribute to disseminating information, modifying attitudes, and facilitating adoption decisions. Opinion leaders or influential individuals within social networks can have a substantial impact on the process of diffusion. According to the theory, a critical mass of adoption is required for an innovation to reach a tipping point and obtain widespread acceptance. As more individuals or organisations adopt the innovation, its visibility increases, it generates network effects, and it lowers the barriers to adoption for others (Oyelana et al., 2021).

The Diffusion of Innovation theory has implications for organisations seeking to introduce and promote novel concepts, technologies, or practises. It emphasises the significance of understanding the characteristics of potential consumers, developing effective communication strategies, addressing adoption barriers, and leveraging influential individuals or groups to facilitate the diffusion process. By applying the principles of the Diffusion of Innovation theory, organisations can gain a deeper understanding of how innovations are adopted, devise strategies to accelerate adoption rates, and maximise the benefits and impact of their innovations (Oyelana et al., 2021).

2.10 Chapter Summary

This section examined the dynamics of electronic procurement (e-procurement), analysing its fundamental principles, obstacles, complexities of integration, and theoretical underpinnings. The investigation commenced with a conceptual review, which identified the fundamental elements of electronic procurement. The following sections, Challenges in E-Procurement, highlighted the intricacies associated with system integration. The importance of possessing technical knowledge, adequate resources, and effective change management strategies was emphasised. Priority was given to promoting user acceptance and guaranteeing system upkeep to achieve smooth integration and long-lasting compatibility.

Following this, the chapter thoroughly examined the substantial costs associated with implementing and maintaining e-procurement. The section also described the investments, integration overheads, ongoing maintenance costs, IT infrastructure expenses, and supplier onboarding expenses. The significance of implementing effective change management strategies and performing thorough cost-benefit analyses in order to make well-informed decisions was emphasised in the section. As the discussion progressed towards the complexities of integration, the chapter clarified the essential significance of proficient IT professionals and the critical necessity for efficient change management strategies. The chapter reached its conclusion by examining Theoretical Frameworks, wherein four theories fundamental to e-procurement were highlighted. The transaction costs could be reduced through electronic platforms, as explicated by the transaction cost theory. According to the Resource-Based View theory, e-procurement systems are critical assets that significantly enhance the performance of the supply chain. Institutional Theory analysed the adoption of e-procurement in light of external pressures and norms,

whereas the Diffusion of Innovation Theory identified perceived benefits, compatibility, complexity, trialability, and scalability as determinants of the adoption process.



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Chapter three provided an overview of the research methodology. The methodology thoroughly explains the research process, including the approach, design, population, sample size, sampling technique, data sources, collection instruments, procedure, analysis, and ethical considerations (Snyder, 2019).

Choosing the right research methodology is important for ensuring the accuracy and consistency of a study's findings (Creswell & Creswell, 2017). The framework allows for the collection and analysis of data, enabling a methodical examination of the research questions and hypotheses.

3.2 Research Approach

The research approach refers to a researcher's strategy to investigate and address the research questions or objectives (Stage, 2015). A quantitative research approach was employed for this study. Quantitative research involves a systematic and empirical approach to analyzing and interpreting numerical data. According to McLeod, (2019) it encompasses collecting and analyzing numerical data through structured instruments like questionnaires, surveys, and experiments (Mellinger & Hanson, 2020).

3.3 Population

The study population also called the target population, encompasses all individuals or elements the researcher aims to investigate or draw conclusions about (Hassan, 2021). This represents the broader population from which the study's sample will be drawn. The study population is determined by specific characteristics, attributes, or criteria

relevant to the research question or objectives (Hassan, 2021). The research population consists of the public sector of Ghana. This study will focus on the staff of the Environmental Protection Agency as the target population.

3.4 Sampling Technique and Sample Size

The sampling technique is a commonly used method by researchers to select a subset of individuals or elements from a larger population for research purposes (Singh & Masuku, 2014). Sampling is used to draw conclusions about the entire population based on observed characteristics of the sample (Rahi, 2017).

There are two main categories of sampling techniques: probability sampling (random sampling) and non-probability sampling (non-random sampling). Probability sampling entails randomly selecting individuals or elements from a population, ensuring that each member of the population has an equal chance of being included (Yang & Banamah, 2014). Probability sampling methods allow researchers to estimate sampling error and draw valid statistical conclusions. They provide a known and calculable probability of inclusion for each element (Goodman & Kish, 1950).

Sampling techniques that do not ensure equal or known probabilities of selection are called non-probability sampling (Lamm & Lamm, 2019). Using non-probability sampling methods can be a practical and cost-effective approach. However, it's important to note that these methods may introduce bias and limit the generalizability of the results (Cantelmi et al., 2021).

This study utilizes a simple random sampling technique to select a sample size of 60 from the target population. A simple random sample is a subset of individuals selected

from a larger set through a random process, ensuring equal probability for each individual to be selected.

3.5 Sources of Data

This research gathered information from both primary and secondary sources. Primary data is the information collected directly by researchers for their study (Ajayi, 2017). As per Ajayi (2017), this refers to information gathered directly from the source and has not been published or used by others before. It is obtained through surveys, interviews, experiments, observations, and focus groups.

Secondary data, in comparison, is information collected and published by other researchers. The data is obtained from various sources, such as published research papers, government reports, company records, databases, and websites (Ajayi, 2017). The study collected primary data through structured questionnaires administered to managers and key personnel at the Environmental Protection Agency.

3.6 Data Analysis

Statistical Package for the Social Sciences (SPSS) and Microsoft Excel was utilised to analyse the data collected for this study. After analysis, the acquired data was prepared for examination. Coding, data entry, and cleansing were all components of this analysis. In Excel or SPSS, the information was entered to generate a structured dataset. Using techniques for data cleansing, any missing values, outliers, or inconsistencies in the data were detected and rectified. Variables had to be appropriately labelled and annotated to facilitate interpretation throughout the analysis process. Descriptive statistics were utilised to provide summaries and characterizations of the attributes of the dataset's variables. The percentages, means,

standard deviations, and frequency distributions were computed. Inferential analysis was employed to evaluate the correlation and impact of the variables.



CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

The data gathered to examine the effects and consequences of electronic procurement procedures on the effectiveness and efficiency of the supply chain is analyzed and presented in this chapter. The chapter provides an in-depth analysis of the collected data to investigate and interpret the connection between adopting electronic procurement and its ensuing impact on supply chain performance metrics.

