# INTERNATIONAL JOURNAL OF PUBLIC PROCUREMENT

AN OFFICIAL JOURNAL OF IPPC

VOLUME 2
ISSUE 1
SUMMER 2026

International Journal of Public Procurement

## About IJoPP

The International Journal of Public Procurement (IJoPP) is an open-access, peer-reviewed academic journal dedicated to advancing both theoretical development and practical improvements in public procurement research worldwide. As a key academic platform within the International Public Procurement Conference (IPPC) network, IJoPP strives to maintain a rigorous scholarly standard while ensuring practical relevance and real-world impact.

## About the manuscript subjects and types

The journal welcomes interdisciplinary research contributions covering topics such as procurement policy, strategy and process management, contract and supply chain management, procurement regulations, as well as emerging issues related to new technologies and public procurement, green and sustainable procurement, public procurement for innovation, and transparency.

The journal accepts a wide range of manuscript types, including original research articles, theoretical and practical reviews, in-depth case studies, commentaries, book reviews, and occasionally, reprints of selected government-published research reports. Academic manuscripts should be analytical in nature, demonstrating theoretical development, empirical investigation, or policy analysis, with a clear articulation of the original contribution to the field of public procurement. The journal particularly encourages research that draws on diverse disciplinary perspectives, including public administration, law, economics, political science, behavioral sciences, information systems, and supply chain management. For practice-oriented submissions, authors are encouraged to provide empirically grounded analyses and policy reflections on procurement reforms, institutional design, performance evaluation, and related areas, as well as theoretical frameworks.

For more information about manuscript preparation and submission, please see **INFORMATION FOR CONTRIBUTORS** at the end of this issue.

Copyright © 2026 by IPPA/IPPC. All rights reserved, neither this work nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, microfilming and recording, or by any information storage and retrieval systems without the advance permission in writing from the publisher.

CODEN: IJoPP 2 (1), 1-112 (20260631)
Print ISSN: 1949-2332
Online ISSN: 1949-2340

## EDITOR-IN-CHIEF AND ASSOCIATE EDITORS

**Editor-in-Chief:**

Fuguo Cao, Central University of Finance and Economics, China

**Associate Editors:**

Karem Sayed Aboelazm, United Arab Emirates University, United Arab Emirates
Sabrina Comotto, UNSAM, Argentina
Sergey Tsygankov, Southern Federal University, Russia
Tünde Tátrai, Corvinus University of Budapest, Hungary

## EDITORIAL OFFICE

**Copy Editor:**
Grace Xavier, University of Malaya, Malaysia
**Issue Managing Editors:**
Shaobo Guo, Central University of Finance and Economics, China
Yusen Yang, Central University of Finance and Economics, China

## EDITORIAL BOARD

Aihua Jiang, Central University of Finance and Economics, China
Alessandro Ancarani, University of Catania, Italy
Alex Nduhura, Uganda Management Institute, Uganda
Anders Lunander, Örebro University, Sweden
Andrea Appolloni, University of Rome Tor Vergata, Italy
Andreas H. Glas, Bundeswehr University Munich, Germany
Andrei Ivanov, St. Petersburg University, Russia
Anna Górczyñska, University of Lodz, Poland
Bert Baeyens, Public Procurement Management VIB, Belgium
Cliff McCue, Florida Atlantic University, USA
Conghu Wang, Renmin University of China, China
Dae-In Kim, Ewha Women University, South Korea
Datin Grace Xavier, University of Malaya, Malaysia
Ed Schwerin, Florida Atlantic University, USA
Eric Prier, Florida Atlantic University, USA
Ewa Suwara, Polish Academy of Sciences, Poland
Fuguo Cao, Central University of Finance and Economics,China
Gabriel Bezchinsky, UNSAM, Argentina
Gustavo Piga, University of Rome Tor Vergata, Italy
Joseph Ntayi, Makerere University, Uganda
Karem Sayed Aboelazm, United Arab Emirates University, United Arab Emirates
Katriina Alhola, Finnish Environment Institute, Finland
Kogila Balakrishnan, WMG University of Warwick, UK

Leslie E. Harper, IADB
Michael Essig, Bundeswehr University Munich, Germany
Paul Davis, Dublin City University, Ireland
Ping Wang, Changcun University of Science and Technology, China
Said Boukendour, University of Quebec, Canada
Sabrina Comotto, UNSAM, Argentina
Sebastian Keith Chua,Health Promotion Board, Ministry of Health, Singapore
Sergey Tsygankov, Southern Federal University, Russia
Sirilaksana Khoman, National Anti-Corruption Commission, Thailand
Teresa Medina-Arnáiz, University of Burgos, Spain
Tünde Tátrai, Corvinus University of Budapest, Hungary
Veiko Lember, Tallinn University of Technology Ragnar Nurkse, Tallinn, Estonia
Xiaoping Zhang, Central University of Finance and Economics, China

INVITATION TO AUTHORS

*International Journal of Public Procurement (IJoPP)* encourages practitioners and scholars to submit manuscripts dealing with the practice and study of public procurement at all levels of government in every country.

*Manuscript Submissions*: Please see "Information for Contributors" at the end of this issue for manuscript style and submissions.

*Suggestions*: *IJoPP* invites readers to submit comments, communications and suggestions for the reprinting of informative government reports to the Editor-in-Chief (Email: caofuguo@cufe.edu.cn). For further information, please visit http://www.ippa.org.

# Volume 2, Issue1, Summer 2026

# CONTENT

***EDITORIAL: PUBLIC PROCUREMENT GOVERNANCE IN THE DIGITAL AGE*** ..... **1**
*Fuguo Cao, Joseph M. Ntay*

***E-PROCUREMENT COMPONENTS AND PUBLIC PROCUREMENT PERFORMANCE IN TANZANIAN PROCURING ENTITIES: DOES E-CONTRACTING MATTER?*** ..... **5**
*Deus N. Shatta*

***ARTIFICIAL INTELLIGENCE AS AN INTEGRATIVE CATALYST FOR PUBLIC PROCUREMENT GOVERNANCE*** ..... **30**
*Jean Pacifique Nkurunziza*

***STAKEHOLDER ENGAGEMENT, GOVERNMENT PROCUREMENT POLICY, AND GREEN PUBLIC PROCUREMENT PERFORMANCE: EVIDENCE FROM PROCUREMENT AND DISPOSAL ENTITIES IN KAMPALA, UGANDA*** ..... **52**
*Nazziwa Hajarah, Sheila Namagembe, Fredrick Aliganyira and Azida Aisha Moya*

***PUBLIC PROCUREMENT IN THE AGE OF AI: CONTRACT ADAPTATION, RENEGOTIATION AND THE LIMITS OF CONTRACTUAL RIGIDITY*** ..... **68**
*Milagros Ibarzabal*

***TOWARD A CONVERGENT THEORY OF PUBLIC PROCUREMENT: INTEGRATING GOVERNANCE, DIGITALISATION, AND SUSTAINABILITY INTO A UNIFIED VALUE-BASED PROCUREMENT SYSTEM*** ..... **90**
*Joseph M. Ntayi, Beatrice Nyakeishiki, Nabiira Nantongo, Benjamin Tukamuhabwa, Bonny Bagenda*

***FORGING A NEW PARADIGM IN PUBLIC ADMINISTRATION: REFRAMING PUBLIC PROCUREMENT EFFECTIVENESS THROUGH A MID-RANGE SYSTEMS THEORY IN THE DIGITAL GOVERNANCE ERA*** ..... **112**
*Aida Nyenje Lubwama , Abdu Mutanje*

## SYMPOSIUM ON INTERNATIONAL PUBLIC PROCUREMENT CONFERENCE: PART I

# EDITORIAL: PUBLIC PROCUREMENT GOVERNANCE IN THE DIGITAL AGE

Fuguo Cao, Joseph M. Ntayi

We are pleased to present Volume 2 (2026), Issue 1 of the International Journal of Public Procurement. The contributions in this issue examine public procurement at a moment when governments are adopting digital tools, confronting new contractual risks, and being asked to reconcile efficiency with integrity, legitimacy, sustainability, and public value. Read together, the articles make a central point: procurement reform cannot be reduced to acquiring technology or complying with procedure. It depends on the institutional and managerial capacity to connect each stage of the procurement cycle to public purposes and to learn from evidence.

The scale of procurement helps explain why these questions matter. Across OECD countries, public procurement represented 12.9% of GDP in 2021, and its role increasingly extends to policy objectives such as sustainability and innovation (OECD, 2023; OECD, 2025). This reach brings opportunity, but also demanding choices: how to digitize without mistaking automation for accountability; how to pursue multiple policy goals without obscuring trade-offs; and how to preserve competition and public control when purchased technologies change rapidly. The six articles in this issue address these questions from complementary empirical, conceptual, legal, and administrative perspectives.

Deus N. Shatta's study of e-procurement in Tanzanian procuring entities begins with the procurement lifecycle itself. Using survey and documentary evidence from 435 respondents, the article finds that e-evaluation is the strongest predictor of performance in the proposed model, while e-contracting also has a significant positive direct relationship. E-evaluation mediates the relationships between e-sourcing, e-tendering, and performance. These findings shift attention from whether an e-procurement platform has been adopted to how its components work together. Digital sourcing and

---

*Fuguo Cao is the president of the International Public Procurement Conference. He is Chair Professor of Law, Law School and School of Public Finance &Taxation, Central University of Finance and Economics. Dean, Chinese Academy of PPP Governance, Central University of Finance and Economics. (Email: caofuguo@cufe.edu.cn)*
*Joseph M. Ntayi is Professor of Procurement, Logistics and Supply Chain Management at Makerere University Business School (MUBS), Uganda. He is the former Dean of the Faculty of Economics, Energy and Management Sciences and the Faculty of Computing and Management Science at MUBS. His research interests include public procurement, supply chain management, business ethics and strategic management. (Email: jntayi@mubs.ac.ug)*

Copyright © 2026 by IPPA/IPPC

tendering can create records and widen access, but their performance value depends on credible evaluation and effective contract execution. This is consistent with the broader lesson that digital procurement systems need integration, usable data, and institutional capability to realize their benefits (World Bank, 2022).

Jean Pacifique Nkurunziza's theory-building article considers artificial intelligence as a possible integrative catalyst for procurement governance. Synthesizing literature and illustrative cases from Uganda, Rwanda, Kenya, and Tanzania, it proposes a configurational framework and identifies enabling conditions and limits. AI may connect information and decision processes that are otherwise fragmented, yet it can also reproduce power asymmetries, infrastructure gaps, or model drift. The article's emphasis on boundary conditions is important: algorithmic tools do not resolve governance problems by themselves. Their value depends on data quality, human oversight, explainability, and the ability to contest or correct decisions. Research on AI in government similarly emphasizes the need to build governance and data safeguards into implementation from the outset (World Bank, 2021).

Nazziwa Hajarah and colleagues examine how stakeholder engagement and government procurement policy relate to green public procurement (GPP) performance in Kampala, Uganda. Based on survey data from 84 Procurement and Disposal Entities, the study finds that both factors are positively associated with GPP performance, with government procurement policy the stronger predictor. Together, they account for 27.0% of the variance in reported performance. By bringing stakeholder theory and institutional theory together, the article highlights how formal policy and meaningful participation can support the implementation of environmental objectives in public procurement. Its findings add empirical evidence from Uganda and point to the importance of clear policy frameworks and sustained stakeholder engagement in advancing green procurement.

Joseph M. Ntayi and colleagues develop a convergent theory of public procurement that integrates governance, digitalisation, and sustainability within a unified value-based system. Their article brings together perspectives that are often treated separately and frames procurement as a connected system for creating public value. This framework complements the issue's empirical and policy-focused contributions by showing how different procurement objectives can be considered together. It also offers a basis for future research into how governance arrangements, digital capabilities, and sustainability goals interact in practice.

Milagros Ibarzabal's analysis of AI procurement turns to the contract after award. AI systems and other data-intensive technologies change through updates, depend on data, and bring cybersecurity, interoperability, performance, and vendor lock-in concerns. Contracts premised on fixed specifications can therefore become difficult to administer, while informal adaptation can weaken transparency and competition. The article argues for governed adaptability: change mechanisms that are predictable, traceable, and auditable while preserving public purpose. This is a timely contribution to procurement practice. Contract flexibility should be designed before implementation, with clear rules for monitoring, data access, updates, security, exit, and review. That

design can help administrations respond to change without abandoning integrity or value for money.

Finally, Aida Nyenje Lubwama and Abdu Mutanje reframe procurement effectiveness through mid-range systems theory in the digital governance era. By positioning procurement within a wider administrative system, their approach draws attention to the connections among capability, institutional context, digital processes, and results. This complements the issue's lifecycle perspective: procurement outcomes depend on the interaction of actors and systems, not on a single tender or platform. It also invites more precise empirical work on how administrative capacity and governance quality shape the effects of digital reform across different contexts.

Taken together, the issue presents a research agenda organized around connection. Digital systems must connect sourcing, evaluation, contracting, and performance monitoring. AI must connect analytical capacity to accountable institutions. Contract rules must connect adaptability to public-law safeguards. Procurement goals must connect operational decisions to the broader values they are meant to serve. And governance, digitalisation, and sustainability must be considered together when assessing how procurement creates public value. These connections should be evaluated with evidence that distinguishes adoption from use, procedural compliance from outcomes, and promised public value from measured results. Future studies can strengthen this agenda through longitudinal designs, cross-country comparisons, implementation research, and transparent measures of efficiency, integrity, sustainability, and service outcomes.

We hope this issue supports continued exchange among researchers, public officials, suppliers, and citizens. Public procurement is a practical instrument of government and an important field of inquiry. Its future will depend on whether institutions can use digital innovation while remaining open to scrutiny, responsive to changing needs, and clear about the values they pursue.

**References**

Grandia, J., & Meehan, J. (2017). Public procurement as a policy tool: Using procurement to reach desired outcomes in society. International Journal of Public Sector Management, 30(4), 302–309. https://doi.org/10.1108/IJPSM-03-2017-0066

Hajarah, N., Namagembe, S., Aliganyira, F., & Moya, A. A. (2026). Stakeholder engagement, government procurement policy, and green public procurement performance: Evidence from procurement and disposal entities in Kampala, Uganda. International Journal of Public Procurement, 2(1), 54–70.

Ibarzabal, M. (2026). Public procurement in the age of AI: Contract adaptation, renegotiation and the limits of contractual rigidity. International Journal of Public Procurement, 2(1),71-93.

Lubwama, A. N., & Mutanje, A. (2026). Forging a new paradigm in public administration: Reframing public procurement effectiveness through a mid-range systems theory in the digital governance era. International Journal of Public Procurement, 2(1),117-136.

Nkurunziza, J. P. (2026). Artificial intelligence as an integrative catalyst for public procurement governance. International Journal of Public Procurement, 2(1),32-53.

Ntayi, J. M., Nyakeishiki, B., Nantongo, N., Tukamuhabwa, B., & Bagenda, B. (2026). Toward a convergent theory of public procurement: Integrating governance, digitalisation, and sustainability into a unified value-based procurement system. International Journal of Public Procurement, 2(1),94-116.

OECD. (2023). Public procurement performance: A framework for measuring efficiency, compliance and strategic goals. OECD Public Governance Policy Papers. https://doi.org/10.1787/0dde73f4-en

OECD. (2025). Implementing the OECD Recommendation on Public Procurement in OECD and Partner Countries: 2020–2024 Report. OECD Publishing. https://doi.org/10.1787/02a46a58-en

Shatta, D. N. (2026). E-procurement components and public procurement performance in Tanzanian procuring entities: Does e-contracting matter? International Journal of Public Procurement, 2(1),5-31.

World Bank. (2021). Artificial intelligence in the public sector: Maximizing opportunities, managing risks. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/809611616042736565

World Bank. (2022). Disruptive technologies in public procurement: Synthesis report. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/173331642410951798

# E-PROCUREMENT COMPONENTS AND PUBLIC PROCUREMENT PERFORMANCE IN TANZANIAN PROCURING ENTITIES: DOES E-CONTRACTING MATTER?

Deus N. Shatta*

***Suggested citation: Shatta, D. N. (2026). E-procurement components and public procurement performance in Tanzanian procuring entities: Does e-contracting matter? International Journal of Public Procurement, 2(1),5-29.***

**Abstract**

Public procurement in developing countries continues to face weak contract management, procurement delays, limited transparency and poor value for money despite the adoption of electronic procurement (e-procurement). This study examines how e-sourcing, e-tendering, e-evaluation and e-contracting influence public procurement performance in Tanzanian procuring entities. Drawing on the Technology–Organization–Environment framework, Resource-Based View and Transaction Cost Theory, it employs a descriptive and explanatory cross-sectional survey design. Data from 435 respondents, selected through stratified sampling from entities using the National e-Procurement System of Tanzania, were analysed using partial least squares structural equation modelling. The model explains 50.9% of the variance in public procurement performance and 41.4% in e-evaluation. E-evaluation is the strongest predictor of procurement performance ($\beta = 0.563$, $p < 0.001$), while e-contracting also has a significant positive direct effect ($\beta = 0.210$, $p < 0.001$). E-evaluation mediates the relationships of e-sourcing and e-tendering with procurement performance, demonstrating that benefits across the procurement lifecycle depend on effective integration rather than technology adoption alone. The findings contribute a multi-theoretical account of e-procurement performance and provide practical guidance for strengthening e-evaluation and e-contracting capabilities in Tanzania and comparable developing-country settings.

**Keywords**

e-procurement; public procurement performance; e-evaluation; e-contracting; Tanzania

## 1. Introduction

**Public procurement performance** remains a major concern in developing countries, including Tanzania, where inefficiencies, procurement delays, weak contract management, limited transparency, and compliance challenges continue to undermine

*Dr. Deus N. Shatta is a Senior Lecturer, Researcher, Reviewer, and Consultant in Procurement, Transport, Logistics, and Supply Chain Management at the Department of Management Sciences, National Institute of Transport, Dar es Salaam, Tanzania. The corresponding author is Dr. Deus N. Shatta (email: deusshatta@gmail.com; ORCID: https://orcid.org/0000-0003-1852-6070 ).*

Copyright © 2026 by IPPA/IPPC

value for money and effective service delivery [1,2]. In response, governments have increasingly adopted **electronic procurement (e-procurement)** systems to enhance accountability, efficiency, and transparency [3–9]. Evidence shows that e-procurement improves procurement performance through greater transparency, accountability, efficiency, and value for money [7,10–15].

In Tanzania, the **National e-Procurement System of Tanzania (NeST)** was introduced to digitalize procurement activities, including supplier registration, tender publication, bid submission, evaluation, reporting, and contract management. Despite this progress, public procuring entities continue to face challenges related to user competence, digital infrastructure, compliance, contract monitoring, and procurement delays [16]. These challenges justify examining how specific e-procurement components contribute to procurement performance in Tanzania.

E-procurement comprises several interrelated components, including e-sourcing, e-tendering, e-evaluation, e-contracting, e-ordering, e-informing, e-purchasing, and e-payment [17–25]. This study focuses on e-sourcing, e-tendering, e-evaluation, and e-contracting because they represent the core stages of the procurement lifecycle, from supplier identification to contract execution, and collectively promote efficiency, accountability, transparency, and value for money [5,6,19,26–30]. Despite their interrelated nature, these four components differ in their objectives and the performance outcomes they are intended to deliver in public procurement [31].

Theoretically, studies on e-procurement adoption and performance emphasize the interaction of technological, organizational, and environmental factors. The **Technology–Organization–Environment (TOE)** framework highlights the role of organizational readiness, technological infrastructure, and environmental conditions in influencing adoption [31–33]. The **Resource-Based View (RBV)** perspective further emphasizes the importance of internal resources, information quality, and organizational capabilities in generating performance gains from e-procurement investments [33].

Recent studies increasingly integrate adoption and strategic theories to strengthen explanatory power in technology-enabled procurement contexts [9,13,27,32,34–38].

Despite the growing body of research integrating theoretical perspectives, empirical studies have rarely combined TOE, RBV, and Transaction Cost Theory (TCT) within a single integrated framework to explain both e-procurement adoption and public procurement performance [31,33,39]. This theoretical gap limits a comprehensive understanding of how technological, organizational, environmental, resource-based, and transaction-cost factors jointly influence e-procurement adoption and its subsequent influence on public procurement performance. Therefore, the current study integrates TOE, RBV, and TCT to develop a more robust and holistic explanatory framework for examining e-procurement adoption and public procurement performance among procuring entities in Tanzania.

## 2. Literature Review

## 2.1 Theoretical Foundations

This study is grounded in the TOE framework, RBV theory, and TCT. TOE emphasizes technological readiness, organizational capacity, and environmental pressures as key factors influencing adoption decisions, with studies showing that elements such as top management support, Information Technology (IT) resources, and regulatory pressure significantly affect adoption [32]. RBV theory clarifies that a firm's sustained competitive advantage comes from its valuable, unique, rare, and difficult-to-imitate internal resources and capabilities. In the context of e-procurement, RBV highlights how internal organizational and technological resources, such as e-evaluation capabilities and top management support, enable firms to transform e-procurement inputs into improved performance outcomes. Similarly, technological factors such as organizational readiness and relative advantage significantly influence e-procurement adoption, which in turn enhances organizational performance. In addition, RBV provides a strong framework for understanding how strategically leveraging internal resources supports effective e-procurement application and improved organizational performance [34]. TCT explains how digital procurement systems, particularly e-contract management, enhance monitoring, reduce opportunism, and minimize transaction costs through improved governance structures [38].