4.2 Socio-Demographics

This section analyses the demographic characteristics of EPA personnel, including gender distribution, age composition, educational background, and length of tenure. The review offers insights into the diversity, experience, and educational profiles of individuals involved in the Agency's procurement processes.

4.2.1 Gender Distribution

Table 4. 1 Gender

	N	%
Female	23	38.3%
Male	37	61.7%

Source: Field Data, 2023

The distribution shows a more significant number of males than females. Males significantly influence the gender distribution at the Agency.

4.2.2 Age of respondents

Table 4. 2 Age Distribution

	N	%
18-24	11	18.3%
25-35	33	55.0%
36-50	14	23.3%
Above 50	2	3.3%

Source: Field Data, 2023

The distribution indicates a notable concentration of employees in the 25 to 35 age range, making up the majority of the employees; hence, there are fewer people in the older age groups (36-50 and above 50). This suggests a younger workforce among the participants.

4.2.3 Educational Background

Table 4. 3 Level of Education

	N	%
1st Degree	35	58.3%
Doctorate	3	5.0%
HND/Equivalent	9	15.0%
Masters Degree	13	21.7%

Source: Field Data, 2023

The data presented indicates that respondents with a Bachelor's degree are the most prevalent (58.3%) within the Agency, while 21.7% hold Master's degrees. Doctorate-holding individuals and those possessing HNDs or comparable credentials constitute comparatively, a minor proportions of the workforce, thus 15% and 5% respectively.

4.2.4 Length of tenure

Table 4. 4 Duration of work

	N	%
2 to 5 years	39	65.0%
above 5 years	7	11.7%
Less than a Year	14	23.3%

Source: Field Data, 2023

This distribution shows that a substantial portion of the workforce has been employed for a duration ranging from 2 to 5 years. There's a smaller representation of individuals with a tenure above five years, while those with less than a year's tenure also form a significant proportion of the sampled population.

4.3 Electronic Procurement Practices

To assess the practices of electronic procurement, a five-point Likert scale was employed. The responses were analysed and presented under Table 4.5 using means and standard deviation. Responses towards 5 indicate a strong agreement, while those towards 1 indicate disagreement with the statements posed to the respondents under this section.

Table 4. 5 Electronic Procurement Practices

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1. E-Sourcing is effectively used to identify, evaluate, and select suppliers in our procurement process	0.0%	0.0%	3.3%	73.3%	23.3%	4.200	0.480
2. The e-requisitioning system allows employees to electronically submit requests for goods or services with ease.	0.0%	0.0%	6.7%	66.7%	26.7%	4.200	0.546
3. The process of creating and submitting electronic purchase orders to selected suppliers is efficient	0.0%	1.7%	1.7%	55.0%	41.7%	4.367	0.610
4. Electronic invoicing has streamlined the invoice submission and approval process effectively.	0.0%	1.7%	5.0%	66.7%	26.7%	4.183	0.596
5. Our organization effectively manages contracts digitally, including creation, negotiation, execution, and tracking.	0.0%	0.0%	1.7%	63.3%	35.0%	4.333	0.510
6. The integration of e-procurement systems with other enterprise systems like ERP or SCM is seamless.	0.0%	1.7%	8.3%	53.3%	36.7%	4.250	0.680
7. The system for ensuring compliance with company policies and industry regulations, including the ability to track and record all procurement activities, is well implemented.	0.0%	0.0%	6.7%	53.3%	40.0%	4.333	0.601

Source: Field Data, 2023

1. E-Sourcing is effectively used to identify, evaluate, and select suppliers in our procurement process

Most respondents (73.3%) believe that e-sourcing effectively identifies, evaluates, and selects suppliers. The widespread agreement on the efficiency of e-sourcing indicates

a streamlined supplier selection process. This suggests potential cost savings, improved supplier relationships, and enhanced supply chain responsiveness due to efficient sourcing. The high mean score of 4.2 signifies a strong agreement among respondents that e-sourcing is effectively used. The low standard deviation of 0.480 suggests a consistent perception across the workforce, indicating a widely accepted and efficient e-sourcing system.

2. The e-requisitioning system allows employees to electronically submit requests for goods or services with ease

Most respondents (66.7%) responded that the e-requisitioning system is user-friendly for submitting requests, indicating a smooth process for requisitioning goods or services. The ease in requisitioning enhances efficiency and speed in acquiring goods or services. These improvements can result in shorter lead times, more efficient inventory management, and higher employee productivity. Like e-sourcing, the high mean score of 4.2 and low standard deviation (0.546) suggest a consensus among employees regarding the ease of using the e-requisitioning system, indicating a universally accepted and user-friendly system.

3. The process of creating and submitting electronic purchase orders to selected suppliers is efficient

Most respondents (91.7 %) find creating and submitting electronic purchase orders highly efficient, suggesting a streamlined procurement process. Creating purchase orders efficiently involves optimizing procurement workflows. By implementing these measures, it is possible to achieve faster order processing, minimize errors, and enhance supplier communication, resulting in improved overall supply chain efficiency. A mean score of 4.367 signifies a strong agreement on the efficiency of

creating purchase orders. The low standard deviation suggests consistent views across the workforce, indicating a streamlined and well-accepted process.

4. Electronic invoicing has streamlined the invoice submission and approval process effectively

A significant majority (66.7%) acknowledged that electronic invoicing has successfully streamlined the process of submitting and approving invoices. Efficient invoicing leads to faster payment cycles and less administrative work. Improved cash flow management and stronger supplier relationships can be achieved through this approach. Despite a slightly lower mean score, the low standard deviation indicates a consistent positive perception of electronic invoicing, implying a widely accepted and efficient system.

5. Our organization effectively manages contracts digitally, including creation, negotiation, execution, and tracking.

Most respondents (68.3%) expressed confidence in the organization's efficient management of contracts through digital means. This suggests a strong system for creating, negotiating, and executing contracts. Based on the data, it is evident that there is widespread agreement on the effectiveness of digital contract management. This indicates that the system for handling contracts is well-accepted and proficient.