## 2.2 Empirical Studies and Hypotheses Development

Empirical evidence further reinforces this theoretical position by demonstrating that e-procurement components improve communication, transparency, compliance, and coordination among stakeholders, leading to enhanced procurement outcomes [31,40]. However, the persistence of inefficiencies in public procurement performance suggests that the interaction between different e-procurement components (e-sourcing, e-tendering, e-evaluation, and e-contracting), particularly the role of e-contracting, remains insufficiently understood. In this study, public procurement performance refers to the extent to which procurement activities deliver value for money, efficiency, transparency, accountability, quality, and timely service delivery while complying with procurement laws and regulations [41].

### 2.2.1 E-Sourcing and Public Procurement Performance

E-**sourcing** is defined as the initial stage of the public procurement process conducted through e-procurement systems, enabling systematic supplier identification, prequalification, and engagement. It promotes supplier diversity, enhances competition, reduces transaction costs, and strengthens transparency and fairness in supplier selection [5,6,19,27,29]. Empirical evidence further indicates that e-sourcing reduces information asymmetry, improves auditability, supports informed decision-making, and enhances supply chain performance [5,6,27,29].

Studies conducted in African countries demonstrate that e-sourcing improves procurement performance by shortening procurement cycles, lowering transaction costs, strengthening supplier relationships, and enhancing accountability through structured supplier information systems and audit trails [19,20]. However, evidence suggests that its effect on procurement performance is often indirect. E-sourcing facilitates **e-evaluation** by providing accurate and organized supplier information, thereby

improving evaluation quality and procurement decisions. Conversely, without effective evaluation and contract management mechanisms, the direct performance gains of e-sourcing may be constrained [42]. Therefore, this study hypothesizes that e-sourcing indirectly influences public procurement performance through e-evaluation.

***H1:*** *E-sourcing has a positive and significant indirect effect on public procurement performance through e-evaluation.*

### 2.2.2 E-Tendering and Public Procurement Performance

E-**tendering** is defined as the bidding stage of e-procurement that automates tender advertisement, submission, and opening processes. It enhances procurement efficiency by reducing procurement cycle times, increasing supplier participation, and minimizing opportunities for corruption and fraud through greater standardization, transparency, and regulatory compliance. Additionally, e-tendering promotes fair competition among bidders and strengthens the integrity of procurement processes [5,6,27,29].

Empirical evidence from East African countries demonstrates that e-tendering is a significant driver of procurement transparency, accountability, and operational efficiency. Studies show that it broadens supplier participation, shortens procurement cycle times, and improves procurement outcomes by automating tender advertisement, bid submission, evaluation, and contract award processes [22,23]. Furthermore, e-tendering supports **e-evaluation** by providing accurate, timely, and transparent bid information, thereby improving the quality and objectivity of supplier assessments. However, its effectiveness may be constrained by low digital literacy, inadequate Information and Communication Technology (ICT) infrastructure, and system integration challenges [43]. Consequently, this study hypothesizes that e-tendering indirectly influences public procurement performance through e-evaluation.

***H2:*** *E-tendering has a positive and significant indirect effect on public procurement performance through e-evaluation.*

### 2.2.3 E-Evaluation and Public Procurement Performance

E-**evaluation** is defined as a critical stage of the e-procurement process that facilitates the accurate, objective, and transparent assessment of supplier bids. It reduces human bias, enhances consistency in the application of evaluation criteria, and supports evidence-based procurement decisions. Empirical studies indicate that e-evaluation improves public procurement outcomes by ensuring contracts are awarded to the most qualified suppliers, contractors, or service providers while maintaining compliance with regulatory requirements [5,29,44].

The literature further highlights the pivotal role of e-evaluation as a mechanism that transforms inputs generated through e-sourcing and e-tendering into effective procurement decisions and improved organizational performance [40]. By enhancing transparency, accountability, record management, and decision accuracy, e-evaluation reduces errors and limits opportunities for corruption in supplier selection and contract implementation [40]. However, its effectiveness depends on the availability of structured and reliable supplier information from e-sourcing and e-tendering, as well as

adequate system integration and user competence [11]. Consistent with the RBV, this study proposes that e-evaluation directly influences public procurement performance.

***H3:*** *E-evaluation has a positive and significant direct effect on public procurement performance.*

#### *2.2.4 Mediation Hypotheses*

***H4:*** *E-evaluation mediates the relationship between e-sourcing and public procurement performance.*

***H5:*** *E-evaluation mediates the relationship between e-tendering and public procurement performance.*

### 2.2.5 E-Contract Management and Public Procurement Performance

E**-contracting** refers to a contractual agreement in which offer and acceptance are exchanged through electronic communication technologies without the physical presence of the contracting parties [1]. As a key post-award component of e-procurement, e-contracting supports contract execution, monitoring, and enforcement while enhancing accountability, transparency, communication, and governance throughout the contract lifecycle. It also reduces contract disputes and opportunistic behavior, thereby improving procurement effectiveness [7,27–29].

The literature identifies e-contracting as an essential mechanism for strengthening stakeholder coordination, facilitating information sharing, and ensuring compliance during contract implementation [7,8,45]. Empirical evidence further suggests that effective e-contract management enhances supply chain performance and improves contract implementation outcomes [31,46–48]. Despite these benefits, e-contracting remains one of the least adopted e-procurement components, particularly in developing countries, due to limited technical capacity, infrastructure constraints, and system interoperability challenges [48]. These limitations can undermine gains achieved in earlier procurement stages. Consequently, this study hypothesizes that e-contracting directly influences public procurement performance.

***H6:*** *E-contracting has a positive and significant direct effect on public procurement performance.*

## 2.3 Conceptual Framework of the Study

While existing studies have confirmed that individual e-procurement components contribute to improved procurement outcomes, limited empirical evidence exists on how these components operate collectively and interact throughout the procurement lifecycle to influence public procurement performance. In particular, the direct influences, indirect effects, and interdependencies among e-tendering, e-sourcing, e-evaluation, and e-contracting remain inadequately explored. Furthermore, a notable theoretical gap exists in the literature, as previous studies have predominantly relied on a single theoretical perspective or a combination of two perspectives to explain either technology adoption or performance outcomes. Limited attention has been given to integrating these complementary theories within a unified framework capable of explaining both the adoption and performance implications of e-procurement systems across the procurement lifecycle. To address these gaps, the present study develops a

conceptual framework, presented in Figure 1, that examines the relationships among e-procurement components and their influence on public procurement performance in Tanzanian procuring entities. The conceptual framework suggests that e-sourcing and e-tendering contribute to public procurement performance through e-evaluation, which acts as a mediating variable. Specifically, e-evaluation facilitates the conversion of information generated through electronic sourcing and tendering into transparent, objective, and effective procurement decisions that enhance public procurement performance. In contrast, e-contracting exerts a direct influence on public procurement performance through improved contract administration, monitoring, compliance, and stakeholder coordination. In addition, by adapting TOE, RBV, and TCT, the conceptual framework provides a more comprehensive explanation of how e-procurement components interact throughout the procurement lifecycle to enhance efficiency, transparency, accountability, and value for money in public procuring entities.

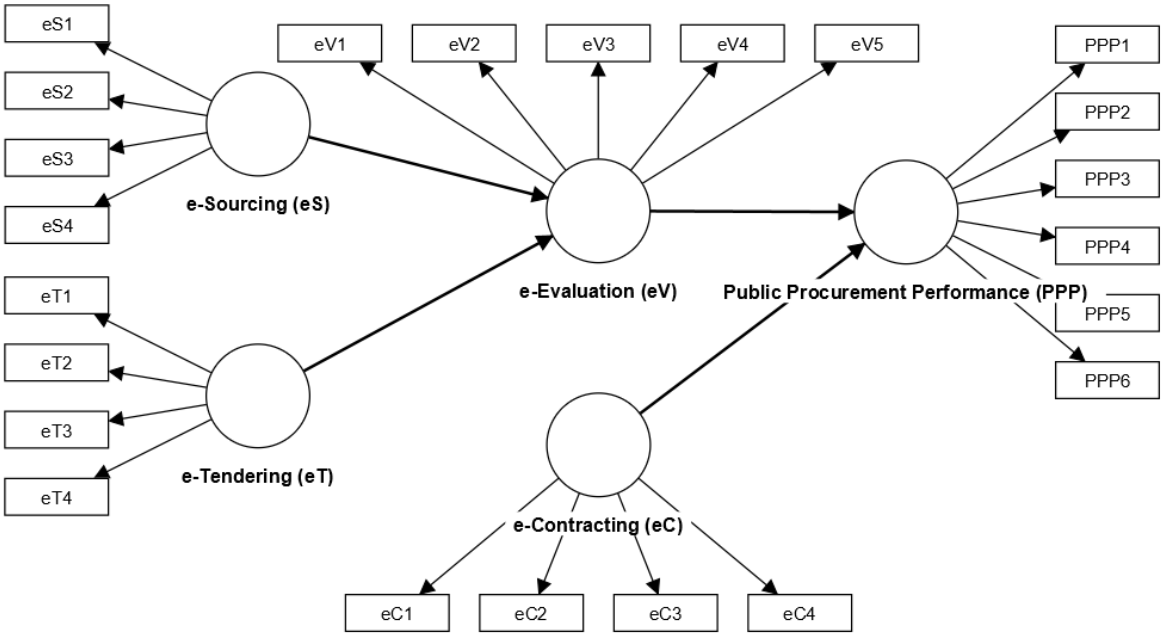



**Figure 1. Proposed Conceptual Model of the Study**

## 2.4 Mathematical Model of the Study

The study adopted the measurement model commonly used in partial least squares structural equation modeling (PLS-SEM) to represent the relationship between latent constructs and their observed indicators. This relationship is expressed mathematically as: $x = \lambda Y + \varepsilon$, where x denotes the observed variable, Y represents the unobserved construct, $\lambda$ is the factor loading coefficient, and $\varepsilon$ captures the measurement error term [49,50].

## 3. Methodology

The study adopted a positivist research philosophy, which is grounded in the assumption that reality is objective, measurable, and can be examined through empirical observation and statistical analysis. The choice of positivism is appropriate given the study's aim to systematically test hypothesized relationships between e-procurement

components (e-sourcing, e-tendering, e-evaluation, and e-contracting) and public procurement performance using established scientific methods. This philosophical stance supports the use of quantitative techniques and structured data collection to ensure reliability, objectivity, and generalizability of findings [51]. In line with this philosophy, the study employed a descriptive and explanatory cross-sectional survey design. The descriptive aspect allows for the characterization of respondents' perceptions regarding e-procurement components and public procurement performance, while the explanatory component facilitates the testing of relationships among variables. The cross-sectional approach involves collecting data at a single point in time from a defined population, making it suitable for capturing current practices and relationships within public procurement performance [51].

In addition, the study employed a survey methodology as the primary data collection method, given its effectiveness in gathering standardized data from a relatively large sample. Structured questionnaires with closed-ended questions were employed to ensure consistency, ease of analysis, and compatibility with quantitative statistical techniques. These items were measured using predefined numerical scales, enabling precise quantification and facilitating both descriptive and inferential statistical analysis. Respondents were selected through stratified sampling from procuring entities, including central government institutions and local government authorities that were active users of the National e-Procurement System of Tanzania (NeST). The respondents comprised procurement officers, supplies officers, contract managers, ICT officers responsible for supporting NeST, and heads of procurement units.

An appropriate sample size was determined using the widely recognized "10-times rule" recommended for PLS-SEM [52]. According to this rule, the minimum sample size should be at least ten times the maximum number of indicators used to measure a single latent construct or the largest number of structural paths directed at a particular construct. However, a substantially larger sample of 435 respondents was collected, which enhances the statistical power, strength, and generalizability of the findings. The evaluation process followed the two-step approach recommended by Hair et al. [52], consisting of assessment of the measurement model (outer model) and assessment of the structural model (inner model). The results indicate that all recommended evaluation criteria for the measurement and structural models were successfully met.

### 3.1 Variables and Measurement Procedures

This study employed both demographic and study variables, which were measured using appropriate scales and analytical procedures. Demographic information, including gender, age, educational attainment, and work experience, was collected to provide a detailed profile of the respondents, assess the representativeness and suitability of the sample, and facilitate a deeper understanding of the contextual factors that may influence perceptions and utilization of e-procurement systems within procuring entities. Gender was measured using a nominal scale, coded as 1 = Male and 2 = Female. Educational attainment was also measured categorically, ranging from 1 =

Certificate Level to 4 = Master's Degree. Age and work experience were measured using ratio scales and recorded in years to facilitate meaningful quantitative analysis.

The study variables comprised independent variables (e-sourcing and e-tendering), a mediating variable (e-evaluation), a dependent variable (public procurement performance), and an additional independent variable (e-contracting). These constructs were operationalized using multiple indicators adapted from relevant literature and measured through respondents' perceptions. Data for these variables were collected using a structured questionnaire with closed-ended items measured on a five-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. The use of the Likert scale enabled the quantification of respondents' perceptions regarding the extent to which e-procurement components influence public procurement performance.

The collected data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics were employed using **IBM SPSS Statistics Version 26**, which facilitated data screening, coding, and preliminary analysis, while PLS-SEM through **SmartPLS 4 software** was used to assess the reliability and validity of the measurement model and to test the hypothesized relationships among the study constructs. This measurement approach ensured consistency, reliability, and validity in assessing the relationships between e-procurement components and public procurement performance.

## 4. Results

### 4.1 Demographic Characteristics of the Respondents

The demographic characteristics of the respondents presented in Table 1 reveal notable patterns in gender, age, education, and work experience. In terms of gender, females constituted 59.8% of respondents, compared with 40.2% male respondents. This indicates a higher female representation in the study and reflects the gender distribution within the targeted population [3,4,31]. Regarding age distribution, the majority of respondents were in the 21–30 age group (51.0%), followed by the 31–40 age group (24.4%) and the 41–50 age group (21.8%), while those in the 51–60 age group constituted only a small proportion (2.8%). This suggests that the sample was predominantly young and in the early stages of their career, which may influence their familiarity with digital systems such as e-procurement. More recently educated employees may also be more receptive to ICT-based innovations [53–55].

In terms of educational attainment, relatively few respondents held diplomas (11.7%) or certificates (3.0%), while most held bachelor’s degrees (63.0%) or master’s degrees (22.3%). This indicates a highly educated sample, suggesting that respondents possessed the necessary knowledge and skills to engage with e-procurement systems effectively, consistent with evidence that higher education and ICT skills facilitate the adoption and effective use of e-procurement technologies [53–57]. Regarding work experience, the majority of respondents had one to ten years of experience (80.7%), followed by those with eleven to twenty years (11.3%), twenty-one to thirty years (5.5%), and thirty-one or more years (2.5%). This strengthens the earlier observation

that the sample was largely composed of early- to mid-career professionals [25,53,54,57]. Generally, this demographic composition of respondents from procuring entities that were active users of NeST was important when interpreting the findings, particularly in relation to the adoption of e-procurement components and their influence on public procurement performance. These findings are supported by current literature, which asserts that ICT readiness and organizational human capital shape e-procurement outcomes [14,15].

**Table 1. Demographic Characteristics of the Respondents (n = 435)**

| Characteristics | | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 175 | 40.2 |
| | Female | 260 | 59.8 |
| Age Group | 21-30 | 222 | 51.0 |
| | 31-40 | 106 | 24.4 |
| | 41-50 | 95 | 21.8 |
| | 51-60 | 12 | 2.8 |
| Education | Certificate Level | 13 | 3.0 |
| | Diploma Level | 51 | 11.7 |
| | Bachelor's Degree | 274 | 63.0 |
| | Master's Degree | 97 | 22.3 |
| Experience | 1-10 | 351 | 80.7 |
| | 11-20 | 49 | 11.3 |
| | 21-30 | 24 | 5.5 |
| | 31+ | 11 | 2.5 |

### 4.2 Outer Loadings, Path Coefficients and $R^2$ Values

Figure 2. provides a comprehensive view of the outer loadings, path coefficients, and $R^2$ values, highlighting how e-procurement components influence public procurement performance (PPP). All indicator loadings in the measurement model were generally above the recommended threshold of 0.708, confirming good indicator reliability [52].

Similarly, the model explains a significant proportion of the variance in public procurement performance (PPP) ($R^2 = 0.509$) and a moderate proportion of the variance in e-evaluation ($R^2 = 0.414$). This indicates that the model has reasonable explanatory capability for the mediating construct (eV) and strong explanatory power for the target construct (PPP). E-evaluation has a strong direct effect on public procurement performance (eV → PPP: $\beta = 0.563$), confirming it as the strongest predictor, followed by e-tendering, which shows a positive effect on e-evaluation (eT → eV: $\beta = 0.478$). Likewise, e-sourcing ($\beta = 0.264$) and e-contracting ($\beta = 0.210$) significantly influence e-evaluation and public procurement performance, respectively.

Based on these results, the model indicates that public procurement performance (PPP) is driven directly by e-evaluation and e-contracting, while e-sourcing and e-tendering play indirect and supportive roles in influencing public procurement performance. The model demonstrates strong measurement properties and provides a coherent basis for interpreting the structural relationships.

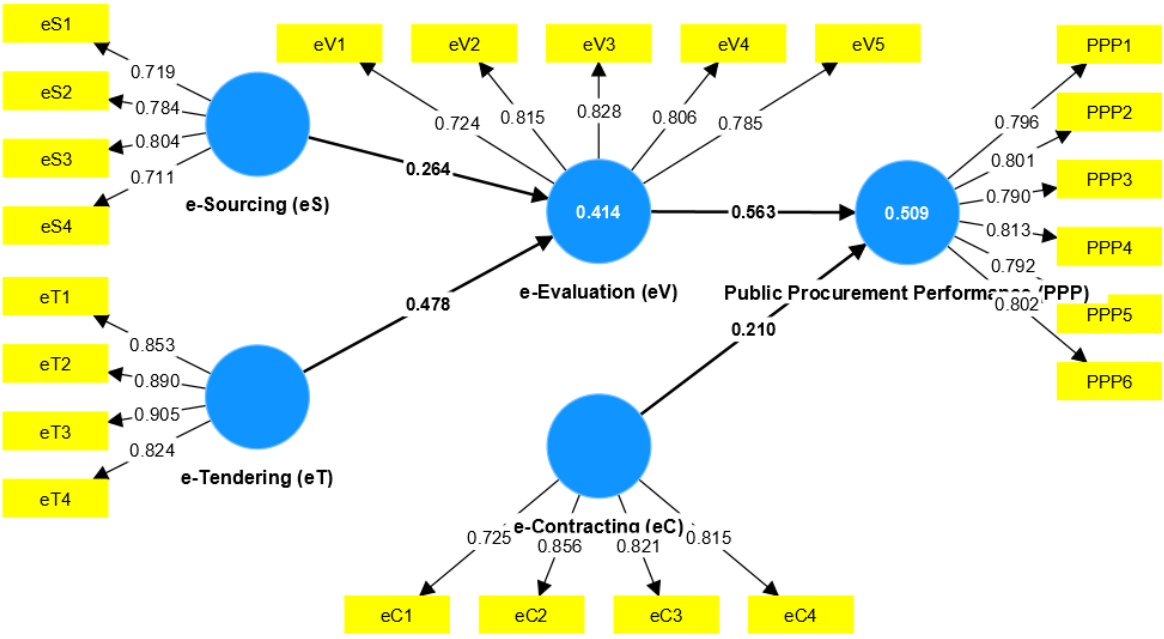



**Figure 2. Outer Loadings, Path Coefficients and $R^2$ Values**

### 4.3 Reliability and Validity Results

The validity and reliability results in Table 2 indicate that the measurement model demonstrates adequate convergent validity and strong internal consistency across all constructs. Hair et al. [52] assert that average variance extracted (AVE) values above 0.50 in PLS-SEM confirm that a construct explains more than half of the variance of its indicators, while composite reliability (CR) values above 0.708 indicate satisfactory reliability. All constructs in the model exceeded the recommended thresholds for composite reliability, with values ranging from 0.841 to 0.925, indicating high internal consistency. In particular, e-tendering (CR = 0.925) shows the highest reliability, suggesting that its indicators are highly consistent in measuring the construct.

In terms of convergent validity, all average variance extracted (AVE) values were above the minimum requirement of 0.50, ranging from 0.571 to 0.755. These results indicate that each construct explains a substantial proportion of the variance in its indicators, meeting the established criteria for convergent validity and internal consistency. This provides a sound foundation for interpreting the structural relationships in the model, particularly the role of e-procurement components in explaining public procurement performance.

**Table 2. Reliability and Validity Results**

| Construct | Composite Reliability (CR) | Average Variance Extracted (AVE) |
|---|---|---|
| Public Procurement Performance (PPP) | 0.914 | 0.638 |
| e-Contracting (eC) | 0.881 | 0.649 |
| e-Evaluation (eV) | 0.894 | 0.628 |
| e-Sourcing (eS) | 0.841 | 0.571 |

| | | |
|---|---|---|
| e-Tendering (eT) | 0.925 | 0.755 |

### 4.4 Discriminant Validity Results

Table 3. shows the discriminant validity results using the Heterotrait–Monotrait Ratio (HTMT) criterion. The HTMT values ranged from 0.539 to 0.794, which are below the recommended threshold of 0.85 [52]. Therefore, discriminant validity was established, indicating that e-Contracting, e-Evaluation, e-Sourcing, e-Tendering, and Public Procurement Performance are distinct constructs.

**Table 3. Discriminant Validity Results**

| | Public Procurement Performance (PPP) | e-Contracting (eC) | e-Evaluation (eV) | e-Sourcing (eS) |
|---|---|---|---|---|
| e-Contracting (eC) | 0.652 | | | |
| e-Evaluation (eV) | 0.794 | 0.746 | | |
| e-Sourcing (eS) | 0.539 | 0.556 | 0.601 | |
| e-Tendering (eT) | 0.587 | 0.694 | 0.669 | 0.558 |

### 4.5 Variance Inflation Factor (VIF) Results

In PLS-SEM, Variance Inflation Factor (VIF) values are evaluated using thresholds of 5 (liberal) or 3.3 (strict), where values above these thresholds may indicate problematic collinearity [52]. The results presented in Table 4 indicate that there were no serious multicollinearity issues in the model. All VIF values ranged between 1.263 and 1.649, which were below the critical level of 5 and well below the conservative threshold of 3.3. This suggests that the predictor constructs are sufficiently distinct from one another and do not excessively overlap in explaining the endogenous constructs.

**Table 4. Collinearity Statistics**

| **Construct** | **Public Procurement Performance (PPP)** | **e-Evaluation (eV)** |
|---|---|---|
| e-Contracting (eC) | 1.649 | |
| e-Evaluation (eV) | 1.649 | |
| e-Sourcing (eS) | | 1.263 |
| e-Tendering (eT) | | 1.263 |

### 4.6 F² Effect Size Results

The f² statistic assesses how much an exogenous construct contributes to the R² value of an endogenous construct when that predictor is included in the model. In PLS-SEM, f² values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively [52]. The effect-size (f²) analysis results presented in Table 5 reveal varying levels of contribution among the predictor constructs. e-Contracting exhibited a small effect on Public Procurement Performance ($f^2 = 0.054$), while e-Evaluation demonstrated a large effect ($f^2 = 0.392$), indicating its substantial importance in explaining Public Procurement Performance. Regarding the predictors of e-Evaluation, e-Sourcing showed a small effect ($f^2 = 0.094$), whereas e-Tendering revealed a medium effect ($f^2 = 0.309$). These findings indicate that e-Evaluation has a large effect on Public Procurement Performance, while e-Contracting and e-Sourcing have smaller effects.

**Table 5. f² Effect Sizes**

| Construct | Public Procurement Performance (PPP) | e-evaluation (eV) |
|---|---|---|
| e-contracting (eC) | 0.054 | |
| e-evaluation (eV) | 0.392 | |
| e-sourcing (eS) | | 0.094 |
| e-tendering (eT) | | 0.309 |

### 4.7 Structural Model for Significant Relationships

The bootstrapping results presented in Figure 3 demonstrate that all hypothesized relationships in the structural model are statistically significant ($p < 0.001$). Specifically, the findings reveal that both e-Sourcing and e-Tendering have significant positive effects on e-Evaluation, indicating that the adoption and effective implementation of electronic sourcing and electronic tendering practices enhance the efficiency and effectiveness of procurement evaluation processes. Furthermore, the results show that e-Evaluation and e-Contracting significantly influence Public Procurement Performance (PPP), suggesting that the digitalization of procurement evaluation and contracting activities contributes substantially to improved procurement outcomes. The significant influence of e-Sourcing and e-Tendering on e-Evaluation implies that procuring entities that invest in electronic procurement platforms can achieve more transparent, accurate, and efficient evaluation procedures. In turn, enhanced e-Evaluation practices contribute to better procurement performance through improved decision-making, reduced administrative inefficiencies, increased accountability, and greater value for money. Moreover, the significant effect of e-Contracting on Public Procurement Performance highlights the importance of automating contract management processes.

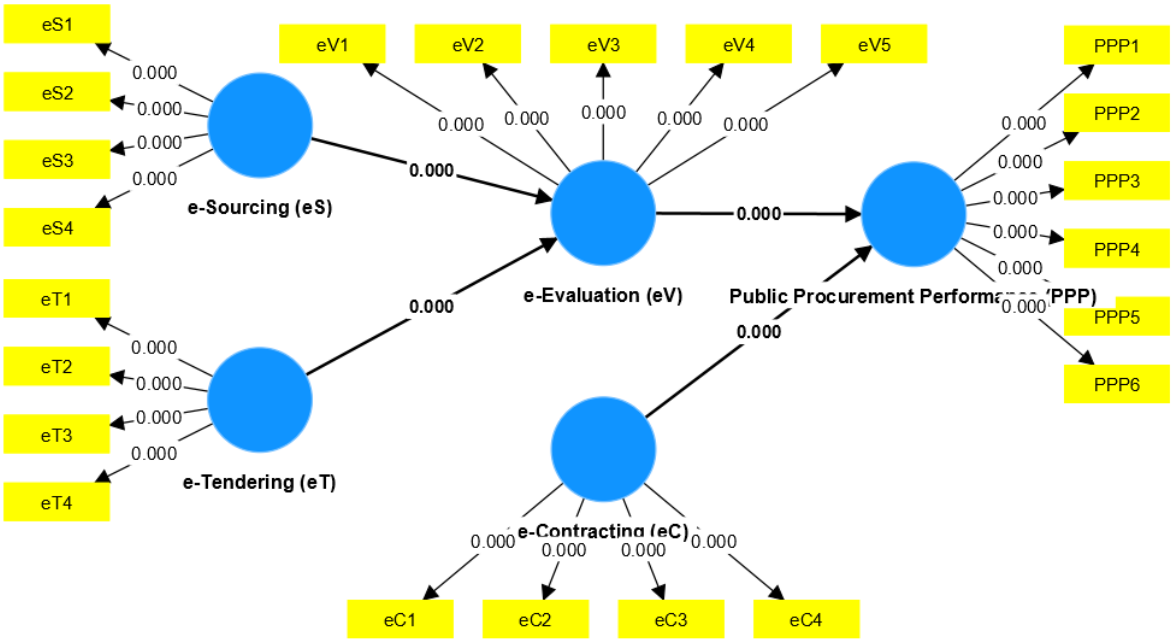



**Figure 3. Structural Model Diagram for Significant Relationships**

### 4.8 Mediation Analysis Results

The mediation analysis results presented in Table 6 reveal that e-Evaluation significantly mediates the relationships between e-Tendering, e-Sourcing, and Public Procurement Performance. The indirect effect of e-Tendering on Public Procurement Performance through e-Evaluation was positive and statistically significant ($\beta = 0.269$, $t = 6.738$, $p < 0.001$), indicating that e-Tendering is associated with improved procurement performance through enhanced evaluation processes. Likewise, the indirect effect of e-Sourcing on Public Procurement Performance through e-Evaluation was also positive and significant ($\beta = 0.149$, $t = 4.281$, $p < 0.001$), suggesting that e-Sourcing improves procurement outcomes through its influence on e-Evaluation. The stronger indirect effect observed for e-Tendering indicates a stronger mediated relationship with public procurement performance. These findings confirm the importance of e-Evaluation as a critical mechanism through which e-procurement practices contribute to improved procurement performance.

**Table 6. Mediation Analysis Results**

| Hypothesis | Sample Mean | Standard Deviation | T-statistics | P-values | Remark |
|---|---|---|---|---|---|
| eT → eV → PPP | 0.269 | 0.040 | 6.738 | <0.001 | Supported |
| eS → eV → PPP | 0.149 | 0.035 | 4.281 | <0.001 | Supported |

### 4.9 Total Effects Analysis Results

The total effects analysis results presented in Table 7 reveal that all hypothesized relationships were positive and statistically significant ($p < 0.001$). e-Evaluation exerted the strongest influence on Public Procurement Performance ($\beta =$

0.563, t = 10.164), indicating its critical role in enhancing procurement outcomes. e-Tendering significantly influences both e-Evaluation (β = 0.478, t = 9.513) and Public Procurement Performance (β = 0.269, t = 6.738), highlighting its importance in the e-procurement process. Similarly, e-Sourcing positively affects e-Evaluation (β = 0.264, t = 4.978) and Public Procurement Performance (β = 0.149, t = 4.281). Furthermore, e-Contracting demonstrates a significant positive effect on Public Procurement Performance (β = 0.210, t = 3.655). These findings suggest that the adoption of e-procurement components significantly improves public procurement performance, with e-Evaluation serving as the most influential mechanism through which these benefits are realized. Likewise, these findings emphasize the need for procuring entities to strengthen electronic evaluation and tendering systems as part of broader efforts to improve public procurement efficiency, transparency, accountability, and overall performance.

**Table 7. Total Effects Analysis Results**

| Hypothesis | Sample Mean (M) | Standard deviation | T-statistics | P-values | Remark |
|---|---|---|---|---|---|
| eC → PPP | 0.210 | 0.057 | 3.655 | <0.001 | Supported |
| eV → PPP | 0.563 | 0.055 | 10.164 | <0.001 | Supported |
| eS → PPP | 0.149 | 0.035 | 4.281 | <0.001 | Supported |
| eS → eV | 0.264 | 0.053 | 4.978 | <0.001 | Supported |
| eT → PPP | 0.269 | 0.040 | 6.738 | <0.001 | Supported |
| eT → eV | 0.478 | 0.050 | 9.513 | <0.001 | Supported |

### 4.10 Predictive Relevance Results ($Q^2$)

According to the guidelines proposed by Hair et al. [52], $Q^2$ values of 0.02, 0.15, and 0.35 indicate small, medium, and large predictive relevance, respectively. The predictive relevance of the model was assessed using the blindfolding procedure and the cross-validated redundancy measure ($Q^2$). The results presented in Table 8 show that all endogenous constructs had $Q^2$ values greater than zero, indicating that the model possesses predictive relevance.

**Table 8. Predictive Relevance Results ($Q^2$)**

| Construct | SSO | SSE | $Q^2$ (= 1 − SSE/SSO) |
|---|---|---|---|
| Public Procurement Performance (PPP) | 2610 | 1783.726 | 0.317 |
| e-contracting (eC) | 1740 | 1740 | 0.000 |
| e-evaluation (eV) | 2175 | 1643.261 | 0.244 |
| e-sourcing (eS) | 1740 | 1740 | 0.000 |
| e-tendering (eT) | 1740 | 1740 | 0.000 |

### 4.11 PLSpredict Results

The predictive relevance of the model was assessed using the PLS-Predict procedure. The results presented in Table 9 reveal that Public Procurement Performance

($Q^2$predict = 0.370) and e-Evaluation ($Q^2$predict = 0.401) both achieved $Q^2$predict values greater than 0.35, indicating large predictive relevance. These findings suggest that the model possesses strong out-of-sample predictive power and is capable of accurately predicting the endogenous constructs. In addition, the relatively low Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) values further support the model's predictive accuracy. Therefore, the structural model demonstrates substantial predictive capability for Public Procurement Performance and e-Evaluation in public-sector procurement contexts.

**Table 9. PLSpredict Results**

| Construct | $Q^2$predict | RMSE | MAE |
|---|---|---|---|
| Public Procurement Performance (PPP) | 0.370 | 0.798 | 0.604 |
| e-evaluation (eV) | 0.401 | 0.782 | 0.580 |

### 4.12 Importance–Performance Map Analysis Results

The Importance–Performance Map Analysis (IPMA) results presented in Figure 4 identify e-Evaluation as the most important determinant of Public Procurement Performance (importance = 0.563, performance = 74), indicating that improvements in electronic evaluation processes may generate substantial performance gains. e-Tendering was identified as the second most important construct (importance = 0.269, performance = 73), suggesting that enhancements in electronic tendering systems could further improve public procurement performance. Although e-Contracting had the highest performance score (75), its importance was relatively lower (0.210), indicating that its existing performance should be maintained while further improvements are considered. e-Sourcing demonstrated the lowest importance (0.149) and performance (70). Overall, the IPMA results highlight e-Evaluation as an important area for managerial attention in improving Public Procurement Performance.

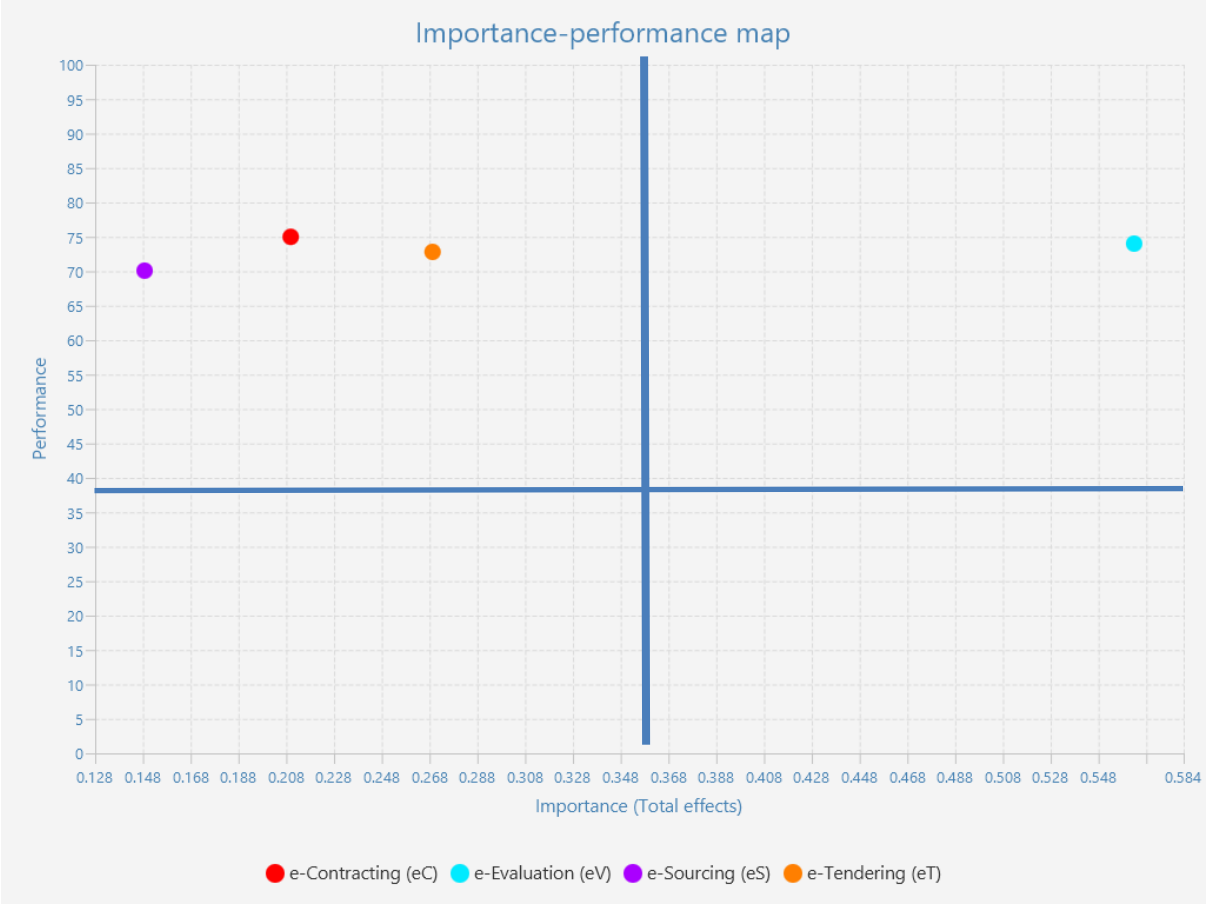



**Figure 4. Importance–Performance Map Results**

## 5. Discussion of Findings

The findings of this study provide strong empirical evidence that e-procurement components significantly influence public procurement performance (PPP) in Tanzanian procuring entities. The structural model explains 50.9% of the variance in public procurement performance ($R^2 = 0.509$) and 41.4% of the variance in e-evaluation ($R^2 = 0.414$), indicating moderate explanatory power. These findings confirm the central argument in the literature that digital procurement systems can substantially improve accountability, transparency, and efficiency when effectively implemented and integrated across the procurement lifecycle [32,38].

A particularly important finding is the dominant role of e-evaluation in influencing public procurement performance. The results reveal that e-evaluation exerts the strongest direct effect on PPP ($\beta = 0.563$, $p < 0.001$), supported by a large effect size ($f^2 = 0.392$) and the highest importance score in the IPMA analysis. This finding suggests that the ability of procuring entities to evaluate bids electronically, objectively, and transparently is an important determinant of procurement performance. While e-procurement systems facilitate various procurement activities, procurement performance depends substantially on the quality of evaluation decisions. These findings support the RBV, which emphasizes that organizational capabilities transform technological resources into valuable performance outcomes [34]. In this context, e-evaluation represents a strategic capability through which procurement information

generated by other e-procurement components is converted into effective procurement decisions.

The findings further demonstrate that e-evaluation serves as a critical mediating mechanism linking upstream e-procurement activities to public procurement performance. The mediation analysis reveals that both e-sourcing and e-tendering significantly influence PPP through e-evaluation. Specifically, the indirect effect of e-tendering on PPP through e-evaluation was stronger than that of e-sourcing. These results indicate that improvements in supplier identification and tender management alone may be insufficient to enhance procurement performance unless they are accompanied by effective evaluation processes. The findings therefore support the view that e-evaluation functions as an operational bridge between procurement inputs and procurement outcomes. In this respect, these findings are consistent with the empirical literature [40], which asserts that e-evaluation acts as a "conversion mechanism" connecting operational activities to strategic outcomes.

Another notable finding is the significant influence of **e-tendering on e-evaluation** ($\beta = 0.478$, $p < 0.001$), which emerges as the strongest antecedent of e-evaluation. This result suggests that electronic tendering systems play a fundamental role in enhancing the quality of procurement evaluation by providing timely, accurate, and transparent bid information. The finding is consistent with previous studies that have associated e-tendering with increased competition, transparency, supplier participation, and improved procurement outcomes. The medium effect size ($f^2 = 0.309$) further confirms the practical significance of e-tendering in strengthening procurement evaluation processes.

The indirect effects of e-tendering and e-sourcing through e-evaluation are both positive and significant, confirming hypotheses H1 and H2. This is consistent with prior studies, which argue that while e-tendering enhances transparency and competition and e-sourcing improves supplier quality, their standalone effects may be limited without integration with e-evaluation [21–23]. The findings therefore strengthen the importance of viewing e-procurement as an interdependent system, where the value of each e-procurement component depends on its alignment with others. On the other hand, several findings deserve particular attention because they challenge prevailing assumptions within the e-procurement literature.

First, e-evaluation emerged as a substantially stronger predictor of public procurement performance than e-contracting, despite increasing emphasis in policy discussions on contract management. Conventional wisdom often assumes that contract execution represents a critical stage affecting value for money. However, the results suggest that procurement outcomes are also strongly shaped during supplier evaluation. This implies that selecting suppliers through transparent and objective evaluation may help prevent contract management problems before implementation begins.

Second, the study found that e-sourcing and e-tendering did not directly influence public procurement performance but instead operated indirectly through e-evaluation. This is theoretically significant because many previous studies implicitly assume that increasing supplier competition automatically improves procurement outcomes. The current findings indicate that greater competition alone does not

guarantee better procurement performance unless evaluation systems are sufficiently capable of distinguishing supplier quality and selecting the most advantageous bids.

Third, e-contracting demonstrated a statistically significant but comparatively modest effect size. Although this finding may appear unexpected, it may reflect the current maturity of Tanzania's National e-Procurement System (NeST), where digital contract management functionalities are still evolving. Consequently, contract management capabilities may not yet have reached their full potential, suggesting that further improvements in e-contracting could generate additional performance gains.

Finally, the model explained approximately 51% of the variance in public procurement performance, indicating that while e-procurement components are major determinants of public procurement performance, nearly half of procurement performance remains influenced by contextual factors. This finding highlights opportunities for future research to incorporate contextual factors into integrated public procurement performance models.

## 5.1 Implications for Theory and Practice

### 5.1.1 Theoretical Implications

This study makes several important theoretical contributions to the e-procurement literature. First, it extends existing knowledge by proposing and empirically validating an integrated process-based model of e-procurement, demonstrating that procurement technologies should be viewed as complementary organizational capabilities rather than isolated technological applications.

Second, the study advances RBV theory by identifying e-evaluation as a strategic organizational capability rather than merely a technological function. The findings demonstrate that sustainable public procurement performance is created through an organization's capability to transform procurement information into objective supplier selection decisions. This extends RBV beyond technology possession toward capability utilization.

Third, the research improves the TOE framework by illustrating that successful technology adoption alone is insufficient to achieve public procurement performance. Instead, organizational value creation depends on how adopted technologies become embedded within operational decision-making processes. This provides a more dynamic interpretation of TOE by linking technology adoption with capability deployment.

Fourth, the study contributes to TCT by demonstrating that transaction cost reductions occur across multiple stages of procurement rather than exclusively during contracting. Digital procurement reduces search costs through e-sourcing, coordination costs through e-tendering, decision costs through e-evaluation, and monitoring costs through e-contracting, providing a more comprehensive application of TCT to public procurement.

Finally, the study contributes methodologically by validating a mediation model showing e-evaluation as the principal mechanism connecting upstream procurement activities with downstream organizational performance. This represents a conceptual advancement over direct-effect models that dominate existing e-procurement research.