6. The integration of e-procurement systems with other enterprise systems like ERP or SCM is seamless.

A majority (90%) of the respondents believe that integrating e-procurement systems with other enterprise systems is smooth, indicating a highly integrated system. The mean score is high, but the higher standard deviation indicates a slightly more

variability in perceptions. Nevertheless, the consensus shows that system integration is widely regarded as smooth and efficient.

7. The system for ensuring compliance with company policies and industry regulations, including the ability to track and record all procurement activities, is well implemented.

Most of the respondents agreed that the system effectively ensures compliance with company policies and industry regulations while efficiently tracking procurement activities. The high mean score and relatively low standard deviation suggest that employees consistently perceive the effectiveness of the compliance and tracking systems. This indicates that the system has been well-implemented and widely accepted.

The findings support well-established principles in the e-procurement literature. There is a consensus on the effectiveness of e-sourcing for identifying and selecting suppliers. This aligns with previous research that emphasizes the significance of efficient supplier selection processes and the potential for cost savings (Barasa & Namusonge, 2017). Moreover, the e-requisitioning system has been acknowledged for its user-friendliness, which aligns with research highlighting the importance of intuitive interfaces in streamlining procurement and potentially improving operational efficiency (Timans et al., 2019). In addition, the efficiency in creating and submitting electronic purchase orders aligns with the literature's focus on streamlined procurement workflows and the potential for improved efficiency in order processing and supply chain operations (Nyile & Shale, 2016).

The successful streamlining of electronic invoicing submission and approval processes aligns with previous research that emphasizes the advantages of electronic

invoicing in speeding up payment cycles and reducing administrative burdens (Hassan et al., 2017). In addition, the organization's confidence in effectively managing contracts digitally, aligns with research highlighting the importance of well-managed contracts in improving procurement practices and nurturing supplier relationships (Nafula & Namusonge, 2017). The perception of seamless integration of e-procurement systems with other enterprise systems is in line with research that highlights the significance of integrated systems in enhancing operational efficiency and communication within an organization (Flynn et al., 2021). In line with current research, it is important to have robust compliance systems and tracking mechanisms in place to ensure adherence to regulations and promote transparency and accountability in procurement activities (Arnold, 2020).

4.4 Supply Chain Performance

This section assessed the performance of the supply chain within the Environmental Protection Agency (EPA). The analysis was conducted using descriptive statistics derived from responses on a Likert scale, ranging from 1 (indicating low performance) to 5 (showing high performance). The collected data represented the perspectives and knowledge of EPA employees regarding various aspects of supply chain performance. The descriptive analysis utilized mean and standard deviation measures to clarify the agreement and variation among respondents' views.

Table 4. 6 Supply Chain Performance

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
8. Electronic Procurement has led to observable improvements in procurement cycle times.	0.0%	0.0%	3.3%	60.0%	36.7%	4.333	0.542
9. Electronic Procurement has contributed to better cost control in procurement activities.	0.0%	0.0%	5.0%	48.3%	46.7%	4.417	0.591
10. Electronic Procurement has positively impacted the accuracy of procurement-related data and documentation.	0.0%	0.0%	0.0%	50.0%	50.0%	4.500	0.504
11. The implementation of Electronic Procurement has resulted in increased supplier performance and reliability.	0.0%	0.0%	3.3%	45.0%	51.7%	4.483	0.567
12. Electronic Procurement has significantly contributed to better compliance with regulatory requirements in procurement.	0.0%	0.0%	3.3%	51.7%	45.0%	4.417	0.561
13. Electronic Procurement has facilitated better communication and collaboration with suppliers.	0.0%	0.0%	1.7%	38.3%	60.0%	4.583	0.530
14. The implementation of Electronic Procurement has led to improved tracking and reporting of procurement activities.	0.0%	0.0%	1.7%	48.3%	50.0%	4.483	0.537

Source: Field Data, 2023

8. *Electronic Procurement has led to observable improvements in procurement cycle times.*

Most respondents acknowledge that electronic procurement has significantly improved procurement cycle times. The mean score and standard deviation suggest a consistent and positive perception of improved efficiency in procurement processes.

9. Electronic Procurement has contributed to better cost control in procurement activities.

Most responses agree that electronic procurement has improved cost control in procurement activities. The mean score and a moderate standard deviation indicate an overall positive perception with some variation.

10. Electronic Procurement has positively impacted the accuracy of procurement-related data and documentation.

A balanced distribution of 50.0% for both (strongly agree and agree) suggests a consensus that electronic procurement has a positive impact on the accuracy of data and documentation. The mean score is high, and the standard deviation is relatively low, indicating a strong and consistent perception of enhanced accuracy.

11. The implementation of Electronic Procurement has resulted in increased supplier performance and reliability

A majority (96.7%) believe that electronic procurement has led to improved supplier performance and reliability. The mean score and standard deviation indicate a positive impact on supplier relationships that is widely accepted.

12. Electronic Procurement has significantly contributed to better compliance with regulatory requirements in procurement.

A high agreement response rate demonstrates the positive impact of electronic procurement on regulatory compliance. The mean score is high, and the standard deviation is moderate, indicating a consistent, yet somewhat varied perception.

13. Electronic Procurement has facilitated better communication and collaboration with suppliers.

Almost all the respondents believe that electronic procurement has greatly improved supplier communication and collaboration. The mean score and standard deviation suggest a high level of agreement.

14. The implementation of Electronic Procurement has led to improved tracking and reporting of procurement activities.

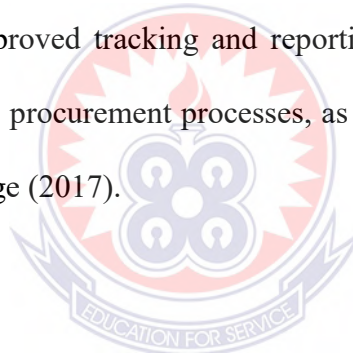
A vast majority (98.3%) of the respondents acknowledged that electronic procurement has significantly enhanced the ability to track and report on procurement activities. The mean score and standard deviation indicate a generally positive perception with some variability.

Respondents consistently acknowledged the positive effects of electronic procurement on different aspects of supply chain efficiency, which aligns with existing research. Previous research has highlighted the importance of efficient processes and shorter timeframes in procurement cycles, which is also reflected in the current study (Flynn et al., 2021). Streamlined electronic systems facilitate procurement, allowing for faster decision-making and order processing, as evidenced by the respondents' consistent feedback.

Likewise, researchers in the field have found that electronic procurement can significantly reduce costs, as demonstrated by the research of Hassan et al. (2017). Nevertheless, differences in experiences with various procurement activities may account for the slight variations in perceptions, which is consistent with previous research findings. Research has shown that electronic systems are highly reliable in maintaining accurate records, which aligns with the respondents' agreement on the positive impact on data accuracy (Barasa & Namusonge, 2017). This alignment highlights the efficiency of electronic procurement in guaranteeing precise

documentation, as evidenced by previous studies. There is a strong consensus among researchers that electronic integration promotes collaboration, reliability, and trust among suppliers (Nyile & Shale, 2016). In addition, there is a strong consensus on the positive impact of electronic systems in promoting compliance with regulations, as supported by existing literature (Arnold, 2020). However, the differences in experiences can be attributed to the various regulatory landscapes in different industries, as mentioned earlier.

There is a consensus among experts that enhancing communication and collaboration with suppliers is crucial. This aligns with recent research highlighting the importance of electronic systems in fostering stronger relationships (Timans et al., 2019). The strong consensus on improved tracking and reporting, highlights the importance of transparent and traceable procurement processes, as previously emphasized in studies by Nafula and Namusonge (2017).



4.5 Challenges

This section explored the challenges faced during the implementation and operation of e-procurement systems within the Environmental Protection Agency (EPA). The data was evaluated using a Likert scale that ranged from 1 (minimal challenge) to 5 (significant challenge). Descriptive statistics, such as mean and standard deviation, was employed to evaluate and analyze these challenges. The investigation centered on gaining insight into the challenges faced by the EPA in implementing and overseeing e-procurement systems. Respondents evaluated each challenge based on its average difficulty level, as indicated by the mean scores. The standard deviation offers valuable insight into the consensus or variability of views among respondents regarding these challenges.

Table 4. 7 Challenges

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
15. Resistance from staff members towards adopting Electronic Procurement Practices has been encountered.	21.7%	16.7%	6.7%	33.3%	21.7%	3.17	1.498
16. Cultural or organizational barriers have been perceived that hinder the smooth integration of Electronic Procurement.	18.3%	20.0%	11.7%	28.3%	21.7%	3.15	1.448
17. Technical issues or limitations with the Electronic Procurement system have been experienced.	18.3%	18.3%	5.0%	33.3%	25.0%	3.28	1.485
18. Concerns about data security or privacy related to Electronic Procurement Practices have been raised.	18.3%	20.0%	3.3%	33.3%	25.0%	3.27	1.494
19. There is a perceived need for additional training or support for staff members to effectively utilize Electronic Procurement systems.	20.0%	15.0%	5.0%	25.0%	35.0%	3.40	1.575
20. The integration of Electronic Procurement has faced resistance due to a lack of understanding or awareness among staff members	21.7%	16.7%	0.0%	31.7%	30.0%	3.32	1.578
21. There have been concerns about the compatibility of existing systems with Electronic Procurement practices.	16.7%	23.3%	3.3%	35.0%	21.7%	3.22	1.451

Source: Field Data, 2023

15. Resistance from staff members towards adopting Electronic Procurement

Practices has been encountered.

Around 55% of the respondents expressed resistance towards adopting e-procurement, with a moderate level of agreement. There is a noticeable range of opinion among

respondents about the resistance level, as indicated by the relatively high standard deviation.

16. Cultural or organizational barriers have been perceived that hinder the smooth integration of Electronic Procurement.

Approximately half of the respondents reported encountering cultural or organizational barriers. The average score suggests a moderate level of agreement. Respondents' perceptions of barriers vary, based on the standard deviation.

17. Technical issues or limitations with the Electronic Procurement system have been experienced.

Around 58% of respondents reported technical issues or limitations, with a mean score suggesting moderate agreement. There seems to be a range of experiences or perceptions regarding these challenges.

18. Concerns about data security or privacy related to Electronic Procurement Practices have been raised.

Around 58% of the respondents expressed concerns regarding data security or privacy, with a mean score indicating moderate agreement. Respondents' levels of concern vary, as indicated by the standard deviation.

19. There is a perceived need for additional training or support for staff members to effectively utilize Electronic Procurement systems.

Approximately, 60% of the respondents expressed a desire for more training or support. A higher mean score suggests a greater level of agreement. There seems to be a range of opinions regarding the extent of this need, as indicated by the relatively high standard deviation.

20. The integration of Electronic Procurement has faced resistance due to a lack of understanding or awareness among staff members.

Around 62% of the respondents recognize that integration resistance can occur when there is a lack of understanding or awareness. The mean score suggests a moderate level of agreement. There is a variation in the levels of understanding among respondents, as indicated by the standard deviation.

21. There have been concerns about the compatibility of existing systems with Electronic Procurement practices.

Around 57% of the respondents expressed concerns regarding compatibility with existing systems. The mean score suggests a moderate level of agreement. There is a range of perceptions among the respondents, as indicated by the standard deviation.

4.6 Relationship between Electronic Procurement Practices and Supply Performance in Ghana's Public Sector

This section examined the relationship between Electronic Procurement Practices and Supply Chain Performance in Ghana's Public Sector. The analysis sought to evaluate the strength of their relationship, using correlation analysis to gauge their association. The study employed a 95% confidence interval and a 5% acceptable error margin to assess the significance of the relationship between these variables. A significance level of 0.05 ($p < 0.05$) was set, indicating that any correlations found would be considered statistically significant.

Table 4. 8 Correlation

		Correlations	
		Electronic Procurement Practices	Supply Chain Performance
Electronic Procurement Practices	Pearson Correlation	1	
Supply Chain Performance	Pearson Correlation	0.228	1
	Sig. (2-tailed)	0.020	

Source: Field Data, 2023

The correlation coefficient between Electronic Procurement Practices and Supply Chain Performance is 0.228. The p-values for both correlations are 0.020 (2-tailed), below the significance threshold of 0.05.

There is a clear and significant positive correlation between Electronic Procurement Practices and Supply Chain Performance in Ghana's public sector. There is a moderate positive relationship between these variables, as indicated by the correlation coefficient of 0.228.