### 5.1.2 Practical Implications

The findings of this study create several practical implications for policymakers, procurement regulators, and public managers. For the Public Procurement Regulatory Authority (PPRA) and the Government of Tanzania, investment priorities should shift toward strengthening e-evaluation capabilities within NeST. Advanced automated evaluation tools, standardized scoring templates, artificial intelligence-assisted bid assessment, audit trails, and decision-support dashboards should receive greater investment because improvements in evaluation processes are likely to generate the greatest performance gains.

For procuring entities, the results suggest that organizational investments should emphasize integration rather than isolated automation. Procurement units should ensure seamless information flows between supplier registration, tender management, evaluation, contract management, and performance monitoring. Fragmented digital systems reduce the cumulative benefits of e-procurement.

For procurement managers, continuous professional development should focus on analytical evaluation competencies rather than system operation alone. Effective use of e-procurement requires expertise in supplier assessment, evaluation methodology, contract risk analysis, and digital governance to fully exploit available technologies.

For ICT developers and system designers, the findings indicate that future versions of NeST should prioritize interoperability, intelligent decision-support functions, automated compliance verification, contract performance monitoring, and predictive analytics. These capabilities would transform e-procurement systems from transaction-processing platforms into strategic decision-support systems.

Finally, the findings suggest that governments in developing countries should evaluate e-procurement success using integrated procurement performance indicators that capture the effectiveness of the entire procurement lifecycle rather than focusing solely on technology adoption rates or system utilization statistics. This broader performance perspective will enable policymakers to identify which digital procurement capabilities generate the greatest public value.

## 5.2 Conclusions

This study examined the influence of e-sourcing, e-tendering, e-evaluation, and e-contracting on public procurement performance in Tanzanian procuring entities. The findings confirm that e-procurement components significantly contribute to public procurement performance when effectively integrated throughout the procurement lifecycle. The structural model demonstrated moderate explanatory power, indicating that the selected e-procurement components explain a considerable proportion of the variation in public procurement performance.

Among the examined constructs, e-evaluation emerged as the most influential predictor of public procurement performance, highlighting the critical importance of transparent, objective, and technology-enabled bid evaluation processes. The findings further reveal that e-evaluation serves as a key mediating mechanism through which e-sourcing and e-tendering improve procurement outcomes. This suggests that

improvements in supplier identification and tender management generate meaningful performance benefits only when supported by effective electronic evaluation processes.

The study also confirms the significant contribution of e-contracting to procurement performance by strengthening contract monitoring, compliance management, stakeholder coordination, and accountability throughout contract implementation. Collectively, the findings demonstrate that procurement performance improvements depend not only on the adoption of e-procurement technologies but also on the effective integration and utilization of these technologies across the entire procurement process.

The study therefore concludes that a comprehensive and integrated e-procurement framework, with particular emphasis on e-evaluation and e-contracting, is important for enhancing transparency, efficiency, accountability, value for money, and overall public procurement performance in developing countries, particularly Tanzania.

## 5.3 Limitations of the study and Recommendations for Future Research

### 5.3.1 Limitations of the study

First, the study employed a cross-sectional research design, which captured respondents' perceptions at a single point in time. Consequently, the findings cannot establish definitive causal relationships or capture changes in e-procurement utilization and procurement performance over time.

Second, the study relied primarily on self-reported data collected through structured questionnaires. Although appropriate statistical procedures were applied to enhance reliability and validity, self-reported measures may be susceptible to common method bias, social desirability bias, and subjective interpretation of procurement performance.

Third, the study focused on four e-procurement components: e-sourcing, e-tendering, e-evaluation, and e-contracting. Other important components, such as e-ordering, e-invoicing, and e-payment, were not included and may also influence public procurement performance.

Fourth, the study included only Tanzanian procuring entities operating under the National e-Procurement System of Tanzania (NeST). Differences in regulatory environments, technological infrastructure, institutional capacity, and procurement practices may limit the generalizability of the findings to other countries and contexts.

Finally, although the study integrated several theoretical perspectives, it did not explicitly examine contextual factors such as organizational culture, leadership commitment, technological readiness, political influence, cybersecurity concerns, and institutional quality, which may influence the effectiveness of e-procurement systems and public procurement performance.

### 5.3.2 Recommendations for Future Research

First, future studies should employ longitudinal research designs to examine how e-procurement implementation and procurement performance evolve over time and to establish stronger causal relationships among the study variables.

Second, researchers should extend the model by incorporating additional e-procurement components such as e-ordering, e-invoicing, and e-payment to provide a more comprehensive understanding of the digital procurement ecosystem.

Third, future research should examine the moderating and mediating roles of contextual variables such as organizational culture, leadership support, technological readiness, ICT infrastructure, regulatory quality, institutional capacity, and cybersecurity preparedness in influencing e-procurement effectiveness.

Fourth, comparative studies across different countries, sectors, and organizational settings are recommended to assess the generalizability of the findings and identify context-specific factors that shape e-procurement performance.

Fifth, mixed-method and qualitative approaches should be employed to complement quantitative findings by exploring user experiences, implementation challenges, organizational dynamics, and barriers to effective e-procurement utilization.

Finally, future studies should further examine the interaction effects among e-procurement components, particularly the integration of e-evaluation and e-contracting with other e-procurement components. Such research would provide deeper insights into how digital procurement systems can be optimally configured to maximize procurement performance, governance, transparency, and value for money.

**References**

[1] Radia, T. (2025). The Nature of E-Commerce Contracts and Methods of Proof. *Science, Education and Innovations in the Context of Modern Problems*.

[2] Bombo, F. (2026). Compliance Gaps in Public Procurement and Contract Management: Empirical Evidence from Controller and Auditor General Audit Reports on Public Authorities and Other Bodies in Tanzania (2014/5–2023/24). *International Journal of Research and Scientific Innovation*.

[3] Issah, O., Ackah, D. (2024). The role of organizational culture as a moderating factor in the relationship between e-procurement adoption, procurement performance, and value for money. *African Journal of Procurement, Logistics & Supply Chain Management*.

[4] Isango, E. (2024). An Assessment of the Impact of E-Procurement Practices on Organizational Performance in Tanzania. *NG Journal of Social Development*.

[5] Khorana, S., Caram, S., Rana, N. (2024). Measuring public procurement transparency with an index: Exploring the role of e-GP systems and institutions. *Gov. Inf. Q.*, 41, 101952.

[6] Musah, A., James, A., Asiedu-Ampomah, M., Koomson, F. (2025). Impact of electronic procurement (E-procurement) on public sector accountability in Ghana. Journal of Governance and Accountability Studies.

[7] Hochstetter, J., Vásquez, F., Diéguez, M., Bustamante, A., Arango-López, J. (2023). Transparency and E-Government in Electronic Public Procurement as Sustainable Development. *Sustainability*.

[8] Mahuwi, L., Israel, B. (2024). Promoting transparency and accountability towards anti-corruption in pharmaceutical procurement system: does e-procurement play a significant role?. *Management Matters*.

[9] Kangungu, I., Kassimba, Y., Kipilimba, T. (2025). Effects of an E-Procurement System on the Performance of Public Procurement in Local Government Authorities in Tanzania: A Case of Mbeya City Council. *Asian Journal of Economics, Business and Accounting*.

[10] Mgawe, N., Shatta, D. (2024). The Effects of Behavioral Intention to Use E-procurement System on Public Procurement Performance in Emerging Countries: Buyer-supplier Perspectives from Tanzania. *SSRN Electronic Journal*.

[11] Charnor, I., Quartey, E. (2024). Electronic procurement adoption and procurement performance: does institutional quality matter? *Bus. Process. Manag. J.*, 30, 1783–1807.

[12] Blum, J., Datta, A., Fazekas, M., Samaddar, S., Siddique, I. (2023). Introducing E-Procurement in Bangladesh: The Promise of Efficiency and Openness.

[13] Adjei-Bamfo, P., Maloreh-Nyamekye, T., Ahenkan, A. (2019). The role of e-government in sustainable public procurement in developing countries: A systematic literature review. *Resources, Conservation and Recycling*.

[14] Salifu, Z., Nangpiire, C., Dawdi, A., Yussif, F. (2023). Assessing the Extent of Electronic Procurement Adoption Challenges in the Public Sector of Ghana. *International Journal of Economics and Financial Issues*.

[15] Mohungoo, I., Brown, I., Kabanda, S. (2020). A Systematic Review of Implementation Challenges in Public E-Procurement. Responsible Design, Implementation and Use of Information and Communication Technology, 12067, 46–58.

[16] Matto, M. (2026). Top shortcomings, causes and recommendations of Tanzania's local government procurement: a review of auditor general's reports (2007–2024). *Journal of Public Procurement*.

[17] Nyaoga, R. (2025). The effect of e-informing on procurement performance of public universities in Kenya: The case of Egerton University. *International Journal of Research and Scientific Innovation*.

[18] Suryani, E., Nugroho, K., Cadith, J. (2025). The effect of e-purchasing implementation through e-catalogue on procurement performance. *Jurnal Bisnis Mahasiswa*.

[19] Murithi, L., Ngugi, P., Kiarie, D. (2024). Electronic Sourcing as an E-Procurement Practice and Its Role on Organizational Performance. *Journal Integration of Social Studies and Business Development*.

[20] Rotich, G., Benard, M., Micheni, E. (2016). E-Sourcing, E-Maintenance and Public Procurement Performance: A Case of Kericho County-Kenya. *Science and research*, 4, 37.

[21] Gathima, J., Njoroge, J. (2018). Effects of e-tendering on organization performance in public sector: A case of Nairobi City County Government. Strategic Journal of Business & Change Management.

[22] Eugenie, U., Jean, D., Dieu, D. (2022). Effect of E-Procurement System on the Performance of Tendering Process in Rwanda: A Case of Rutsiro District (2017–2020).

[23] Nakamya, S., Gikandi, E., Kizza, J. (2025). Effect of E-Tendering Practices on Procurement Performance of State Corporations in Uganda. *Journal of Procurement and Supply Chain Management*.

[24] Arthur, B., Mwaseba, N., Mnasi, H. (2023). Examining the Influence of E-Payment System on LGAs' Public Procurement Performance: A Case of Kasulu District Council, Kigoma Tanzania. *Global Journal of Purchasing and Procurement Management*.

[25] Pérez, E. (2022). Empirical Analysis of E-Procurement adoption in SMEs. *Journal of Enterprise and Business Intelligence*.

[26] Mavidis, A., Folinas, D. (2022). From Public E-Procurement 3.0 to E-Procurement 4.0; A Critical Literature Review. *Sustainability*.

[27] Gardenal, F. (2013). A model to measure e-procurement impacts on organizational performance. *Journal of Public Procurement*, 13, 215–242.

[28] Ali, A., Hussain, A., Ali, T., Hussain, M., Hassan, M., Hussain, S. (2025). Enhancing Efficiency, Transparency, Fairness, Competition and Obtaining Best Value for Money Through the Implementation of an E-Procurement Management System for Public Sector and PSDP/Donor Funded Projects in Gilgit Baltistan. *Social Science Review Archives*.

[29] Radojičić, M., Jovanović, P., Andjelic, O., Matas, S. (2025). Can E-Procurement Be a Panacea for Upgrading the Competition and Efficiency in Public Procurement? *Transylvanian Review of Administrative Sciences*.

[30] Ahmad, H., Hassan, S., Ismail, S. (2021). Transparency level of the electronic procurement system in Malaysia. *Journal of Financial Reporting and Accounting*.

[31] Shatta, D., Mabina, B. (2024). Theorized model for e-procurement system in developing countries. International Journal of Research in Business and Social Science (2147- 4478).

[32] Susantya, S., Aswar, K., Sumardjo, M., Panjaitan, I. (2022). E-procurement adoption in Indonesian government: A study of TOE model. *Innovative Marketing*.

[33] Nandankar, S., Sachan, A. (2020). Electronic procurement adoption, usage and performance: a literature review*., 11*, 515–535.

[34] Malhotra, G., Dandotiya, G., Shaiwalini, S., Khan, A., Homechaudhuri, S. (2024). Benchmarking for organisational competitiveness: a resource-based view perspective. *Benchmarking: An International Journal*.

[35] Khalfan, M., Azizi, N., Haass, O., Maqsood, T., Ahmed, I. (2022). Blockchain Technology: Potential Applications for Public Sector E-Procurement and Project Management. *Sustainability*.

[36] Ahmad, T., Aljafari, R., Venkatesh, V. (2019). The Government of Jamaica's electronic procurement system: experiences and lessons learned. Internet Res., 29, 1571–1588.

[37] Rotich, G., Benard, M., Waruguru, E. (2015). Relationship Between E-Tendering and Procurement Performance Among County Governments in Kenya. *Science and innovation*, 3, 46.

[38] McIvor, R. (2008). How the transaction cost and resource-based theories of the firm inform outsourcing evaluation. Journal of Operations Management, 27, 45–63.

[39] Rokkan, A., Haugland, S. (2021). A transaction cost approach for public procurement. *Journal of Business & Industrial Marketing*.

[40] Boafo, N., Ahudey, E., Darteh, A. (2020). Evaluating E-Procurement Impact in the Public Sector. Archives of Business Research.

[41] Patrucco, A. S., Luzzini, D., Ronchi, S. (2016). Evaluating the Effectiveness of Public Procurement Performance Management Systems in Local Governments. Local Government Studies, 42, 739–761.

[42] Faheem, M., Siddiqui, D. (2019). The Impact of E-Procurement Practices on Supply Chain Performance: A Case of B2B Procurement in Pakistani Industry. *Global Commodity Issues eJournal*.

[43] Mtengule, M., Kimario, H., Akyoo, E. (2026). E-tendering as a pandemic mitigation tool: Lessons from Tanzania's healthcare procurement during COVID-19. *African Journal of Empirical Research*.

[44] Niewerth, S., Vogt, P., Thewes, M. (2020). Tender evaluation through efficiency analysis for public construction contracts. *Frontiers of Engineering Management, 9*, 148–158.

[45] Ananthajothi, K., Jaisuriya, P. K., Haribala, S. (2024, April). Ethereum powered e-tendering system. In *2024 International Conference on Communication, Computing and Internet of Things (IC3IoT)* (pp. 1–5). IEEE.

[46] Kimambo, J. (2026). Influence of the National e-Procurement System of Tanzania (NeST) on Employees' Performance in Public Higher Learning Institutions. *NG Journal of Social Development*.

[47] Baruti, S., Lwoga, E., Komba, M. (2024). The Influence of the National E-Procurement System on Employees' Performance in Selected Public Institutions in Tanzania. *Huria Journal of The Open University of Tanzania*.

[48] Komba, M. M., Baruti, S. P., Lwoga, E. T. (2023). The influence of the National e-procurement system on employees' performance in selected public institutions in Tanzania. *Huria: Journal of the Open University of Tanzania*, *30*(1): 151–166.

[49] Sarstedt, M., Ringle, C. M., Hair, J. F. (2022). Partial Least Squares Structural Equation Modeling. In C. Homburg, M. Klarmann, & A. E. Vomberg (Eds.), Handbook of Market Research (pp. 587–632). Springer.

[50] Shatta, D. N. (2023). Determinants of Behavioral Intention to Use E-Procurement System in Developing Countries: Suppliers' Perception from Tanzania. In State of the Art in Partial Least Squares Structural Equation Modeling (PLS-SEM) Methodological Extensions and Applications in the Social Sciences and Beyond (pp. 537–555). Cham: Springer International Publishing.

[51] Creswell, J. W., Plano, C. V. L. (2018). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage.

[52] Hair, J. F., Risher, J. J., Sarstedt, M., Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1): 2–24.

[53] Afolabi, A., Ibem, E., Aduwo, E., Tunji-Olayeni, P., Oluwunmi, O. (2019). Critical Success Factors (CSFs) for e-Procurement Adoption in the Nigerian Construction Industry. *Buildings*.

[54] Nani, D., Ali, S. (2020). Determinants of Effective E-Procurement System: Empirical Evidence from Indonesian Local Governments. *Jurnal Dinamika Akuntansi dan Bisnis*.

[55] Masudin, I., Aprilia, G., Nugraha, A., Restuputri, D. (2021). Impact of E-Procurement Adoption on Company Performance: Evidence from Indonesian Manufacturing Industry*., 5*, 16.

[56] Musa, U., Jaafar, M., Raslim, F. (2023). E-procurement adoption in Nigeria: perceptions from the public sector employees. *Arab Gulf Journal of Scientific Research*.

[57] Ibem, E., Aduwo, E., Afolabi, A., Oluwunmi, A., Tunji-Olayeni, P., Ayo-Vaughan, E., Uwakonye, U. (2020). Electronic (e-) Procurement Adoption and Users' Experience in the Nigerian Construction Sector. International Journal of Construction Education and Research, 17, 258–276.

# ARTIFICIAL INTELLIGENCE AS AN INTEGRATIVE CATALYST FOR PUBLIC PROCUREMENT GOVERNANCE

Jean Pacifique Nkurunziza

***Suggested citation: Nkurunziza, J. P. (2026). Artificial intelligence as an integrative catalyst for public procurement governance. International Journal of Public Procurement, 2(1),30-51.***

**Abstract**

Public procurement — 12–15% of the gross domestic product of Organization for Economic Co-operation and Development (OECD) countries — remains fragmented across theoretical, legal, technological, environmental, and institutional dimensions. This paper advances a theory-building argument: under specified enabling conditions, Artificial Intelligence (AI) can act as an integrative catalyst bridging these structural silos. Through interpretive synthesis and abductive analysis, we develop a configurational framework of AI-enabled public procurement governance and derive four testable propositions. The framework's plausibility is illustrated through four East African case examples — Uganda, Rwanda, Kenya, and Tanzania — each grounded in a verifiable, peer-reviewed publication and presented as illustrative rather than causal evidence. The cases report improvements in forecasting accuracy and perceived procurement performance alongside clearly documented governance gaps. We identify five implementation challenges, propose a three-phase adoption roadmap, and discuss boundary conditions — infrastructure gaps, power asymmetries, and model-drift risks — under which AI ceases to function as an effective integrator.

**Keywords**

artificial intelligence; public procurement; algorithmic governance; sustainability; East Africa; theory-building

## 1. Introduction

Public procurement represents 12–15% of Organization for Economic Co-operation and Development (OECD) countries' Gross Domestic Product (GDP) and an even larger share in developing economies [1]. Yet this financial lever remains underexploited. Procurement systems suffer from structural fragmentation across theoretical, legal, technological, environmental, and governance dimensions [2]. Despite growing consensus on the need for resilient, transparent

*Jean Pacifique Nkurunziza is a Lecturer and Researcher at the National School of Administration of Burundi (ENA-Burundi). He holds a Master's degree in Operational Research and Optimization from the University of Abomey-Calavi (Benin) and a Ph.D. in Applied Mathematics with a specialization in Operational Research and Artificial Intelligence from the University of Burundi.*

Copyright © 2026 by IPPA/IPPC

systems in recent scholarship (Martin et al., 2024) and OECD analysis [3], this fragmentation persists.

The African context presents both acute challenges and an opportunity for technological leapfrogging. Public procurement systems often struggle to translate policies into tangible results. Yet rapid digital adoption, a young population, and political will — notably through the African Union's Agenda 2063 [4] — create reform conditions. Within the East African Community (EAC), regional integration provides a natural laboratory for governance innovation [5], while capacity disparities and limited interoperability pose obstacles. Nagitta, Mugurusi, Obicci, and Awuor [6], in a study gathering data from procurement practitioners in Uganda and Kenya, find limited customization of AI technologies for procurement, an absence of developed governance frameworks, and little practitioner distinction between AI procurement and ordinary technology procurement — a direct empirical illustration of this fragmentation at the point of implementation.

This article addresses three research questions:

1. Under what enabling conditions can AI serve as an integrative catalyst that bridges the fragmented dimensions of public procurement governance?

2. What configurational framework explains how AI can integrate the theoretical, legal, technological, sustainability, and governance dimensions of procurement?

3. What are the procurement-specific legal and practical implications of AI adoption, and which elements are transferable to other developing regions?

We treat AI as a potentially powerful integrator whose effectiveness is contingent on institutional, infrastructural, and regulatory factors. The article makes three contributions. First, it proposes a configurational framework of AI-enabled procurement governance, articulated around five pillars (theory, law, technology, sustainability, governance) and illustrated using four East African case examples. This framework articulates the interdependence of enabling conditions — a move beyond additive "list of applications" models. Second, it derives four testable propositions from this framework. Third, it specifies boundary conditions — the circumstances under which AI is not an effective integrator. Throughout, the illustrative evidence base rests exclusively on peer-reviewed, DOI-indexed publications rather than institutional grey literature, so that every reported figure and finding can be independently traced and checked by the reader.

The remainder of this article is organized as follows. Section 2 sets out the research design, the literature search strategy, and the evidentiary standard applied to the four illustrative case examples. Section 3 reviews the theoretical background, covering public procurement as a fragmented field, AI in public administration and governance, AI specifically in public procurement, and the gaps this article addresses. Section 4 develops the configurational framework around five interdependent pillars and derives four testable propositions, together with the boundary conditions under which AI ceases to function as an effective integrator. Section 5 presents the four illustrative case examples — Uganda, Rwanda, Kenya, and Tanzania — each grounded in a peer-reviewed, DOI-verifiable publication, and discusses cross-case transferability. Section 6 examines implementation challenges and critical perspectives, including algorithmic discrimination, data infrastructure and human capacity deficits, and bias-control and legal-

framework requirements. Section 7 proposes a three-phase roadmap for responsible adoption. Section 8 discusses the theoretical contribution, alignment with existing literature, and limitations. Section 9 concludes and identifies priorities for future research.