4.7 Effects of Electronic Procurement on Supply Chain Performance in Ghana's Public Sector

This section focused on investigating the impact of Electronic Procurement on Supply Chain Performance within Ghana's Public Sector through the utilization of linear regression analysis. The aim was to discern the extent to which variations in Electronic Procurement Practices predicted and influenced alterations in Supply Chain Performance. The employment of linear regression allowed for quantifying and comprehending the relationship between these variables.

Table 4. 9 Regression

Model		Coefficients ^a			t	Sig.
		Unstandardized Coefficients	Std. Error	Standardized Coefficients		
1	(Constant)	B 3.576	0.497	Beta	7.193	0.000
	Electronic Procurement Practices	0.207	0.116	0.228	1.782	0.020

a. Dependent Variable: Supply Chain Performance

Source: Field Data, 2023

The linear regression analysis showed that the coefficient for Electronic Procurement Practices was 0.207, with a standard error of 0.116. The Beta coefficient of 0.228 indicates the strength and direction of the relationship between Electronic Procurement Practices and Supply Chain Performance as discussed previously.

The t-value for Electronic Procurement Practices was 1.782, resulting in a p-value of 0.020. The p-value suggests statistical significance below the threshold of 0.05, indicating a significant relationship between Electronic Procurement Practices and Supply Chain Performance.

The analysis revealed a connection between Electronic Procurement Practices and Supply Chain Performance, indicating that for every unit increase in Electronic Procurement Practices, there is a predicted increase of 0.207 units.

The correlation and regression analysis reveals a positive relationship between Electronic Procurement Practices and Supply Chain Performance in Ghana's public sector, aligning with various findings in previous studies. Research conducted by Ngeno and Kinoti (2017) and Nyile and Shale (2016) has thrown light on the significant effects of e-procurement on supply chain management. These studies emphasize the positive outcomes regarding improved supply chain efficiency and

performance. This correlation finding supports the notion that efficient e-procurement practices has a measurable and beneficial impact on supply chain performance metrics. In addition, the study found a positive correlation that supports the importance of having sufficient technological infrastructure (Waniani, Namusonge, & Lagat, 2016) and integrating e-procurement systems (Flynn et al., 2021). When e-procurement practices are effectively integrated and supported by strong technological infrastructure, they positively impact supply chain performance in the public sector. The observed positive correlation aligns with the existing literature's focus on the numerous benefits of e-procurement. These advantages include more efficient processes, stronger supplier relationships, and better information sharing among supply chain participants (Flynn et al., 2021; Chang, Hsin, et al., 2018).



CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter briefly summarizes the study's outcomes, helping to better understand the research's contributions and implications.

5.2 Summary of Findings

The study's first objective was to establish the relationship between Electronic Procurement Practices and SupplyChain Performance in Ghana's Public Sector. The correlation analysis showed a moderate positive correlation of 0.228 between Electronic Procurement Practices and Supply Chain Performance. This suggests a significant and favourable relationship between the two variables, supported by previous research emphasizing the positive impact of efficient e-procurement practices on supply chain management.

The study's second objective was to evaluate the impact of Electronic Procurement on Supply Chain Performance in Ghana's Public Sector. The analysis revealed a significant connection between Electronic Procurement Practices and Supply Chain Performance, with a coefficient of 0.207. This finding aligns with previous research that emphasizes the positive effects of e-procurement implementation on supply chain efficiency, supplier relationships, and technological infrastructure integration.

The third objective focused on identifying the challenges of integrating Electronic Procurement in Ghana's Public Sector. The findings uncovered various challenges, such as staff resistance, cultural or organizational barriers, technical limitations, data security concerns, additional training/support, integration resistance due to lack of awareness, and compatibility issues with existing systems.

The findings suggest a strong link between Electronic Procurement Practices and Supply Chain Performance. However, there are notable obstacles to implementing e-procurement systems in Ghana's Public Sector.

5.3 Conclusion

This study highlights the effects of Electronic Procurement Practices on Supply Chain Performance within Ghana's Public Sector. The significant relationship between these variables highlights the benefits of successful e-procurement implementation. Nevertheless, there are notable difficulties in incorporating Electronic Procurement in the Public Sector. The findings highlights that Electronic Procurement Practices positively impact Supply Chain Performance. However, several obstacles impede its smooth adoption. Several challenges ought to be addressed; including but not limited to, resistance among staff, organizational barriers, technical limitations, data security concerns, and compatibility issues with existing systems. It is essential to tackle these challenges to ensure that the benefits of Electronic Procurement are fully utilized. Efficiently integrating processes requires strategies focusing on staff training, cultural change, technical enhancements, and fostering awareness. Addressing these issues will significantly enhance the efficiency and effectiveness of Public Sector procurement in Ghana.

5.4 Recommendation

The study's findings highlights critical areas necessitating attention to enhance the integration of Electronic Procurement Practices within Ghana's Public Sector. Addressing these challenges and maximizing potential benefits requires strategic actions to be considered.

Improving the skills of the staff is crucial. Focused training programmes and awareness campaigns can significantly enhance user proficiency and comprehension of Electronic Procurement systems.

Promptly addressing technical issues and limitations within the Electronic Procurement systems is essential. Upgrading systems, handling compatibility concerns, and fortifying technological infrastructure are pivotal in achieving smooth integration and optimal functionality.

Ensuring data security emerges as a top priority. Implementing robust data encryption methods, access controls, and security protocols can effectively tackle data privacy concerns and foster trust in the Electronic Procurement system.

Addressing cultural barriers hindering the assimilation of Electronic Procurement requires organizational change initiatives. Cultivating a work culture that values and embraces technological advancements in procurement processes is pivotal to overcoming resistance and fostering acceptance.

Collaboration between departments ensures compatibility between existing systems and Electronic Procurement practices. Effective communication and collaboration between IT and procurement departments streamlines technological system integration.

Regular assessments and evaluations are imperative. Establishing systems for ongoing assessments aids in identifying persistent challenges, allowing for timely and iterative improvements in the e-procurement system.

Implementing these recommendations leads to a more seamless and effective integration of Electronic Procurement practices within Ghana's Public Sector. This, in turn, will unlock the full potential for efficiency and transparency in procurement processes.