## 2. Methodology

### 2.1 Research Design

This article is positioned as a theory-building study, not an empirical test of a pre-existing theory [7]. Given the novelty and complexity of AI in public procurement governance, we adopt an abductive reasoning logic [8]: we move iteratively between the empirical material and theoretical elaboration, seeking the most plausible explanation for observed patterns. The theory-building process followed three stages: identification of fragmentation dimensions from the literature; abductive analysis of illustrative case examples to identify patterns of AI integration; and development of a configurational framework with testable propositions.

### 2.2 Literature Search Strategy

We conducted an interpretive literature synthesis [9] with clearly specified search parameters. The following databases were searched up to June 2025: Scopus, Web of Science Core Collection, and Google Scholar.

Exact search strings.

Scopus: TITLE-ABS-KEY(("artificial intelligence" OR "machine learning" OR "algorithmic decision-making") AND ("public procurement" OR "government procurement" OR "public purchasing") AND (governance OR sustainability OR transparency OR "East Africa" OR "developing country")) — Field: TITLE-ABS-KEY; Records retrieved: 412; Date: 15 June 2025.

Web of Science: TS=(("artificial intelligence" OR "machine learning" OR "algorithmic decision") AND ("public procurement" OR "government procurement") AND (governance OR sustainability OR transparency OR Africa OR developing)) — Field: Topic (TS); Records retrieved: 287; Date: 15 June 2025.

Google Scholar: "artificial intelligence" AND "public procurement" AND (governance OR sustainability OR transparency) AND ("East Africa" OR "developing countries") — Approximately 1,240 hits returned; the first 200 results (ranked by relevance) were screened; Date: 16 June 2025.

Deduplication and selection.

The 899 records identified across the three databases (412 Scopus, 287 Web of Science, 200 screened from Google Scholar) were exported to Zotero 7. Of these, 149 duplicates were removed automatically and 11 manually, leaving 739 unique records screened at title/abstract level. Of these, 118 full texts were assessed, and 37 sources were retained in the theoretical synthesis and appear in the final reference list: 27 peer-reviewed journal articles, 3 institutional or organizational documents, 3 book chapters, 1 monograph, 1 conference-proceedings paper, and 2 preprints/working papers.

Case identification strategy.

The four illustrative country cases used in Section 5 were identified through a separate, targeted search restricted to digital-object-identifier-indexed publications

reporting an empirical study (quantitative or qualitative) of artificial intelligence or machine learning with direct relevance to public-sector procurement, demand planning, or supply-chain decision-making in an East African country. This search deliberately excluded institutional reports, working papers without digital object identifiers, and grey literature, so as to ensure the traceability and verifiability of sources. It returned confirmed, traceable results for all four countries retained — Uganda, Rwanda, Kenya, and Tanzania — thereby preserving the original four-case structure on an authenticated evidentiary basis. One source [6] covers both Uganda and Kenya, since its underlying fieldwork was conducted jointly across the two countries; it is used as the Uganda case and complemented, for Kenya, by an independent quantitative study [10].

Theoretical saturation.

Saturation was assessed following the principle that no new themes emerge from additional sources [9]. After the 37 retained theoretical sources, no new coding categories emerged across three consecutive screening rounds.

Coding.

Coding and thematic synthesis were conducted using NVivo 14. I performed a double-coding procedure at a three-month interval on the full corpus; intra-coder agreement was 91%. No independent second coder participated in this study; consequently, no inter-coder reliability statistic (such as Cohen's kappa or Krippendorff's alpha) is reported, and no claim of multiple-coder validation is made anywhere in this article.

### 2.3 Case Selection and Evidentiary Standard

Four illustrative case examples are used in this article, one per country, each grounded in a digital-object-identifier-verifiable publication. Each source carries a digital object identifier or a stable, indexed repository identifier, and reports its own method, sample, and results — the elements required for verifiability that institutional grey literature could not supply. The four cases are analytically complementary rather than matched on a single method: two are qualitative/exploratory studies of institutional and governance readiness (Uganda, and the Kenya-side of Nagitta et al.), and two are quantitative, regression-tested studies of a specific AI application's association with performance (Rwanda's technical model; Kenya's and Tanzania's perception surveys). None of the four studies audits an operational, government-deployed AI system end to end; this distinction is maintained explicitly throughout Section 5.

## 3. Theoretical Background

### 3.1 Public Procurement as a Fragmented Field

Public procurement scholarship has evolved through several paradigmatic shifts. The early transaction-cost economics perspective [11] framed procurement primarily as a mechanism for minimizing transaction costs through efficient contracting. This gave way to a public value creation paradigm [12,13], which recognized procurement's potential to generate broader societal value beyond cost savings. More recently, a strategic turn has framed procurement as an instrument of industrial policy, innovation, and sustainability [2,14].

Despite this evolution, fragmentation persists across four key dimensions. Legal-compliance scholarship focuses on procedural regularity, transparency, and anti-corruption, largely separate from performance and value creation concerns. Supply management research emphasizes efficiency and supplier relationships, often without explicit attention to public law constraints. Sustainability scholarship advocates for Environmental, Social, and Governance (ESG) integration but rarely engages with procurement law or supply chain management literatures. Governance studies examine institutional arrangements and accountability but often overlook procurement's technical dimensions. Hänninen et al. [15], in the International Journal of Public Sector Management, propose a multi-level framework connecting micro-level purchasing decisions to macro-level policy outcomes. This integration challenge is precisely what AI may help address — though, as we argue, only under specific enabling conditions.

### 3.2 AI in Public Administration and Governance

The application of AI to public sector decision-making has generated a rapidly growing literature. Janssen et al. [16] identify data governance as the linchpin of trustworthy AI in government, arguing that without robust data governance frameworks, AI systems risk perpetuating existing biases and generating unreliable outputs. Al-Enezi [17] provides a conceptual framework for AI governance in the public sector, distinguishing between technical, organizational, and regulatory dimensions of AI adoption.

More recent work published in Government Information Quarterly has focused on three critical areas. Toledo [18] examines algorithmic accountability, proposing auditability, contestability, and adversarial risk assessment as core principles for public sector AI. Mohib et al. [19] document the risk of AI entrenching existing inequalities, showing through empirical analysis that algorithmic procurement systems can systematically disadvantage Small and Medium Enterprises (SMEs) and minority-owned businesses without active bias monitoring and correction mechanisms.

Nagitta et al. [6] contribute directly to this literature from a developing-country, procurement-specific angle: based on fieldwork among procurement practitioners in Uganda and Kenya, they argue for delineating public procurement's own role in human-centered AI (HCAI) discourse, and propose a framework through which procurement professionals can embed HCAI principles into AI procurement processes in the absence of settled legal frameworks. Aboelazm and Dganni [20], in Corporate Law & Governance Review, analyze the factors shaping the adoption of AI in public tender processes and conclude that technological, organizational, and political factors are the most critical determinants of successful adoption. Smuha [21] provides a legal analysis encompassing constitutional and administrative law, data protection law, and AI-specific law. The concept of "regulation by design" — encoding legal requirements directly into algorithms — has attracted increasing attention in both computer science and legal scholarship [22].

### 3.3 AI Specifically in Public Procurement

A subset of the literature has begun to examine AI applications across the procurement cycle. Reuben et al. [23], examine predictive analytics for healthcare supply chains in sub-Saharan Africa, finding that AI can reduce stockouts but requires sustained investment in data infrastructure and technical capacity — a finding directly corroborated, at the level of an individual predictive model, by the Rwanda case in Section 5.

Abdelsalam et al. [24], also in JoPP, analyze smart contracts in public contracts, cautioning against over-automation and emphasizing the need for legal recognition of smart contract triggers before deployment at scale; this article treats Distributed Ledger Technology (DLT) as conceptually and legally distinct from AI throughout, and none of the four illustrative cases in Section 5 is DLT-based. Sciarrone et al. [25] examine AI-enabled sustainable public procurement, finding that AI can both enable and distort green criteria integration depending on training data quality and algorithm design. Santos Júnior [26], in Public Administration Review, examine digital sovereignty concerns in AI procurement, finding that AI systems procured from international vendors often create technological dependencies and data control risks.

Andersson et al. [27], in JoPP, assess the value of AI in governmental public procurement, finding that perceived benefits revolve around improved operational capabilities, process efficiencies, and enhanced monitoring — a pattern of perceived rather than independently audited benefit that closely parallels the Tanzania and Kenya survey cases reported in Section 5. Andhov et al. [28], in Frontiers in Sustainability, critically examine AI's potential to support sustainable public procurement across the full procurement lifecycle, finding that AI can be a bridge between high-level sustainability aspirations and practical implementation.

### 3.4 Gaps Addressed and Conceptual Clarifications

Three gaps motivate this article. First, the existing literature lacks an integrative framework that bridges the five fragmentation dimensions simultaneously. Most studies focus on a single procurement phase or a single AI technology. Second, theory-building studies with developing-country procurement contexts remain rare and, where they exist, frequently rely on unverifiable institutional sources rather than peer-reviewed data — a limitation this article has deliberately tried not to repeat. Third, despite growing normative advocacy for AI adoption, rigorous articulation of the enabling conditions under which AI can (and cannot) function as an integrator is largely absent.

By public procurement governance, we refer to the institutional arrangements, rules, and practices through which public purchasing decisions are made, implemented, and evaluated. Algorithmic governance denotes the use of algorithmic systems to facilitate the application, execution, and enforcement of regulation [21]. Enabling conditions are the institutional, infrastructural, legal, and human capacity factors that must be in place for AI to function effectively as an integrative catalyst.

Three technology categories must be distinguished [24]: Artificial Intelligence (prediction, Natural Language Processing, decision support); Automation (rule-based routine tasks such as Robotic Process Automation and workflow engines); and Distributed Ledger Technology (blockchain) for immutable record-keeping and smart

contracts. Nagitta et al. [6] find, empirically, that procurement practitioners in Uganda and Kenya often show "little knowledge and distinction between AI procurement and other typical technology procurement processes" — direct field evidence for why this typology matters in practice, not merely in theory. Table 1 presents a typology of AI applications across the procurement life cycle, distinguishing generic literature examples from the four verified cases used later in this article.

**Table 1. Typology of AI Applications Across the Procurement Life Cycle**

| Technology | Stage | Example | Key Requirement |
|---|---|---|---|
| Predictive AI | Planning | Demand forecasting (Uganda) | 5+ years quality data |
| Explainable AI | Evaluation | Bid scoring with SHAP (Rwanda) | Legal framework |
| Computer Vision | Execution | Delivery verification | Connectivity |
| Generative AI | Sourcing | Drafting tender documents | Human review |
| Prescriptive Analytics | Risk | Supplier risk scoring (Tanzania) | Bias monitoring |
| Natural Language Processing | Tendering | Tender document classification | Multilingual corpora |
| Anomaly Detection | Control / Audit | Red-flagging bid patterns | Labelled fraud cases |
| Robotic Process Automation (Automation) | Execution | Routine transaction handling | Digital workflows |
| Workflow Engines (Automation) | Execution | Approval routing and escalation | Process standardization |
| Distributed Ledger Technology (blockchain) | Execution | Smart-contract payment triggers | Interoperable ledger |

## 4. Configurational Framework and Propositions

### 4.1 Overview of the Configurational Approach

This section proposes a configurational framework — a set of interdependent pillars whose combination, rather than any single element, produces effective AI-enabled governance [29]. Crucially, AI's integrative function is conditional: it requires enabling configurations across all five pillars. We first present each pillar with its theoretical grounding, then derive the integrative logic and boundary conditions.

### 4.2 Pillar 1: From Principle to Operational Practice

The first pillar concerns the relationship between theory and operational practice. Procurement theories have focused successively on transaction cost minimization [11], allocative efficiency, and public value creation [12]. A persistent gap separates these theoretical models from operational implementation. AI can re-materialize theory in processes: machine learning models can operationalize stakeholder theory by analyzing large data corpora to weight competing interests [30], while multi-objective optimization algorithms can concretize the balance between public value, cost, and sustainability [13]. AI thereby transforms theoretical postulates into adjustable algorithmic parameters — but only if the underlying data infrastructure faithfully represents the phenomena the theory identifies, a condition directly tested by the Rwanda case in Section 5.

From this analysis, we derive Proposition 1: *The extent to which AI operationalizes public value theory in procurement decisions is positively moderated by the completeness and representativeness of procurement data infrastructure*.

### 4.3 Pillar 2: From Static Text to Dynamic Regulation

The second pillar addresses the evolution from static legal texts to dynamic and executable regulation. Legal frameworks of public procurement struggle to keep pace with digital innovation. AI introduces the concept of "regulation by design" [22]: legal requirements — equal treatment, non-discrimination, environmental thresholds — can be encoded into pre-qualification and evaluation algorithms, preventing deviations by design. The Uganda/Kenya case [6] shows this pillar's absence in practice: the study reports "a lack of developed governance frameworks" for AI procurement in both countries at the time of fieldwork, and proposes embedding human-centered AI principles into procurement practice precisely because the legal architecture Proposition 2 calls for does not yet exist.

Critically, AI-assisted decision-making raises three unresolved procurement-law questions that require specification. First, transparency of award criteria requires that algorithmic criteria, weights, and scoring methodology be disclosed to tenderers before bid submission. Second, explainability and the duty to give reasons demand that excluded bidders receive a substantive explanation identifying the specific criteria on which the bid scored lower. Third, standstill periods, record-keeping, and audit trails require that AI-generated decision logs be preserved in formats compatible with administrative review and judicial challenge.

Smuha [21] provides an analysis of the legal framework governing algorithmic regulation by public administrations, encompassing constitutional and administrative law, data protection law, and AI-specific law. Proposition 2 follows: *AI's capacity to make procurement regulation dynamically executable is contingent on the prior existence of clear legal provisions on algorithmic transparency, explainability, and the right of appeal***.**

### 4.4 Pillar 3: From Task Automation to Augmented Intelligence

The third pillar distinguishes AI from adjacent technologies. AI, automation, and Distributed Ledger Technology serve different functions. Demand forecasting requires

predictive AI because the task requires learning complex patterns from historical data — automation alone cannot provide this, as illustrated technically by the Rwanda case and, in a private-sector setting, by the Kenya case [10]. Bid evaluation requires explainable AI because the task requires both scoring and providing auditable justifications. The Uganda/Kenya case [6] shows why this pillar matters at the level of practice, not just theory: practitioners in both countries showed "little knowledge and distinction between AI procurement and other typical technology procurement processes," meaning the very categories this pillar proposes are not yet operative on the ground. Contract execution using DLT-based smart contracts is appropriate only where payment conditions are fully verifiable and objective, connectivity and infrastructure are reliable, and the legal framework recognizes automated execution [24]. Proposition 3 states*: Effective AI integration across the procurement life cycle requires technology-specific governance regimes matched to the decision stakes, auditability requirements, and reversibility of each phase.*

### 4.5 Pillar 4: From Ancillary Clause to Measurable Sustainability

The fourth pillar addresses the integration of sustainability criteria. The integration of ESG criteria often remains symbolic for lack of reliable data and robust evaluation methods [25,31]. AI makes sustainability quantifiable in principle: Life Cycle Assessment can be automated at scale; logistics optimization can minimize carbon footprints [32]. Andhov et al. [28] find that AI can be a bridge between high-level sustainability aspirations and practical implementation, while noting that its use in the public sector remains limited. AI-powered ESG measurement also carries a bias risk: large, formally-certified companies are easier to evaluate than small, informal, or rural suppliers, creating a structural risk of excluding SMEs from AI-mediated procurement markets [33].

### 4.6 Pillar 5: From Procedural Control to Ethical Algorithmic Governance

The fifth pillar concerns the evolution from procedural control to ethical algorithmic governance. AI requires an evolution toward algorithmic governance [17,18] that ensures legitimacy, fairness, and accountability, structured around four principles: auditability, adapted transparency, meaningful human supervision, and separation of duties. Nagitta et al. [6] propose a concrete mechanism for this pillar in the absence of settled law: a practitioner-level framework for embedding human-centered AI principles directly into procurement processes in Uganda and Kenya. Aboelazm and Dganni [20] find that organizational and political factors — not only technological ones — are decisive for successful AI adoption in public tender processes, a finding echoed by the Tanzania case (Section 5), where accountability and transparency gains lagged behind efficiency gains despite generally positive staff perceptions of AI adoption.

### 4.7 Configurational Logic and Boundary Conditions

The five pillars do not operate independently: their joint presence — under appropriate enabling conditions — produces an integrative effect that no single pillar

can achieve alone [29]. Where legal frameworks are absent, AI deployment on the second pillar should be limited to decision support, never automation. Proposition 4 follows: AI functions as an effective integrator of procurement governance when enabling conditions are simultaneously present across all five pillars; partial configurations produce sub-optimal or counterproductive outcomes.

The configurational framework identifies five boundary conditions under which AI fails as an effective integrator. First, data infrastructure gaps: when procurement data are fragmented, non-standardized, or incomplete, AI outputs are unreliable. The Rwanda case is instructive in the opposite direction: the reported model's moderate but non-perfect accuracy (Section 5) illustrates that even a five-year, facility-level consumption dataset leaves meaningful residual error, underscoring how much harder the task becomes where such data infrastructure does not exist. Second, legal framework absence: the Uganda/Kenya case [6] provides direct evidence of this boundary condition, reporting an explicit absence of developed AI-procurement governance frameworks in both countries at the time of the study. Third, institutional and organizational capacity deficits: Aboelazm and Dganni [20] identify organizational and political factors as decisive for AI adoption outcomes, a pattern consistent with the perception-based evidence from Tanzania and Kenya (Section 5). Fourth, infrastructure dependencies: limited electricity, internet connectivity, or cloud availability constrains AI deployment across the region generally. Fifth, model drift and gaming risks: without monitoring and recalibration, AI predictions degrade over time and can be gamed by regulated parties [18]. These boundary conditions are necessary, not optional, and none of the four verified cases in this article should be read as demonstrating that they have been fully overcome — several, in fact, document precisely that they have not.

## 5. Four Illustrative Case Examples Grounded in Peer-Reviewed, DOI-Verifiable Publications

The four illustrative case examples below are grounded in peer-reviewed, DOI-verifiable publications, not institutional grey literature, and every quantitative figure or qualitative finding reported is taken directly from the cited source's own stated results. None of the four is a causal impact evaluation of an operational government AI system; each is a published, methodologically transparent study that this article uses to illustrate — never to confirm — specific propositions of the framework in Section 4. A complete evidence table linking every quantitative figure to its exact source is provided in the accompanying Evidence and Verification Appendices (submitted as a separate document alongside this manuscript).

### 5.1 Case 1: AI-Procurement Governance Readiness — Uganda (and Kenya)

Nagitta, Mugurusi, Obicci, and Awuor [6] conducted an exploratory qualitative inquiry among public procurement practitioners in Uganda and Kenya — two countries the authors note share similar procurement regimes. The sample and unit of analysis are stated in the source: procurement practitioners engaged through an exploratory field inquiry, examined for their knowledge of, and readiness for, AI-specific procurement

governance. The method is qualitative and exploratory, not a statistical hypothesis test; this article treats its findings accordingly, as documented governance gaps rather than as effect sizes.

The published findings report: (i) limited customization of AI technologies for the local procurement context; (ii) a lack of developed governance frameworks specific to AI procurement; and (iii) little practitioner knowledge of, or distinction between, AI procurement and ordinary technology procurement processes. In response, the authors propose a framework through which procurement professionals can embed human-centered AI (HCAI) principles — honesty, trust, accountability for outcomes, and a right to explanation — into AI procurement practice in the absence of settled legal frameworks. This study did not evaluate a deployed AI system; it evaluated practitioner readiness and institutional preparedness for AI procurement, and this article does not claim more than that. It directly and traceably illustrates Pillars 2, 3, and 5, and the boundary condition on legal-framework absence (Section 4.5): rather than showing AI functioning as an integrator, it documents, empirically, the pre-integrative state the framework predicts will produce sub-optimal outcomes under Proposition 4.

### 5.2 Case 2: Predictive Demand Planning for Essential Medicines — Rwanda

Mbonyinshuti, Nkurunziza, Niyobuhungiro, and Kayitare [34] applied a random forest (RF) machine-learning model to consumption data (2015–2019) for approximately 500 medical products supplied through Rwanda's public health system, in order to predict demand for the 17 essential medicines most commonly used to manage non-communicable diseases (NCDs). The sample and unit of analysis are stated: monthly, district-level consumption records over a five-year period. The method of calculation is a supervised random forest regression, evaluated on a held-out test set.

According to the published results, the RF model achieved a 78% accuracy rate on the training set and a 71% accuracy rate on the testing set [34]. The authors conclude that random forest models can improve health-supply-chain planning, while noting dependence on multi-year data availability and quality. This study did not audit an operational government demand-planning system; it is a methodological demonstration using real facility-level data. It directly illustrates Pillar 1 and Proposition 1: the model's accuracy, well above chance but well below certainty, is itself evidence that data quality bounds AI's contribution rather than eliminating the need for ongoing human oversight. A related study by the same author team [35] reports a comparable exercise on a different medicine subset (88% training / 76% testing accuracy), corroborating the general conclusion from an independent model specification.

### 5.3 Case 3: AI-Driven Demand Forecasting and Supply-Chain Performance — Kenya

Mwove and Kithandi [10] examined the effect of AI-based demand-forecasting applications on supply-chain performance among large supermarkets in Nairobi City County, Kenya. The sample and unit of analysis are stated explicitly: 70 employees working in the supply-chain departments of 10 large supermarkets, surveyed with structured questionnaires and analyzed with correlation and regression analysis (SPSS).

This is a private-sector retail study, not a public procurement case, and this article uses it accordingly: it illustrates the technical and organizational plausibility of AI-driven demand forecasting in the Kenyan commercial context, complementing rather than substituting for the public-sector governance evidence in Case 1. A verification caveat applies to this source and is disclosed in full in the accompanying Evidence and Verification Appendices: the cited abstract is presently accessible mainly through a Daystar University institutional-repository record whose methodology section is partly written in the future tense, a pattern consistent with a thesis or research-project document; whether the AJoCS journal issue cited contains an identical, finalized peer-reviewed version has not been conclusively confirmed, and the author will verify this directly with the journal before final submission.

According to the published results, AI-demand forecasting had a statistically significant positive effect on supply-chain performance. Read together with the Kenya-side findings of Nagitta et al. [6] — that public procurement practitioners in the same country report limited AI governance frameworks — the two sources jointly illustrate a pattern this article treats as informative rather than confirmatory: technical effectiveness of AI-driven forecasting appears attainable in the Kenyan private sector, while the public-procurement governance conditions this framework's Pillars 2 and 5 require have not, on the same country's evidence, yet caught up. This directly illustrates Proposition 4's claim that partial configurations (technology present, governance absent) produce sub-optimal outcomes for the procurement system as a whole, even where the underlying technology performs well in an adjacent commercial setting.

### 5.4 Case 4: Perceived Effect of AI on Procurement Performance —Tanzania

Orio [36] examined the perceived impact of AI technologies — specifically Robotics, Robotic Process Automation, and Machine Learning — on procurement management performance at the College of Business Education (CBE), Mbeya Campus, Tanzania, with a focus on transparency, accountability, and value for money. The sample and unit of analysis are stated: 40 purposively selected participants (procurement officers, auditors, and accountants), surveyed using structured questionnaires; instrument reliability was checked with Cronbach's Alpha (reported at $\geq$0.8 across constructs).

According to the published results, all three AI technologies were found to have a statistically significant positive association with procurement performance. Machine Learning showed the strongest relationship, particularly with transparency and value for money; the reported correlation between Process Automation and Transparency was $r = 0.642$, and between Machine Learning and Value for Money was $r = 0.612$. In the regression model, Machine Learning was the strongest predictor of overall procurement performance. The author also reports that, despite generally positive perceptions of AI integration, accountability and transparency indicators had not improved to the same degree as efficiency-related indicators. Because this is a cross-sectional perception survey of 40 respondents at a single institution, it speaks to practitioners' assessed experience of AI adoption rather than to an independently audited change in institutional outcomes. It illustrates Pillar 5 and the boundary condition concerning

organizational and human capacity (Section 4.5). Table 2. summarizes the four cases side by side.

### 5.5 Cross-Case Reading and the Limits of Transferability

**Table 2. Cross-Case Comparison of the Four Verified Illustrative Cases**

| Dimension | Uganda | Rwanda | Kenya | Tanzania |
|---|---|---|---|---|
| Source | Nagitta et al. [6] | Mbonyinshuti et al. [34] | Mwove & Kithandi [10]; Nagitta et al. [6] | Orio [36] |
| Type of evidence | Qualitative, exploratory | Quantitative, technical model | Quantitative survey (private sector) + qualitative (public sector) | Quantitative survey |
| Sector | Public procurement | Public health supply chain | Private retail (+ public procurement, qualitative) | Public procurement |
| Pillar(s) illustrated | 2, 3, 5 | 1 | 3, 4 (via Prop. 4) | 5 |

The four cases are deliberately heterogeneous in method and sector, because together they speak to different pillars of the framework rather than to a single, uniform "AI works in East African procurement" claim. Because the Kenya case draws partly on a private-sector retail study, and because all four cases remain individually modest in scope (single institutions, single cities, or exploratory fieldwork), claims of transferability beyond the specific settings directly evidenced here are necessarily tentative. We do not claim that these four studies establish a regional pattern; we claim only that they are consistent with, and provide traceable illustration for, specific propositions of the framework developed in Section 4. Broader transferability — to other East African Community members, to other developing regions, to public-sector retail contexts comparable to the Kenyan private-sector case, or across procurement phases not covered by any of the four studies — remains an empirical question for future research using the same evidentiary standard applied here.

## 6. Implementation Challenges and Critical Perspectives

### 6.1 Critical Risks of AI in Public Procurement

Several critical risks must be acknowledged. Algorithmic discrimination is a significant concern, as AI may entrench existing vendor power or exclude SMEs without digital capabilities [33]. Without active bias monitoring, AI systems risk reproducing historical inequalities. Lack of contestability presents another risk: AI-assisted decisions may be difficult to challenge, and bidders excluded by algorithmic scoring need meaningful explanations to contest decisions. Current legal frameworks

in most African jurisdictions do not provide for algorithmic explanation rights — a gap Nagitta et al. [6] document directly for Uganda and Kenya.

Erosion of administrative discretion is also a concern: excessive automation reduces procurement to mechanical scoring, eliminating contextual judgment that procurement law requires. Procurement officers must retain authority to override AI recommendations in exceptional cases. The black box problem persists: even Explainable AI explanations are only as meaningful as the model's internal logic is coherent, and interpretability outputs can be gamed [18]. Power and inequality concerns arise from AI systems procured from international vendors, creating technological dependencies and data sovereignty risks .

### 6.2 Data Infrastructure and Human Capacity

Data infrastructure and interoperability present fundamental challenges. AI depends on quality, structured, interoperable, and current data. In most African countries, public procurement data remain fragmented, non-standardized, and often non-existent for execution and evaluation phases. The Rwanda case (Section 5) shows that even a relatively well-documented, five-year consumption dataset produces a model that is useful but imperfect.

Human and organizational capacity is another critical challenge. African public administrations suffer from digital skills deficits [3]. Andersson et al. [27] find that governmental agencies exhibit low levels of AI maturity, with challenges related to organizational, process, technological, and data management factors — a finding the Uganda/Kenya case [6] reflects directly, and which the Tanzania case reflects at the level of individual practitioner perceptions, where accountability and transparency gains lagged efficiency gains despite generally positive views of AI adoption.

### 6.3 Bias Controls, Legal Framework, and Operational Risks

Algorithmic bias and fairness require concrete controls. Procurement regulators should require bias test metrics such as disparate impact ratios comparing scores or acceptance rates of different supplier categories. Procurement-specific red flags such as collusion detection patterns and single-bidder flags should be automatically flagged and investigated by human auditors. Human override rules should require that for high-value contracts, AI recommendations be reviewed and signed off by a senior procurement officer.

The legal framework and accountability remain unresolved in most African jurisdictions [22], a conclusion Nagitta et al. [6] reach independently and empirically for Uganda and Kenya: questions of responsibility for AI errors, compliance with transparency requirements, and maintenance of standstill periods and audit trails remain unanswered. Operational risks including model drift, supplier gaming, and adversarial attacks require periodic model re-calibration, red-team audits, and robust human oversight [18]. Social acceptability and trust are also essential: AI systems may fail without user and citizen acceptance [37].

## 7. Roadmap for Responsible Adoption

The three-phase roadmap below is a proposal derived from the framework's logic and the four verified cases — not a tested, universally valid solution, and not a claim that any of the four cases has itself passed through these phases. Each phase is stated with its priority actions, its procurement-specific implication, its success indicators, and its potential failure modes, so that the roadmap can be audited by a reader against the same evidentiary standard applied to the rest of the article. Alternative pathways may be appropriate depending on specific country contexts, institutional capacities, and political circumstances; the roadmap should be read as a sequencing logic derived from the framework's boundary conditions (Section 4.5), not as a fixed timetable.

### 7.1 Phase 1: Foundation Building (0–24 Months)

Phase 1 addresses the boundary conditions that the framework identifies as binding at the outset — data infrastructure gaps and legal framework absence (Section 4.5) — and responds directly to the governance gap that Nagitta et al. [6] document empirically for Uganda and Kenya. Five priority actions structure this phase.

Data audit and standardization. Procurement authorities should map available procurement and supply-chain data, identify gaps against the completeness threshold the Rwanda case shows to be consequential (Section 5, Case 2), and adopt machine-readable formats consistent with the Open Contracting Data Standard (OCDS). The procurement-specific implication is to amend national Public Procurement Authority regulations to require structured, machine-readable data in all tender notices and contract-award notices, and to require at least the multi-year consumption or transaction history that the Rwanda model relied upon [34] before any predictive application is piloted.

Legal and ethical framework development. This action responds directly to Proposition 2 and to the specific absence Nagitta et al. [6] report for Uganda and Kenya: a national AI-in-public-administration charter should be adopted, and procurement law should be amended to establish tenderers' right to an algorithmic explanation, consistent with the duty-to-give-reasons requirement discussed in Pillar 2 (Section 4).

Basic capacity building. All procurement officers should receive foundational training in AI fundamentals, data literacy, and critical evaluation of algorithmic outputs. This directly targets the organizational-capacity boundary condition that Aboelazm and Dganni [20] identify as decisive, and the practitioner-level knowledge gap Nagitta et al. [6] document empirically ("little knowledge and distinction between AI procurement and other typical technology procurement processes").

Low-risk pilots in non-critical areas. Pilots should be restricted to decision-support functions with mandatory human sign-off — for example, demand-forecasting pilots modelled on the Rwanda case (Section 5, Case 2), which itself reported meaningful residual error (71% test accuracy) even on a comparatively well-documented five-year dataset, underscoring why early pilots should remain advisory rather than determinative.

Independent ethics committee. An ethics committee combining technical experts, procurement lawyers, and civil-society representatives should be established

to conduct ex ante review of proposed AI pilots and ex post audit of their outcomes, addressing the contestability and auditability requirements of Pillar 5.

Success indicators: procurement data completeness exceeding 80% in at least one pilot domain; formal adoption of an AI-in-procurement charter or equivalent legal instrument; at least 50% of procurement officers having completed foundational AI training; and the ethics committee formally constituted and operating.

Potential failure modes: insufficient political commitment to legal reform; data completeness remaining below the 60% threshold at which the framework's boundary conditions predict unreliable outputs (Section 4.5); and organizational resistance of the kind Nagitta et al. [6] and Andersson et al. [27] both documents, left unaddressed by training.

### 7.2 Phase 2: Controlled Expansion (24–48 Months)

Phase 2 tests whether the foundations built in Phase 1 hold under moderate-stakes use, with human supervision remaining mandatory throughout. Six actions structure this phase.

Decision-support systems in "assistant" mode. AI outputs — demand forecasts, risk scores, or evaluation support — should be explicitly advisory, with standard tender and planning documents specifying that any AI-generated figure requires human validation before use, consistent with the meaningful-human-supervision principle of Pillar 5.

An ESG/sustainability data gateway. Building on Pillar 4, a shared database of verifiable supplier environmental and social performance should be developed, with defined certification standards and an explicit human-review pathway for uncertified small and medium enterprises (SMEs) — a direct response to the SME-exclusion risk that Zorina [33] identifies and that this framework treats as a structural bias risk of AI-mediated ESG scoring (Section 4, Pillar 4).

Expanded ethics-committee powers. The committee established in Phase 1 should gain formal authority to review AI-assisted award decisions and to require a published "Algorithmic Transparency Statement" for every procurement using AI-assisted evaluation.

Advanced technical training. Investment should shift toward developing in-house data-science and algorithmic-governance capacity, reducing the dependency risk on international vendors identified by Santos Júnior and D. B. [26].

Moderate-risk pilots. Pilots may extend to pre-qualification screening with mandatory human supervision, but not to award decisions.

Continuous impact assessment. Authorities should publish annual assessments of effects on efficiency, equity, sustainability, and supplier trust, so that claims of improvement remain independently traceable in the way this article's own evidentiary standard requires (Section 5).

Success indicators: measurable reduction in processing or evaluation lead times in pilot domains, reported transparently with baseline, method, and sample specified (following the standard set out in the accompanying Evidence and Verification

Appendices); no detected disparate-impact ratio below 0.80 for SME or minority-owned suppliers; and at least one published Algorithmic Transparency Statement.

Potential failure modes: bias-detection mechanisms embedded too late in the pilot design; over-reliance on AI recommendations despite their nominally advisory status, a risk consistent with the erosion-of-discretion concern raised in Section 6.1; and legal gaps in explainability rights persisting despite Phase 1's charter, undermining the trust the roadmap depends on [37].

### 7.3 Phase 3: Responsible Automation (48–72 Months)

Phase 3 should not be initiated unless Phase 2's success indicators have been met; the framework treats this conditionality as a direct expression of Proposition 4, that partial configurations produce sub-optimal outcomes. Five priority actions structure this phase.

Limited automation of recurrent, low-value, low-risk decisions. Where legally recognized, standardized low-value purchases may use automated call-off mechanisms with a mandatory administrative kill switch, consistent with the DLT-specific conditions Abdelsalam et al. [24] set out — full payment-condition verifiability, reliable connectivity, and legal recognition of automated execution — none of which this article's four verified cases independently confirms as met in any of the four countries studied.

Integrated predictive risk management. Continuous supplier risk monitoring, of the kind conceptually illustrated by the Rwanda predictive model (Section 5, Case 2) but scaled to a live monitoring context, should trigger alerts rather than automatic exclusion, with flagged suppliers given written notice and an opportunity to respond.

Automated bid evaluation limited to non-complex contracts. Any automation of evaluation should be restricted to low-complexity, low-value contracts and subject to a "right to human review" analogous to Article 22 of the EU General Data Protection Regulation, addressing the explainability requirement of Pillar 2.

Regional harmonization within the East African Community. Common data standards and a regional supplier-data exchange platform would extend the framework's logic beyond the single-country evidence base used in Section 5, and would require the same peer-reviewed, independently auditable evidentiary standard applied here before any regional claim of effectiveness is made.

Mandatory annual independent bias audits. All AI applications used for decisions materially affecting suppliers' rights should be subject to a published, independent annual bias audit, operationalizing the auditability principle of Pillar 5 and directly addressing the model-drift and gaming boundary condition [18].

Success indicators: a defined share of eligible low-risk contracts processed through automated call-off mechanisms without a rise in disputed decisions; independently audited bias metrics published annually; and no unresolved right-to-human-review requests outstanding beyond a defined statutory period.

Potential failure modes: model drift or supplier gaming going undetected between audit cycles [18]; over-automation eroding the contextual judgment procurement law requires (Section 6.1); and trust erosion if any automated decision is later found to lack

a legally adequate explanation, reopening the accountability gap the roadmap was designed to close.

This roadmap deliberately stops short of prescribing outcomes: consistent with the article's evidentiary standard, no phase-specific numerical target is presented as an expectation of the four illustrative cases in Section 5, since none of the four studies audits an operational system moving through these phases. The roadmap instead operationalizes the boundary conditions identified in Section 4.5 into a sequence procurement authorities can adapt and, at each phase, independently evaluate.

## 8. Discussion

### 8.1 Contribution to Theory

This article advances the theoretical understanding of AI in public procurement in three ways. First, the configurational framework moves beyond additive "list of applications" models to articulate the interdependence of enabling conditions across five pillars, responding to the fragmentation. Second, the four testable propositions provide a foundation for future empirical work. Third, the explicit treatment of boundary conditions responds to a gap in the existing literature on when AI is not an effective integrator.

### 8.2 Alignment with Existing Literature

The findings are broadly consistent with the international literature on algorithmic governance [14–16]. They are consistent with the view that AI augments rather than replaces human decision-making, and that meaningful human supervision is indispensable — a view reinforced by Andersson et al.'s [27] finding that perceived AI benefits center on operational and monitoring gains, a pattern the Tanzania and Kenya cases reproduce at the level of individual practitioners. By examining a single published model, the Rwanda case extends the finding that AI can reduce stockouts in African health supply chains only with sustained data investment, revealing precisely how much of the demand signal a five-year dataset can and cannot capture. The Uganda/Kenya case [6] extends Aboelazm and Dganni's [18] finding that organizational and political factors dominate technological ones, by documenting the specific governance gap — the absence of AI-procurement-specific frameworks — that this article's Pillar 2 and Proposition 2 identify as a precondition, not an afterthought.

### 8.3 Limitations and Implications for Practice

This study has several important limitations, several of which follow directly from the decision to rebuild the evidentiary base on peer-reviewed sources. First, the four cases are heterogeneous in method (two qualitative/exploratory, two quantitative survey-based) and, for Kenya, partly drawn from a private-sector retail study rather than a public procurement authority; this heterogeneity is disclosed throughout Section 5 rather than smoothed over. Second, none of the four studies audits an operational, government-deployed AI system end to end; each speaks to a bounded aspect (a technical model, practitioner perceptions, or governance readiness) of the broader phenomenon this article theorizes. Third, as a single-author study, the analysis reflects

the perspective of one researcher; no independent inter-coder reliability statistic is reported. Fourth, the article does not directly address infrastructure dependency (electricity reliability, internet penetration, cloud availability) as a variable in the framework, and data sovereignty risks, while identified, are not theorized in depth.

For procurement authorities, this article offers concrete guidance: start with data audit and legal framework development before any automation, addressing the specific gap Nagitta et al. [6] document; ensure bias testing and human oversight mechanisms are in place before scaling; maintain safeguards and monitoring even after automation; and, when commissioning or citing evidence of AI's effect on procurement, insist on peer-reviewed or independently auditable sources rather than self-reported institutional figures. For international donors, the findings suggest that funding should prioritize foundational data infrastructure and human capacity, and specifically the governance-framework gap identified in Uganda and Kenya, over technology procurement per se. For regulators, the framework provides a checklist for evaluating AI proposals: Are the five pillars addressed? Are enabling conditions in place? Are failure modes acknowledged and mitigated? Is the evidence offered for any claimed benefit independently traceable?

## 9. Conclusion

This article has advanced a theory-building argument: under specified enabling conditions across five interdependent pillars (theory, law, technology, sustainability, governance), AI can serve as an integrative catalyst for public procurement governance. We have proposed a configurational framework and derived four testable propositions, and we have illustrated — never confirmed — the framework's plausibility using four peer-reviewed, DOI-verifiable East African studies, chosen specifically because their findings are independently traceable.

Three overarching conclusions emerge. First, AI's integrative potential is conditional: it requires simultaneous progress on institutional, legal, and infrastructural enabling conditions, and the Uganda/Kenya case shows that, in at least two countries, the legal and institutional conditions have not yet caught up with the technology's availability. Second, the Rwanda and Kenya technical cases show that AI applications can perform well on a bounded task even where the surrounding governance framework is incomplete — precisely the configuration Proposition 4 predicts will be sub-optimal for the system as a whole. Third, the primary research gaps this field now requires is not more advocacy for AI adoption, but rigorous, independently verifiable empirical evaluation of AI procurement pilots — ideally with proper counterfactual designs, independent data collection, and systematic attention to distributional consequences for small and marginalized suppliers.

East Africa — with its active regional integration framework, rapidly evolving digital infrastructure, and demonstrable political will — may be a valuable laboratory for AI-enabled procurement governance. The four cases documented here, modest and narrowly scoped as they are, point toward the kind of independently verifiable evidence base this field needs more of. What is needed now is the institutional patience to build

the enabling conditions first, and the research infrastructure — peer review, DOIs, open data — to evaluate outcomes rigorously and verifiably thereafter.

**References**

[1] OECD. (2021). *Government at a glance 2021*.

[2] Uyarra, E., Flanagan, K., Magro, E., Zabala-Iturriagagoitia, J. M. (2020). Public procurement, innovation and industrial policy: Rationales, roles, capabilities and implementation. *Research Policy*, *49*(1): Article 103844.

[3] OECD. (2025). AI in public procurement. In *Governing with artificial intelligence*.

[4] African Union. (2015). *Agenda 2063: The Africa we want*. African Union Commission.

[5] East African Community. (2019). *EAC procurement and supply chain management policy*. EAC Secretariat.

[6] Nagitta, P. O., Mugurusi, G., Obicci, P. A., Awuor, E. (2022). Human-centered artificial intelligence for the public sector: The gate keeping role of the public procurement professional. *Procedia Computer Science*, *200*, 1084–1092.

[7] Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4): 532–550.

[8] Dubois, A., Gadde, L.-E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research*, *55*(7): 553–560.

[9] Dixon-Woods, M., Agarwal, S., Jones, D., Young, B., Sutton, A. (2005). Synthesising qualitative and quantitative evidence: A review of possible methods. *Journal of Health Services Research & Policy*, *10*(1): 45–53.

[10] Mwove, R. M., Kithandi, C. K. (2026). Artificial intelligence demand forecasting and supply chain performance of large supermarkets in Nairobi City County, Kenya. *African Journal of Commercial Studies*, *7*(1): 162–174.

[11] Williamson, O. E. (1998). Transaction cost economics: How it works; where it is headed. *De Economist*, *146*(1): 23–58. .

[12] Symes, A. (1999). [Review of the book Creating public value: Strategic management in government, by M. Moore]. International Public Management Journal, 2(1): 158–167.

[13] Thai, K. V. (2016). Global public procurement theories and practices: An introduction. In K. V. Thai (Ed.), Global public procurement theories and practices (pp. 1–14). Springer.

[14] Edler, J., Blind, K., Kroll, H., Schubert, T. (2023). Technology sovereignty as an emerging frame for innovation policy: Defining rationales, ends and means. *Research Policy*, *52*(6): Article 104765.