REFERENCES

- Acquah, A. A., D'Souza, C., Martin, B., Arko-Mensah, J., Nti, A. A., Kwarteng, L., Takyi, S., Quakyi, I. A., Robins, T. G., & Fobil, J. N. (2019). *Processes and challenges associated with informal electronic waste recycling at Agbogbloshie, a suburb of Accra, Ghana*. 63(1), 938–942.
- Adam, H., & Somer, A. (2022). *The Supply Chain: From Raw Materials to Order Fulfillment*. Investopedia.
<https://www.investopedia.com/terms/s/supplychain.asp>
- Adjei-Bamfo, P., Domfeh, K. A., Bawole, J. N., Ahenkan, A., Maloreh-Nyamekye, T., Adjei-Bamfo, S., & Darkwah, S. A. (2020). An e-government framework for assessing readiness for public sector e-procurement in a lower-middle income country. *Information Technology for Development*, 26(4), 742–761.
- Agyekum, E. B., Amjad, F., Mohsin, M., & Ansah, M. N. S. (2021). A bird's eye view of Ghana's renewable energy sector environment: A Multi-Criteria Decision-Making approach. *Utilities Policy*, 70, 101219.
<https://doi.org/10.1016/j.jup.2021.101219>
- Ahoa, E., Kassahun, A., & Tekinerdogan, B. (2020). Business processes and information systems in the Ghana cocoa supply chain: A survey study. *NJAS - Wageningen Journal of Life Sciences*, 92, 100323.
<https://doi.org/10.1016/j.njas.2020.100323>
- Alaghehband, F. K., Rivard, S., Wu, S., & Goyette, S. (2021). An assessment of the use of Transaction Cost Theory in information technology outsourcing. *The Journal of Strategic Information Systems*, 20(2), 125–138.
<https://doi.org/10.1016/j.jsis.2011.04.003>
- Alalwan, A. A. (2020). Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse. *International Journal of Information Management*, 50, 28–44.
- Ali, Md. R., Nipu, S. Md. A., & Khan, S. A. (2023). A decision support system for classifying supplier selection criteria using machine learning and random forest approach. *Decision Analytics Journal*, 7, 100238.
<https://doi.org/10.1016/j.dajour.2023.100238>
- Al-Yahya, M., & Panuwatwanich, K. (2018). Implementing e-tendering to improve the efficiency of public construction contract in Saudi Arabia. *International Journal of Procurement Management*, 11(3), 267–294.
- Aminah, S., Ditari, Y., Kumaralalita, L., Hidayanto, A. N., Phusavat, K., & Anussornnitisarn, P. (2018). E-procurement system success factors and their impact on transparency perceptions: Perspectives from the supplier side. *Electronic Government, an International Journal*, 14(2), 177–199.

- Argyroudis, S. A., Mitoulis, S. A., Chatzi, E., Baker, J. W., Brilakis, I., Gkoumas, K., Vousdoukas, M., Hynes, W., Carluccio, S., Keou, O., Frangopol, D. M., & Linkov, I. (2022). Digital technologies can enhance climate resilience of critical infrastructure. *Climate Risk Management*, 35, 100387. <https://doi.org/10.1016/j.crm.2021.100387>
- Arnold, J. T. (2020). *Introduction to materials management*.
- Ashiagbor, G., Asante, W. A., Forkuo, E. K., Acheampong, E., & Foli, E. (2022). Monitoring cocoa-driven deforestation: The contexts of encroachment and land use policy implications for deforestation free cocoa supply chains in Ghana. *Applied Geography*, 147, 102788. <https://doi.org/10.1016/j.apgeog.2022.102788>
- Besada, H., & Golla, T. (2023). Policy impacts on Ghana's extractive sector: The implicative dominance of gold and the future of oil. *The Extractive Industries and Society*, 14, 101214. <https://doi.org/10.1016/j.exis.2023.101214>
- Bhookya, J., Kumar, M. V., Kumar, J. R., & Rao, A. S. (2022). Implementation of PID controller for liquid level system using mGWO and integration of IoT application. *Journal of Industrial Information Integration*, 28, 100368. <https://doi.org/10.1016/j.jii.2022.100368>
- Bienhaus, F., & Haddud, A. (2018). Procurement 4.0: Factors influencing the digitisation of procurement and supply chains. *Business Process Management Journal*.
- Branstad, A., & Solem, B. A. (2020). Emerging theories of consumer-driven market innovation, adoption, and diffusion: A selective review of consumer-oriented studies. *Journal of Business Research*, 116, 561–571. <https://doi.org/10.1016/j.jbusres.2020.01.028>
- Chaffey, D., Edmundson-Bird, D., & Hemphill, T. (2019). *Digital business and e-commerce management*. Pearson UK.
- Cox, K. (2022). Chapter 11—Digital purchasing and procurement systems: Evolution and current state. In B. L. MacCarthy & D. Ivanov (Eds.), *The Digital Supply Chain* (pp. 181–197). Elsevier. <https://doi.org/10.1016/B978-0-323-91614-1.00011-3>
- De Angelis, R., Howard, M., & Miemczyk, J. (2018). Supply chain management and the circular economy: Towards the circular supply chain. *Production Planning & Control*, 29(6), 425–437.
- Fatorachian, H., & Kazemi, H. (2021). Impact of Industry 4.0 on supply chain performance. *Production Planning & Control*, 32(1), 63–81.
- Flynn, M., Smitherman, H. M., Weger, K., Mesmer, B., Semmens, R., Van Bossuyt, D., & Tenhundfeld, N. L. (2021). *Incentive mechanisms for acceptance and adoption of automated systems*. 1–6.