[15] Hänninen, M., Immonen, M., Hallikas, J. (2026). Artificial intelligence in public procurement: A multilevel dynamic capabilities perspective. *International Journal of Public Sector Management*, 1–22.

[16] Janssen, M., Brous, P., Estevez, E., Barbosa, L. S., Janowski, T. (2020). Data governance: Organizing data for trustworthy artificial intelligence. *Government Information Quarterly*, *37*(3): Article 101493.

[17] Al-Enezi, M. (2026). Governing AI adoption in public administration: An integrative framework for AI governance and data protection. Academic Journal of Research and Scientific Publishing, 8(89): 39–75.

[18] Toledo, R. R. (2026). Algorithmic accountability in public administration: A systematic review and conceptual framework for responsible AI governance (SocArXiv j495x_v1). Center for Open Science. .

[19] Mohib, M., Khan, F. K., El Burari, E. R., Ali, S. (2025). The challenges and limitations of artificial intelligence adoption in small and medium-sized enterprises. Review Journal of Social Psychology & Social Works, 3(1): 292–303.

[20] Aboelazm, K. S., Dganni, K. M. (2025). Public procurement contracts futurity: Using of artificial intelligence in a tender process. *Corporate Law & Governance Review*, *7*(1): 60–72. .

[21] Smuha, N. A. (2025). The use of algorithmic systems by public administrations: Practices, challenges and governance frameworks. In N. A. Smuha (Ed.), *The Cambridge handbook of the law, ethics and policy of artificial intelligence* (pp. 383–410). Cambridge University Press.

[22] Zalnieriute, M., Moses, L. B., Williams, G. (2019). The rule of law and automation of government decision-making. *Modern Law Review*, *82*(3): 425–455. .

[23] Reuben, W. N. M., Nyondo, G. G., Sangeda, R. Z., Ngoma, S. J. (2026). Technologies used for the quantification of essential medicines in health facilities in sub-Saharan Africa: A systematic review. *SSM - Health Systems*.

[24] Abdelsalam, M., Abouahmed, A., Shatat, A., Hashish, A., Alqodsi, E. (2025). Blockchain and smart public procurement contracts: A comparative legal analysis of digital transformation in the public sector. Access to Justice in Eastern Europe, 8(4): 242–274. .

[25] Sciarrone, A., Calabrese, M. (2026). Governing AI in sustainable public procurement: Towards an ESG-oriented conceptual architecture. VINE Journal of Information and Knowledge Management Systems. Advance online publication.

[26] Santos Júnior, D. B. (2026). Digital sovereignty and AI governance: From claim to instrument in a comparison of the Brazilian AI Plan and America's AI Action Plan [Preprint]. SciELO Preprints.

[27] Andersson, P. E., Arbin, K., Rosenqvist, C. (2025). Assessing the value of artificial intelligence (AI) in governmental public procurement. *Journal of Public Procurement*, *25*(1): 120–139.

[28] Andhov, M., Darnall, N., Andhov, A. (2025). Leveraging AI for sustainable public procurement: Opportunities and challenges. *Frontiers in Sustainability*, *6*, Article 1603214.

[29] Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal*, *54*(2): 393–420.

[30] Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., de Colle, S. (2010). *Stakeholder theory: The state of the art*. Cambridge University Press.

[31] Brammer, S., Walker, H. (2011). Sustainable procurement in the public sector: An international comparative study. *International Journal of Operations & Production Management*, *31*(4): 452–476.

[32] Bektaş, T., Laporte, G. (2011). The pollution-routing problem. *Transportation Research Part B: Methodological, 45(8): 1232–1250.*

[33] Zorina, Y. (2025). AI-driven sustainable procurement: Balancing strategy and ESG compliance. *Journal of Procurement and Supply Chain Management*, *4*(3): 1–13.

[34] Mbonyinshuti, F., Nkurunziza, J., Niyobuhungiro, J., Kayitare, E. (2022). Application of random forest model to predict the demand of essential medicines for non-communicable diseases management in public health facilities. *Pan African Medical Journal*, *42*, Article 89.

[35] Niyobuhungiro, J., Mbonyinshuti, F., Kayitare, E., Nkurunziza, J. (2022). The prediction of essential medicines demand: A machine learning approach using consumption data in Rwanda. *Processes*, *10*(1): Article 26. .

[36] Orio, G. J. (2025). Impact of artificial intelligence on procurement management performance. *NG-Journal of Social Development.*

[37] Rahwan, I. (2018). Society-in-the-loop: Programming the algorithmic social contract. *Ethics and Information Technology*, 20, 5–

# STAKEHOLDER ENGAGEMENT, GOVERNMENT PROCUREMENT POLICY, AND GREEN PUBLIC PROCUREMENT PERFORMANCE: EVIDENCE FROM PROCUREMENT AND DISPOSAL ENTITIES IN KAMPALA, UGANDA

Nazziwa Hajarah, Sheila Namagembe, Fredrick Aliganyira, and Azida Aisha Moya

***Suggested citation: Hajarah, N., Namagembe, S., Aliganyira, F., & Moya, A. A. (2026). Stakeholder Engagement, Government Procurement Policy, and Green Public Procurement Performance: Evidence from Procurement and Disposal Entities in Kampala, Uganda. International Journal of Public Procurement, 2(1), 52-67.***

**Abstract:**

Purpose: This study investigates the relationships between stakeholder engagement, government procurement policy, and green public procurement (GPP) performance in Uganda's Procurement and Disposal Entities (PDEs), while also analyzing their combined predictive effect.

Design/Methodology/Approach: A quantitative cross-sectional survey design was employed, drawing data from 84 PDEs in Kampala (83.2% response rate from a Yamane-determined sample of 101). Pearson correlation and multiple regression analysis were conducted using SPSS.

Findings: Both stakeholder engagement ($r = 0.413$, $p < 0.01$) and government procurement policy ($r = 0.470$, $p < 0.01$) demonstrated significant positive associations with GPP performance. Government procurement policy ($\beta = 0.368$, $p < 0.001$) emerged as the stronger predictor compared to stakeholder engagement ($\beta = 0.278$, $p = 0.007$). Combined, the two variables account for 27.0% of the variance in GPP performance (adjusted $R^2 = 0.270$).

Originality/Value: This study provides rare empirical evidence on the dual theoretical explanation of GPP performance, drawing from both stakeholder theory and institutional theory, in a developing sub-Saharan African country. It advances the limited body of literature on green procurement governance in Uganda and surfaces actionable policy implications for the Public Procurement and Disposal of Public Assets (PPDA) Authority.

---

*Nazziwa Hajarah, Sheila Namagembe, Fredrick Aliganyira, and Azida Aisha Moya are academics affiliated with Makerere University Business School, Uganda. Sheila Namagembe serves as Dean of the Faculty of Procurement and Logistics Management. Their research interests include public procurement, supply chain management, sustainable procurement, project management, and logistics.*

Copyright © 2026 by IPPA/IPPC

**Keywords**
green public procurement; stakeholder engagement; government procurement policy; institutional theory; stakeholder theory; **Uganda**; developing countries

## 1. Introduction

Green Public Procurement (GPP) has emerged as a globally significant instrument for embedding environmental sustainability into public sector operations [1, 2]. By integrating environmental criteria into procurement decisions across the lifecycle of goods, works, and services, governments can leverage their considerable market power to reduce ecological harm, stimulate eco-innovation, and accelerate progress toward the Sustainable Development Goals, particularly SDG 12 on responsible consumption and production [3, 4].

Despite its recognized strategic value, GPP performance in developing countries, including Uganda, remains persistently weak. Audits of Ugandan Procurement and Disposal Entities (PDEs) reveal that only a marginal proportion actively integrate green criteria, and most lack institutional capacity to monitor environmental outcomes [5]. This contrasts markedly with the more advanced GPP adoption observed in OECD economies, where structured legal mandates, stakeholder coordination platforms, and sustainability reporting frameworks have been shown to drive significantly higher GPP performance [6, 7].

Within this context, two antecedents have consistently emerged in the literature as central to GPP effectiveness: stakeholder engagement and government procurement policy [8, 9, 10]. Stakeholder engagement ensures that environmental priorities are co-constructed with diverse actors, including suppliers, civil society, environmental agencies, and user departments, thereby enhancing legitimacy, compliance, and adaptive capacity [11, 12]. Government procurement policy provides the formal institutional infrastructure through which sustainability objectives are translated into binding mandates, evaluation criteria, and enforcement mechanisms [7, 13].

However, empirical evidence on how these two enablers individually and jointly relate to GPP performance in Sub-Saharan Africa remains limited. Most studies in the region are either theoretical or case-based [14, 15], and few apply dual theoretical lenses or a quantitative methodology. In the Ugandan context specifically, the PPDA Act has undergone sustainability-oriented amendments, yet the association between policy reform and measurable green procurement outcomes remains insufficiently documented [16, 17].

This study therefore addresses three interconnected gaps. First, it contributes to the scant empirical, quantitative evidence on GPP performance in Ugandan PDEs. Second, it responds to calls for theoretically grounded investigation of GPP antecedents in developing countries by applying both stakeholder theory [18] and institutional theory [19]. Third, it examines the combined predictive power of stakeholder engagement and procurement policy, filling an analytical gap noted in the literature where these factors are studied in isolation rather than together [8]. The paper is organized as follows: Section 2 presents the theoretical framework and hypotheses.

Section 3 describes the methodology. Section 4 reports results. Sections 5 and 6 discuss findings and present conclusions with implications and future research directions.

## *2. Theoretical Framework* and *Hypotheses Development*

### *2.1 Theoretical Underpinnings*

This study is anchored in a dual theoretical framework comprising stakeholder theory and institutional theory, which together offer complementary explanations of why and how PDEs improve their GPP performance.

Stakeholder theory, originating from Freeman's (1984) seminal work and elaborated by subsequent scholars [20, 21], posits that organizations achieve superior outcomes when they identify and actively balance the interests of all relevant parties, including employees, suppliers, communities, regulators, and civil society. Applied to GPP, stakeholder theory explains why active engagement across the procurement cycle enhances environmental integration: inclusive participation generates legitimacy, mobilizes distributed knowledge, surfaces local environmental needs, and fosters commitment from those responsible for implementing green criteria [11, 9].

Institutional theory [19, 22] provides a complementary lens by examining how formal rules, regulatory mandates, and cultural expectations shape organizational behavior. Scott's [23] three institutional pillars, namely regulative, normative, and cognitive, explain how government procurement policy functions: mandatory green clauses exert coercive pressure, professional standards generate normative alignment, and policy discourse normalizes sustainability as a legitimate procurement objective. In Uganda, where PDEs are legally accountable to the PPDA Act and increasingly subject to sustainability guidelines, institutional pressures are a primary driver of GPP behavior [16]. Critically, neither theory alone is sufficient. Stakeholder theory without institutional backing risks compliance gaps, while institutions without stakeholder engagement risk performative rather than substantive adoption of green practices [24, 25].

### **2.2 Hypotheses Development**

#### **2.2.1 Stakeholder Engagement and GPP Performance**

Meaningful stakeholder participation throughout the procurement cycle, encompassing needs assessment, specification development, bid evaluation, and contract management, has been found to strengthen GPP performance by aligning diverse interests with environmental goals. Globally, Agyekum et al. [14] demonstrated that stakeholder engagement enhances GPP implementation in public works procurement in Ghana. In Uganda, Nakyeyune et al. [17] found that structured stakeholder coordination is associated with more consistent application of green criteria in PDEs. Liu et al. [9] further established that external stakeholder pressure and organizational learning are associated with GPP practices in Chinese public institutions. Viewed through an institutional lens, stakeholder engagement operates primarily as a normative mechanism [19]: professional norms and relational expectations among suppliers, civil society, and user departments generate informal pressure toward environmentally responsible conduct, distinct from the coercive pressure of formal

policy mandates addressed under H2 below. Based on stakeholder theory, institutional theory, and this body of evidence:

H1: Stakeholder engagement has a significant positive relationship with GPP performance in Ugandan PDEs.

### 2.2.2 Government Procurement Policy and GPP Performance

Government procurement policy provides the formal regulatory framework that mandates, incentivizes, and operationalizes green procurement objectives. The clarity, enforceability, and coherence of such policies have been consistently associated with stronger GPP performance. Testa et al. [7] found that public institutions subject to mandatory GPP frameworks show significantly higher environmental integration than those operating under voluntary guidelines. Brammer and Walker [6], in a comparative OECD study, established that structured green procurement frameworks are associated with stronger adoption of environmental criteria. In Uganda, the PPDA Act's sustainability provisions, though still unevenly enforced, represent an institutional pressure toward GPP compliance [26]. This relationship is best explained through coercive isomorphism [19]: as a legally binding regulatory authority, the PPDA Act compels PDE compliance irrespective of individual organizational preference, a mechanism distinct from the normative pressure associated with stakeholder engagement under H1 above. Based on institutional theory and prior evidence:

H2: Government procurement policy has a significant positive relationship with GPP performance in Ugandan PDEs.

### 2.2.3 Combined Effect on GPP Performance

Beyond their independent effects, the synergy between stakeholder engagement and government procurement policy is argued to generate an amplified impact on GPP performance. Policy frameworks that are co-designed with stakeholder input yield procurement guidelines better aligned with market realities and local environmental priorities [25]. Conversely, stakeholder commitment to green procurement is more sustained when backed by clear regulatory mandates that legitimize and incentivize participation [24]. This synergistic relationship has been empirically documented in European contexts but remains underexplored in Sub-Saharan Africa. Based on both theories and the noted literature gap:

H3: Stakeholder engagement and government procurement policy jointly and significantly predict GPP performance in Ugandan PDEs.

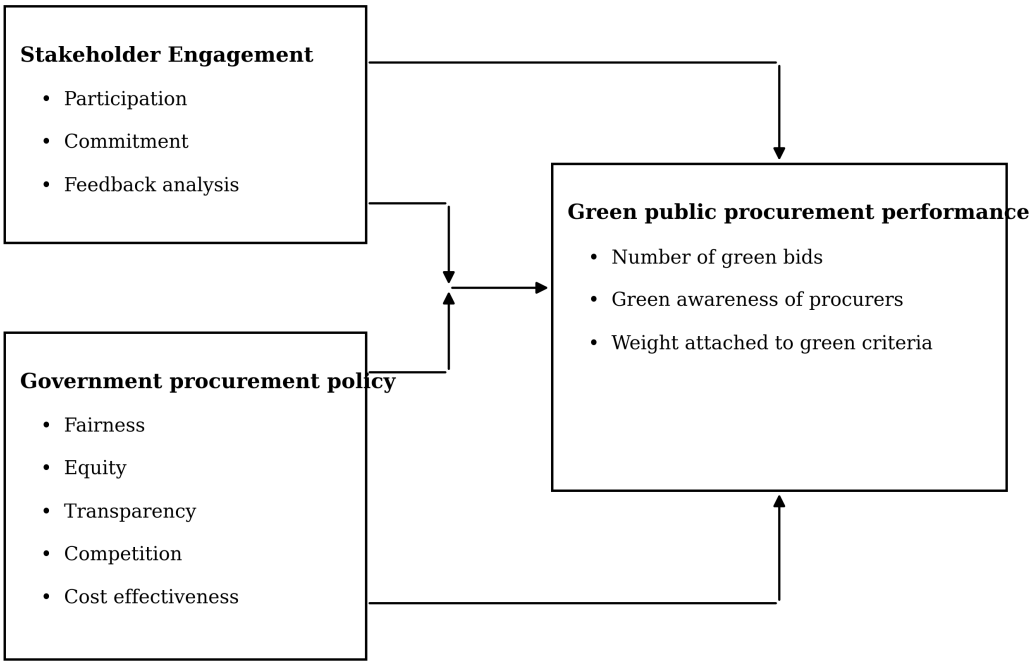



*Figure 1. Conceptual model*

**Source: Developed from Freeman** [18]**; DiMaggio and Powell** [19]**; Liu et al.** [9]**; Santosh et al.** [10]**; Testa et al.** [7]

## 3. Methodology

### 3.1 Research Design and Population

A quantitative cross-sectional survey design was employed, consistent with prior GPP studies employing positivist approaches to establish statistical associations among variables [27, 28]. The study population comprised 136 PDEs operating in Kampala, Uganda's administrative capital and home to the highest concentration of government ministries, commissions, authorities, and regulatory bodies (E-Procurement Portal, Government of Uganda, 2025). Kampala was selected because its PDEs are representative of Uganda's public procurement system and are subject to the full spectrum of PPDA regulatory requirements.

### 3.2 Sampling and Data Collection

Using Yamane's [29] sample size formula, with a 95% confidence level and margin of error of 0.05, a sample of 101 PDEs was determined from the population of 136. Simple random sampling without replacement was applied, assigning unique identifiers to each PDE and using a random number generator for selection, ensuring equal probability of inclusion and minimizing selection bias. One knowledgeable respondent per PDE was targeted: a procurement officer or senior procurement practitioner directly involved in policy implementation and sustainability integration. Structured self-administered questionnaires were distributed both physically and via email between October 2024 and September 2025. Completed, usable responses were received from

84 PDEs, yielding a response rate of 83.2%, considered highly adequate for survey-based research [30].

### 3.3 Measurement of Variables

Each construct was operationalized using validated scales from prior studies. Stakeholder engagement was measured across three dimensions: participation, commitment, and feedback, adapted from Bonson and Ratkai [31], Greenwood [11], and Mutebi et al. [32], totaling 12 items. Government procurement policy was measured through five dimensions, namely fairness, equity, transparency, competition, and cost-effectiveness, adapted from the PPDA Act (2003), Marron [33, 34], and Vabaza [35], totaling 15 items. GPP performance was operationalized using eco-label integration, energy efficiency, waste reduction, and sustainable sourcing criteria, adapted from Liu et al. [36], Testa et al. [37], and Ye et al. [38], totaling 12 items. All items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

A conceptual boundary between stakeholder engagement and government procurement policy warrants clarification given their moderate inter-correlation ($r = 0.368$; see Table 3). The stakeholder engagement items are designed to capture participation initiated by or extended to internal and external actors, for example the extent to which suppliers, civil society, and user departments are consulted or provide feedback, and are conceptually distinct from the government procurement policy items, which assess respondents' perceptions of the fairness, equity, transparency, competitiveness, and cost-effectiveness of the regulatory framework itself, independent of whether or how the PDE engages external parties. This distinction supports the discriminant validity of the two constructs, although a confirmatory factor analytic review of item loadings is recommended in future refinements of the instrument to further verify that no items conflate participatory engagement with mere policy compliance.

It should also be clarified that the GPP performance scale, comprising eco-label integration, energy efficiency, waste reduction, and sustainable sourcing criteria, is oriented toward process-level adoption of green procurement practice, for example the inclusion of environmental specifications in tender documents and the application of eco-labelling criteria during bid evaluation, rather than downstream environmental outcomes such as measured reductions in emissions or resource consumption. This process orientation is consistent with the operationalizations used by Liu et al. [36], Testa et al. [37], and Ye et al. [38], from which the scale was adapted, but should be borne in mind when interpreting the practical significance of the findings: the study speaks to the extent of green procurement practice adoption rather than to verified environmental impact.

### 3.4 Validity and Reliability

Content validity was established through a panel of six procurement and sustainability experts using the Item-Level Content Validity Index (I-CVI), with acceptable thresholds of 0.78 or higher for panels of six or more experts [39]. All constructs met or exceeded this threshold as shown in Table 1. Cronbach's alpha

coefficients exceeded 0.70 for all constructs, confirming adequate internal consistency [40].

Table 1. Reliability and Validity Summary

| *Variable* | *Number of items* | *I-CVI score* | *Cronbach's α* |
|---|---|---|---|
| Stakeholder Engagement | 12 | 0.785 | 0.777 |
| Government Procurement Policy | 15 | 0.844 | 0.763 |
| GPP Performance | 12 | 0.796 | 0.788 |

**Source: Primary data (2025)**

### 3.5 Data Analysis

Pearson correlation analysis was employed to assess the strength and direction of bivariate relationships among the study variables. Multiple linear regression analysis was then used to examine the joint predictive power of stakeholder engagement and government procurement policy on GPP performance. All analyses were conducted using SPSS version 28.0. Diagnostic tests, including normality checks and collinearity diagnostics confirmed the appropriateness of parametric analysis, with VIF values below 3 for all predictors.

### 3.6 Common Method Bias

Because all three constructs were collected from a single respondent using a single self-administered instrument, the data are potentially susceptible to common method bias (CMB) [41]. Procedural remedies were applied at the design stage, including psychological separation of predictor and criterion items within the questionnaire and assurance of respondent anonymity to reduce social desirability bias. In addition, Harman's single-factor test was conducted: all items were entered into an unrotated exploratory factor analysis, with CMB considered unlikely to be a serious concern if no single factor accounts for the majority of the variance [41]. [Author to insert: % of variance explained by the first unrotated factor, from the underlying SPSS/EFA output.] The result is reported in Section 4.2.

## 4. Results

### 4.1 Respondent and PDE Characteristics

Of the 84 respondents, 57.1% were male and 42.9% female, reflecting a moderate gender imbalance in procurement roles consistent with broader public sector dynamics in Uganda. The majority (71.4%) held a Bachelor's degree and 53.6% were in the 35–39-year age bracket, indicating a mature and experienced workforce. Regarding procurement experience, 73.0% of respondents had at least four years of professional experience, with 27.4% having 10 to 12 years and 19.0% exceeding 12 years, providing high confidence in the validity and relevance of data reported. Regarding PDE type, 42.9% were government institutions, 29.8% ministries, 16.7% authorities, 6.0% commissions, and 4.8% hospitals, ensuring broad cross-sectoral representation.