- Goel, P., Jain, P., Pasmán, H. J., Pistikopoulos, E. N., & Datta, A. (2020). Integration of data analytics with cloud services for safer process systems, application examples and implementation challenges. *Journal of Loss Prevention in the Process Industries*, 68, 104316. <https://doi.org/10.1016/j.jlp.2020.104316>
- Goswami, Y., Agrawal, A., & Bhatia, A. (2020). *E-Governance: A tendering framework using blockchain with active participation of citizens*. 1–4.
- Guntupalli, R., Sudhakaran, M., & raj, P. A.-D.-V. (2022). Modeling & implementation of DRLA based partially shaded solar system integration with 3- ϕ conventional grid using constant current controller. *Heliyon*, 8(6), e09669. <https://doi.org/10.1016/j.heliyon.2022.e09669>
- Hassan, H., Tretiakov, A., & Whiddett, D. (2017). Factors affecting the breadth and depth of e-procurement use in small and medium enterprises. *Journal of Organizational Computing and Electronic Commerce*, 27(4), 304–324.
- Hong, Q. N., Gonzalez-Reyes, A., & Pluye, P. (2018). Improving the usefulness of a tool for appraising the quality of qualitative, quantitative and mixed methods studies, the Mixed Methods Appraisal Tool (MMAT). *Journal of Evaluation in Clinical Practice*, 24(3), 459–467.
- Hwang, H., Colyvas, J. A., & Drori, G. S. (2019). The proliferation and profusion of actors in institutional theory. In *Agents, actors, actorhood: Institutional perspectives on the nature of agency, action, and authority*. Emerald Publishing Limited.
- Karale, A. (2021). The Challenges of IoT Addressing Security, Ethics, Privacy, and Laws. *Internet of Things*, 15, 100420. <https://doi.org/10.1016/j.iot.2021.100420>
- Knudsen, D. (2019). Aligning corporate strategy, procurement strategy and e-procurement tools. *International Journal of Physical Distribution & Logistics Management*.
- Kwon, W.-S., Woo, H., Sadachar, A., & Huang, X. (2021). External pressure or internal culture? An innovation diffusion theory account of small retail businesses' social media use. *Journal of Retailing and Consumer Services*, 62, 102616. <https://doi.org/10.1016/j.jretconser.2021.102616>
- Langley, C. J., Novack, R. A., Gibson, B., & Coyle, J. J. (2020). *Supply chain management: A logistics perspective*. Cengage Learning.
- Liang, T.-P., Lin, Y.-L., & Hou, H.-C. (2021). What drives consumers to adopt a sharing platform: An integrated model of value-based and transaction cost theories. *Information & Management*, 58(4), 103471. <https://doi.org/10.1016/j.im.2021.103471>
- Liu, M., Liu, Z., Chu, F., Zheng, F., & Chu, C. (2022). Integrated inventory management, supplier selection, disruption risk assessment problem under

- ripple effect. *10th IFAC Conference on Manufacturing Modelling, Management and Control MIM 2022*, 55(10), 3094–3099. <https://doi.org/10.1016/j.ifacol.2022.10.204>
- Mavidis, A., & Folinas, D. (2022). From Public E-Procurement 3.0 to E-Procurement 4.0; A Critical Literature Review. *Sustainability*, 14(18), 11252.
- Mugabi, S. (2018). *E-procurement and supply chain performance: A case study of the new vision printing and publishing company*.
- Mustafa, M. K., & Waheed, S. (2019). A governance framework with permissioned blockchain for the transparency in e-tendering process. *International Journal of Advanced Technology and Engineering Exploration*, 6(61), 274–280.
- Nandi, S., Gonela, V., & Awudu, I. (2023). A resource-based and institutional theory-driven model of large-scale biomass-based bioethanol supply chains: An emerging economy policy perspective. *Biomass and Bioenergy*, 174, 106813. <https://doi.org/10.1016/j.biombioe.2023.106813>
- Nani, D. A., & Ali, S. (2020). Determinants of Effective E-Procurement System: Empirical Evidence from Indonesian Local Governments. *Jurnal Dinamika Akuntansi Dan Bisnis*, 7(1), 33–50.
- Osborne, D., & Dempsey, F. (2023). 19—Supply chain management for bulk materials in the coal industry. In D. Osborne (Ed.), *The Coal Handbook (Second Edition)* (Vol. 1, pp. 619–664). Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-824328-2.00004-2>
- Osei-Tutu, E., Kissi, E., Osei-Tutu, S., & Desmond, A. (2019). *Evaluating critical factors for the implementation of e-procurement in Ghana*.
- Oyelana, O., Kamanzi, J., & Richter, S. (2021). A critical look at exclusive breastfeeding in Africa: Through the lens of diffusion of innovation theory. *International Journal of Africa Nursing Sciences*, 14, 100267. <https://doi.org/10.1016/j.ijans.2020.100267>
- Özbilgin, İ. G., & Imamoğlu, M. Y. (2021). The impact of dynamic purchasing systems in the electronic public procurement processes. *World Conference on Information Technology*, 3, 1571–1575. <https://doi.org/10.1016/j.procs.2011.01.051>
- Peters, B. G. (2022). Institutional theory. In *Handbook on Theories of Governance* (pp. 323–335). Edward Elgar Publishing.
- Polverini, D., Ardente, F., Sanchez, I., Mathieux, F., Tecchio, P., & Beslay, L. (2018). Resource efficiency, privacy and security by design: A first experience on enterprise servers and data storage products triggered by a policy process. *Computers & Security*, 76, 295–310. <https://doi.org/10.1016/j.cose.2017.12.001>

- Reunis, M. R. B., van Raaij, E. M., & Santema, S. C. (2019). Actor-to-actor dissemination of electronic procurement (EP) adoption: An exploration of influencing factors. *The 13th Annual IPSERA Conference - The Purchasing Function: Walking a Tightrope*, 10(4), 201–210. <https://doi.org/10.1016/j.pursup.2004.10.002>
- Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, 25(4), 100552. <https://doi.org/10.1016/j.pursup.2019.100552>
- Schuk, V., Jiménez, M. E. P., & Martin, U. (2022). Technical specifications to meet the requirements of an Automatic Code Compliance Checking tool and current developments in infrastructure construction. *Results in Engineering*, 16, 100650. <https://doi.org/10.1016/j.rineng.2022.100650>
- Senyo, P. K., Effah, J., & Osabutey, E. L. C. (2021). Digital platformisation as public sector transformation strategy: A case of Ghana's paperless port. *Technological Forecasting and Social Change*, 162, 120387. <https://doi.org/10.1016/j.techfore.2020.120387>
- Singh, P. K., & Chan, S. W. (2022). The Impact of Electronic Procurement Adoption on Green Procurement towards Sustainable Supply Chain Performance: Evidence from Malaysian ISO Organizations. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(2), 61. <https://doi.org/10.3390/joitmc8020061>
- Song, M., Fisher, R., & Kwoh, Y. (2019). Technological challenges of green innovation and sustainable resource management with large scale data. *Technological Forecasting and Social Change*, 144, 361–368.
- Sreedevi, R., & Saranga, H. (2017). Uncertainty and supply chain risk: The moderating role of supply chain flexibility in risk mitigation. *International Journal of Production Economics*, 193, 332–342.
- Suleman, S., Ennin, G. K., & O. Iledare, O. (2023). An empirical review of petroleum revenue management and distribution after a decade of oil production and export in Ghana. *The Extractive Industries and Society*, 13, 101228. <https://doi.org/10.1016/j.exis.2023.101228>
- Sunmola, F. T., & Shehu, Y. U. (2020). A case study on performance features of electronic tendering systems. *Procedia Manufacturing*, 51, 1586–1591.
- Timans, R., Wouters, P., & Heilbron, J. (2019). Mixed methods research: What it is and what it could be. *Theory and Society*, 48(2), 193–216.
- University of Derby. (2018). *Centre for Supply Chain Improvement*. <https://www.derby.ac.uk/research/centres-groups/centre-for-supply-chain-improvement/>

- Vaidya, K., & Campbell, J. (2016). Multidisciplinary approach to defining public e-procurement and evaluating its impact on procurement efficiency. *Information Systems Frontiers*, 18(2), 333–348.
- Vegter, D., van Hillegersberg, J., & Olthaar, M. (2023). Performance measurement system for circular supply chain management. *Sustainable Production and Consumption*, 36, 171–183. <https://doi.org/10.1016/j.spc.2023.01.003>
- Walker, H., & Harland, C. (2008). E-procurement in the United Nations: Influences, issues and impact. *International Journal of Operations & Production Management*.
- Waters, D. (2021). *Logistics An Introduction to supply chain management*. Palgrave macmillan.
- Xie, Y., Allen, C., & Ali, M. (2022). Critical success factor based resource allocation in ERP implementation: A nonlinear programming model. *Heliyon*, 8(8), e10044. <https://doi.org/10.1016/j.heliyon.2022.e10044>
- Yang, N., Liao, X., & Huang, W. W. (2014). Decision support for preference elicitation in multi-attribute electronic procurement auctions through an agent-based intermediary. *Decision Support Systems*, 57, 127–138. <https://doi.org/10.1016/j.dss.2013.08.006>
- Yu, A. T. W., Yevu, S. K., & Nani, G. (2020). Towards an integration framework for promoting electronic procurement and sustainable procurement in the construction industry: A systematic literature review. *Journal of Cleaner Production*, 250, 119493. <https://doi.org/10.1016/j.jclepro.2019.119493>
- Zhang, X., Wei, X., Zhang, T., Tan, Y., Xu, D., & Pablos, P. O. de. (2023). How platform-based internet hospital innovation affects doctors' active stress coping efforts: The conservation of resource theory perspective. *Technovation*, 121, 102556. <https://doi.org/10.1016/j.technovation.2022.102556>
- Zheng, M., Li, Y., Su, Z., Fan, Y. V., Jiang, P., Varbanov, P. S., & Klemeš, J. J. (2022). Supplier evaluation and management considering greener production in manufacturing industry. *Journal of Cleaner Production*, 342, 130964. <https://doi.org/10.1016/j.jclepro.2022.130964>

APPENDIX A: QUESTIONNAIRE

QUESTIONNAIRE

This survey instrument was created to assist in the study: ***“AN INVESTIGATION INTO THE ROLE OF ELECTRONIC PROCUREMENT ON SUPPLY CHAIN PERFORMANCE IN THE PUBLIC SECTOR: A CASE STUDY OF ENVIRONMENTAL PROTECTION AGENCY”***

Please take a moment to read the instructions carefully before proceeding to answer the questionnaire. Your responses will be treated with strict confidentiality, and all data collected will be used for research purposes only. There are no right or wrong answers, and your honest opinions and experiences are highly appreciated.

Select the option that best represents your viewpoint or experience by indicating your choice with a tick (✓) or selecting the appropriate response.

Section A: Demographics

1) What is your gender?

Male []

Female []

2) What is your age group?

18-30 []

18-24 []

25-35 []

36-50 []

Above 50 []

3) What is your educational qualification?

Secondary School []

Diploma/Certificate []

1st Degree []

Master's Degree []

Doctorate/Ph.D []

Other []

Please specify

4) How many years have you worked with the firm?

Less than one year []

2-5 years []

More than five years []

Please indicate your level of agreement or disagreement with the following statements using a 5-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Section B: Electronic Procurement Practices	1	2	3	4	5
E-Sourcing is effectively used to identify, evaluate, and select suppliers in our procurement process					
The e-requisitioning system allows employees to electronically submit requests for goods or services with ease.					
The process of creating and submitting electronic purchase orders to selected suppliers is efficient					
Electronic invoicing has streamlined the invoice submission and approval process effectively.					
Our organization effectively manages contracts digitally, including creation, negotiation, execution, and tracking.					
The integration of e-procurement systems with other enterprise systems like ERP or SCM is seamless.					
The system for ensuring compliance with company policies and industry regulations, including the ability to track and record all procurement activities, is well implemented.					
Section C: Supply Chain Performance	1	2	3	4	5
Electronic Procurement has led to notable improvement in procurement cycle times.					
Electronic Procurement has contributed to better cost control in procurement activities.					
Electronic Procurement has positively impacted the accuracy of procurement-related data and documentation.					
The implementation of Electronic Procurement has resulted in increased supplier performance and reliability.					
Electronic Procurement has significantly contributed to better compliance with regulatory requirements in procurement.					
Electronic Procurement has facilitated better communication and collaboration with suppliers.					
The implementation of Electronic Procurement has led to improved tracking and reporting of procurement activities.					

Section C: Challenges	1	2	3	4	5
Resistance from staff members towards adopting Electronic Procurement Practices has been encountered.					
Cultural or organizational barriers have been perceived hindering the smooth integration of Electronic Procurement.					
Technical issues or limitations with the Electronic Procurement system have been experienced.					
Concerns about data security or privacy relating to Electronic Procurement Practices have been encountered					
There is a perceived need for additional training or support for the staff to effectively utilize Electronic Procurement systems.					
The integration of Electronic Procurement has faced resistance due to a lack of understanding or awareness among staff members					
There have been concerns about the compatibility of existing systems with Electronic Procurement practices.					

Thank you for your time and participation. Please do not hesitate to contact the researcher if you have any questions or concerns regarding the questionnaire or the study.