***Table 2. Respondent and PDE Characteristics***

| *Category* | *Item* | *% of Respondents* | *Cumulative %* |
|---|---|---|---|
| Gender | Male | 57.1 | 57.1 |
| | Female | 42.9 | 100.0 |
| Highest Education | Bachelor's degree | 71.4 | 71.4 |
| | Other qualifications (diploma, master's, etc.)* | 28.6 | 100.0 |
| Age Bracket | 35–39 years | 53.6 | 53.6 |
| | Other age brackets (combined)* | 46.4 | 100.0 |
| Procurement Experience | 10–12 years | 27.4 | 27.4 |
| | More than 12 years | 19.0 | 46.4 |
| | 4–9 years* | 26.6 | 73.0 |
| | Less than 4 years* | 27.0 | 100.0 |
| PDE Type | Government institutions | 42.9 | 42.9 |
| | Ministries | 29.8 | 72.7 |
| | Authorities | 16.7 | 89.4 |
| | Commissions | 6.0 | 95.4 |
| | Hospitals | 4.8 | 100.2 |

*Figures are the residual/complement of percentages directly reported in the survey narrative (Section 4.1) and should be verified against the underlying dataset. N = 84. Source: Primary data (2025).

**4.2 Common Method Bias Assessment**

Following the procedure outlined in Section 3.6, an unrotated exploratory factor analysis was conducted on all items measuring stakeholder engagement, government procurement policy, and GPP performance. [Author to insert: e.g. "The first unrotated factor accounted for XX.X% of total variance, below the 50% threshold conventionally used to flag common method bias as a serious concern [41], suggesting CMB is unlikely to substantially distort the relationships reported below."] Pending confirmation of this result against the underlying dataset, the correlation and regression findings reported in Sections 4.3 and 4.4 should be interpreted as provisional with respect to common method bias.

### 4.3 Correlation Analysis

Table 3 presents the Pearson correlation results, which show that all three variables are positively and significantly correlated at the 0.01 level. Following Cohen's [42] classification, stakeholder engagement has a moderate positive and significant relationship with GPP performance ($r = 0.413$, $p < 0.01$), confirming H1. Government procurement policy demonstrates a slightly stronger moderate positive and significant relationship with GPP performance ($r = 0.470$, $p < 0.01$), confirming H2. The two independent variables also show a moderate significant inter-correlation ($r = 0.368$, $p < 0.01$), indicating conceptual relatedness while remaining distinct enough to contribute independently to GPP performance. Multicollinearity diagnostics confirmed this, with VIF values of 1.157 for both predictors, well within acceptable thresholds.

***Table 3. Pearson Correlation Results***

| *Variable* | *1. Stakeholder Engagement* | *2. Govt. Procurement Policy* | *3. GPP Performance* |
|---|---|---|---|
| 1. Stakeholder Engagement | 1.000 | .368** | .413** |
| 2. Govt. Procurement Policy | .368** | 1.000 | .470** |
| 3. GPP Performance | .413** | .470** | 1.000 |

**Note**. **** p < 0.01 (**two**-tailed); N = 84. Source: Primary data (2025)**.

### 4.4 Regression Analysis

Table 4 presents the multiple regression results examining the joint predictive power of stakeholder engagement and government procurement policy on GPP performance (H3). The overall model is statistically significant ($F(2, 81) = 16.333$, $p < 0.001$). The $R^2$ value of 0.287 (adjusted $R^2 = 0.270$) indicates that the two independent variables collectively account for 27.0% of the variance in GPP performance. Government procurement policy ($\beta = 0.368$, $p < 0.001$) emerged as the stronger predictor of GPP performance compared to stakeholder engagement ($\beta = 0.278$, $p = 0.007$), with both making statistically significant and independent contributions. These results confirm H3. Effect sizes ($f^2$), computed as $t^2/df_residual$ following Selya et al. [43], are reported in Table 4 alongside the standardized coefficients.

**Table 4. Multiple Regression Results (Dependent Variable: GPP Performance)**

| *Variable* | *B* | *Std. Error* | *Beta* | *t* | *Sig.* | *VIF* | $f^2$ |
|---|---|---|---|---|---|---|---|
| (Constant) | 1.768 | 0.407 | -- | 4.339 | < .001 | -- | -- |
| Stakeholder Engagement | 0.268 | 0.098 | 0.278 | 2.751 | .007 | 1.157 | 0.093 |
| Govt. Procurement Policy | 0.356 | 0.098 | 0.368 | 3.644 | < .001 | 1.157 | 0.164 |

**Note**. **R = 0.536;** $R^2$ **= 0.287;** adjusted $R^2$ **= 0.270; F(2, 81) = 16.333, p < 0.001.** $f^2$ **computed as** $t^2/df_residual$ **(df_residual = 81), following Selya et al.** [43]**; per Cohen's** [42] **benchmarks,** $f^2$ **=** 0**.02 (small),** 0**.15 (medium),** 0**.35 (large). Source: Primary data (2025)**

## 5. Discussion

### 5.1 Stakeholder Engagement and GPP Performance

The finding that stakeholder engagement is positively and significantly associated with GPP performance ($r = 0.413$; $\beta = 0.278$) aligns with and substantively extends the existing literature. Within stakeholder theory [18], this finding confirms that PDEs which embed structured mechanisms for participation, commitment-building, and feedback integration across procurement cycles are better positioned to translate environmental objectives into concrete procurement outcomes. This is consistent with Agyekum et al. [14], who documented similar patterns in Ghanaian public works procurement, and with Liu et al. [9], who found that external stakeholder engagement drives organizational learning toward greener procurement practices.

Importantly, the significant but modest effect size ($\beta = 0.278$; $f^2 = 0.093$, a small-to-medium effect using Cohen's [42] benchmarks) suggests that while stakeholder engagement is meaningfully associated with GPP performance, this association in Ugandan PDEs is constrained by documented institutional barriers including unequal power dynamics, limited awareness of green procurement among suppliers and SMEs, and the absence of formal coordination platforms [17, 44]. This implies that engagement strategies must be institutionalized rather than treated as ad hoc consultations to achieve their full potential. For Ugandan PDEs, this means creating standing stakeholder advisory committees, standardized feedback collection systems, and capacity-building programs that equip both procurement officers and suppliers to participate meaningfully in green procurement dialogues.

### 5.2 Government Procurement Policy and GPP Performance

Government procurement policy emerged as the stronger predictor of GPP performance ($r = 0.470$; $\beta = 0.368$; $f^2 = 0.164$, a medium effect using Cohen's [42] benchmarks), a finding with significant implications for Uganda's green procurement reform agenda. Through the lens of institutional theory [19], this result demonstrates the primacy of coercive institutional pressure: PDEs that perceive their procurement policies as fair, transparent, equitable, and competitive are significantly more likely to operationalize environmental criteria throughout the procurement cycle.

This is consistent with Testa et al. [7], who established that mandatory GPP policy frameworks generate significantly higher environmental integration than voluntary guidelines, and with Brammer and Walker [6], who demonstrated that policy quality is among the strongest predictors of green procurement performance across OECD countries. In the Ugandan context, the PPDA Act's sustainability amendments and the GPP Guidelines [45, 26] represent progressive but still incompletely enforced institutional signals. The significant policy-performance association found in this study suggests that even partial policy implementation is already driving measurable GPP improvements, indicating that comprehensive enforcement holds substantial transformative potential. The finding also resonates with Pouikli's (2020) argument that mandatory rather than voluntary GPP frameworks are essential for driving systemic change.

The comparatively stronger effect of government procurement policy relative to stakeholder engagement ($\beta = 0.368$ versus 0.278; $f^2 = 0.164$ versus 0.093) can be further explained by features of Uganda's institutional context. Uganda's public administration has historically operated through a hierarchical, rules-based bureaucratic culture in which compliance with centrally issued mandates carries greater behavioral weight than voluntary, bottom-up consultation [16]. Civil society and supplier associations engaged in procurement oversight in Uganda also remain comparatively under-resourced relative to state regulatory bodies, which may limit the leverage that stakeholder engagement alone can exert on procurement behavior [44]. In addition, the data collection window for this study (October 2024 to September 2025) followed the issuance of more assertive green procurement directives under the PPDA Act's amendments, which may have made policy-related coercive pressure especially salient to respondents at the time. Together, these contextual features are consistent with the coercive-isomorphism interpretation of H2 advanced in Section 2.2.2.

### 5.3 Combined Effect and Governance Implications

The joint model (adjusted $R^2 = 0.270$) confirms that stakeholder engagement and government procurement policy together predict a significant proportion of GPP variance, though the model also signals that additional factors, including market readiness, digital procurement infrastructure, political commitment, and budget availability account for the unexplained variance. This is consistent with Alvarez-Risco et al. [46] and Di Vaio et al. [47], who argue that GPP performance is a multidimensional outcome requiring holistic enabling conditions beyond policy and engagement alone.

The dual theoretical contribution of this paper is particularly salient here: stakeholder theory explains the legitimacy-building function of inclusive engagement, while institutional theory explains the compliance function of formal policy mandates. Neither operates effectively in isolation. As Amann et al. [24] demonstrated, high policy quality without stakeholder capacity results in formalistic compliance, while robust stakeholder engagement without strong policy backing generates fragmented and non-scalable green practices. The synergistic governance model proposed and supported by this study therefore provides a practical roadmap for Uganda's PPDA Authority.

A further consideration concerns the coherence of Uganda's green procurement policy architecture itself. PDEs currently operate under multiple, only partially harmonized instruments, including the PPDA Act, the National Public Sector Procurement Policy, the GPP Guidelines [45], and the Uganda Green Growth Development Strategy. The extent to which these instruments send consistent signals was not directly assessed in this study, and conflicting or overlapping mandates could plausibly dilute the strength of the policy-performance relationship documented here, because "government procurement policy" is measured through respondents' perceptions of fairness, equity, transparency, competition, and cost-effectiveness rather than through an audit of instrument-level consistency. This represents an important boundary condition for interpreting the policy effect and is a priority for future research combining document analysis with survey data.

## 6. Conclusion

### 6.1 Summary of Findings

This study examined the roles of stakeholder engagement and government procurement policy as antecedents of GPP performance in Uganda's PDEs, grounded in stakeholder and institutional theories. Drawing on quantitative cross-sectional data from 84 PDEs in Kampala, the study found that both variables demonstrated significant positive associations with GPP performance and jointly account for 27.0% of its variance. Government procurement policy was the stronger predictor ($\beta = 0.368$), followed by stakeholder engagement ($\beta = 0.278$), with both making independent and statistically significant contributions.

### 6.2 Theoretical Implications

First, this study contributes to the limited empirical literature on GPP antecedents in Sub-Saharan Africa, providing quantitative evidence from a developing country context [16, 15, 48]. Second, it advances the theoretical integration of stakeholder theory and institutional theory as complementary frameworks for understanding GPP governance, demonstrating that sustainability outcomes in public procurement arise from the intersection of participatory and regulatory forces. Third, it responds to calls by Liu et al. [9] and Fraser et al. [8] for empirical investigation of stakeholder-policy synergies in green procurement, providing evidence that these effects are mutually reinforcing.

### 6.3 Practical Implications

For policymakers at the PPDA Authority and the Ministry of Finance, Planning and Economic Development, the findings support mandatory incorporation of green specifications into all procurement stages, accompanied by clear enforcement mechanisms and sustainability performance monitoring. Concretely, the PPDA Regulations could be amended to require that a specified minimum share of the evaluation weighting, for example, 20–30% of the evaluation weighting for medium- and high-value contracts, be allocated to environmental and social criteria, alongside supplier sustainability reporting requirements and incentive structures such as expedited payment terms or pre-qualification status for eco-compliant bidders.

For procurement managers within PDEs, the study recommends institutionalizing stakeholder engagement rather than treating it as an ad hoc consultative exercise. A practical first step would be for PDEs to establish standing, mandatorily attended multi-stakeholder GPP review forums, convening procurement officers, environmental agency representatives, supplier associations, and civil society, on at least a quarterly basis, alongside structured pre-bid environmental consultations. Piloting this model in two or three Kampala PDEs, evaluated over 12 to 18 months, would generate the longitudinal evidence needed to test whether institutionalized engagement translates into improved GPP performance. Investing in green procurement capacity-building for procurement officers, suppliers, and user departments remains essential to translate engagement intentions into performance outcomes. These findings align directly with

Uganda's commitments under SDG 12 on responsible consumption and production and SDG 16 on peace, justice, and strong institutions, positioning GPP as a critical instrument for sustainable development in the Ugandan context.

### 6.4 Limitations and Future Research Directions

The cross-sectional design precludes causal inference and cannot capture the evolution of GPP performance over time. Longitudinal studies are recommended to track the impact of policy reforms and sustained stakeholder engagement. The geographical focus on Kampala limits generalizability to rural PDEs, local governments, and parastatals. The unexplained variance (73%) signals the presence of additional determinants, including digital procurement infrastructure, supplier market readiness, and political commitment, which warrant investigation in expanded models. Future studies should also apply structural equation modeling to test complex mediation and moderation paths, and employ qualitative methods to deepen understanding of the mechanisms through which policy and engagement translate into green procurement outcomes.

Four further limitations should be noted. First, although procedural safeguards were applied and Harman's single-factor test was conducted (Section 4.2), common method bias arising from single-respondent, single-instrument data collection cannot be fully ruled out and should be interpreted alongside the finalized CMB test result. Second, the regression model did not include control variables such as PDE size, the procurement officer's years of experience, or prior GPP training; these were not captured in the current dataset and are recommended for inclusion in future replications to help rule out alternative explanations. Third, Uganda's green procurement architecture comprises multiple, only partially harmonized instruments, and the extent to which these send coherent or conflicting signals to PDEs was not directly assessed (see Section 5.3); future research combining document analysis with survey data could usefully examine policy coherence as a boundary condition for the policy-performance relationship documented here. Fourth, while the focus on Kampala PDEs was deliberate given their concentration of regulatory oversight and institutional capacity, PDEs in rural or upcountry settings likely face different capacity constraints and exposure to GPP guidance; comparative studies would help establish the external validity of the present findings beyond the capital.

### References

[1] OECD. (2024). Harnessing public procurement for the green transition: Good practices in OECD countries. OECD Public Governance Reviews. https://doi.org/10.1787/e551f448-en

[2] UNEP. (2022). Sustainable public procurement implementation guidelines. United Nations Environment Programme.

[3] United Nations. (2017). Sustainable development goals: Progress towards the goals report 2017. United Nations Publications.

[4] World Bank Group. (2021). Green public procurement: An overview of green reforms in country procurement systems.

[5] PPDA. (2023). Annual performance report 2022/2023. Public Procurement and Disposal of Public Assets Authority.
[6] Brammer, S., Walker, H. (2011). Sustainable procurement in the public sector: An international comparative study. International Journal of Operations and Production Management, 31(4): 452–476.
[7] Testa, F., Annunziata, E., Iraldo, F., Frey, M. (2016). Drawbacks and opportunities of green public procurement: An effective tool for sustainable production. Journal of Cleaner Production, 112: 1893–1900.
[8] Fraser, M., Agaba, E., Kiiza, P. (2021). The influence of stakeholder groups on the implementation of green procurement in public entities. African Journal of Public Procurement, 8(2): 112–127.
[9] Liu, J., Ma, Y., Appolloni, A., Cheng, W. (2021). How external stakeholders drive the green public procurement practice? An organizational learning perspective. Journal of Public Procurement, 21(2): 138–166.
[10] Santosh, M., Kharola, P. S., Rana, N. P. (2020). Supplier collaboration and green supply chains: Evidence from public sector procurement. International Journal of Supply Chain and Operations Resilience, 4(2): 101–118.
[11] Greenwood, M. (2007). Stakeholder engagement: Beyond the myth of corporate responsibility. Journal of Business Ethics, 74(1): 15–27.
[12] Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C. H., Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. Journal of Environmental Management, 90(5): 1933–1949.
[13] Pouikli, K. (2020). Towards mandatory green public procurement requirements under the EU Green Deal: Reconsidering the role of public procurement as an environmental policy tool. Environmental Policy and Governance, 30(5): 333–344.
[14] Agyekum, A. K., Fugar, F. D. K., Agyekum, K., Akomea-Frimpong, I. (2022). Barriers to stakeholder engagement in sustainable procurement of public works. Engineering, Construction and Architectural Management. https://doi.org/10.1108/ECAM-08-2021-0746
[15] Nabimanya, D., Atukunda, P., Katusabe, J. (2021). Green public procurement in Uganda: Opportunities and challenges. Journal of Public Procurement and Contract Management, 6(2): 45–58.
[16] Mugarura, D., Tusiime, F., Atukunda, R. (2024). Green procurement and policy coherence in Uganda: The role of institutional collaboration. Uganda Journal of Environmental Policy, 12(1): 33–49.
[17] Nakyeyune, P., Lwanga, D., Kyambadde, R. (2023). Stakeholder engagement and sustainable procurement practices in Ugandan public entities. Makerere Journal of Public Policy, 19(2): 77–93.
[18] Freeman, R. E. (1984). Strategic management: A stakeholder approach. Pitman.
[19] DiMaggio, P. J., Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2): 147–160.

[20] Phillips, R. A., Barney, J. B., Freeman, R. E., Harrison, J. S. (2019). Stakeholder theory. Cambridge University Press.
[21] Mahajan, R., Lim, W. M., Sareen, M., Kumar, S., Panwar, R. (2023). Stakeholder theory. Business Ethics Quarterly, 33(2): 273–295.
[22] Scott, W. R. (2008). Approaching adulthood: The maturing of institutional theory. Theory and Society, 37(5): 427–446.
[23] Scott, W. R. (1995). Institutions and organizations. Sage Publications.
[24] Amann, M., Roehrich, J. K., Essig, M., Harland, C. (2014). Driving sustainable supply chain management in the public sector: The importance of public procurement in the European Union. Supply Chain Management: An International Journal, 19(3): 351–366.
[25] Alhola, K., Ryding, S. O., Salmenperä, H., Busch, N. J. (2019). Exploiting the potential of public procurement: Opportunities for sustainable innovation and policy integration. Journal of Cleaner Production, 218: 242–256.
[26] PPDA. (2022). Annual performance report 2021/2022. Public Procurement and Disposal of Public Assets Authority.
[27] Bryman, A. (2016). Social research methods (5th ed.). Oxford University Press.
[28] Preuss, L. (2009). Addressing sustainable development through public procurement: The case of local government. Supply Chain Management: An International Journal, 14(3): 213–223.
[29] Yamane, T. (1967). Statistics: An introductory analysis (2nd ed.). Harper and Row.
[30] Babbie, E. R. (2007). The practice of social research (11th ed.). Thomson Wadsworth.
[31] Bonson, E., Ratkai, M. (2013). A set of metrics to assess stakeholder engagement and social legitimacy on a corporate Facebook page. Online Information Review, 37(5): 787–803.
[32] Mutebi, H., Aryatwijuka, W., Rukundo, A., Twongyirwnne, R., Tumwebembeire, N., Tugiramasiko, M. (2023). Stakeholder expectations, inter-organizational coordination and procurement practices among humanitarian organizations.
[33] Marron, D. B. (1997). Buying green: Government procurement as an instrument of environmental policy. Public Finance Review, 25(3): 285–305.
[34] Marron, D. B. (2003). Greener public purchasing as an environmental policy instrument. OECD Journal on Budgeting, 3(4): 71–105.
[35] Vabaza, L. (2015). A review of the implementation of government procurement policy. Journal of Public Procurement, 15(3): 321–338.
[36] Liu, J., Shi, B., Xue, J., Wang, Q. (2018). Improving the green public procurement performance of Chinese local governments: From the perspective of officials' knowledge. Journal of Environmental Policy and Planning.
[37] Testa, F., Grappio, P., Gusmerotti, N. M., Iraldo, F., Frey, M. (2015). Examining green public procurement using content analysis: Existing difficulties for procurers and useful recommendations. Environmental Science and Policy, 55: 34–48.

[38] Ye, M., Ma, Y., Liu, J. (2022). Why do public sectors perform high-level green public procurement practice? A new insight with fsQCA approach. Journal of Environmental Planning and Management, 65(14): 2719–2747.

[39] Lynn, M. R. (1986). Determination and quantification of content validity. Nursing Research, 35(6): 382–385.

[40] Nunnally, J. C., Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.

[41] Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5): 879–903.

[42] Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

[43] Selya, A. S., Rose, J. S., Dierker, L. C., Hedeker, D., Mermelstein, R. J. (2012). A practical guide to calculating Cohen's $f^2$, a measure of local effect size, from PROC MIXED. Frontiers in Psychology, 3, 111.

[44] Mwesigye, J., Nambalirwa, S. (2022). Barriers to green procurement implementation in Uganda's public sector. International Journal of Procurement and Supply Chain Management, 6(1): 45–57.

[45] PPDA. (2021). Green public procurement guidelines for Uganda. Public Procurement and Disposal of Public Assets Authority.

[46] Alvarez-Risco, A., Del-Aguila-Arcentales, S., Yanez, J. A. (2021). Sustainable public procurement: A strategic tool for fostering green innovation. Sustainability, 13(15), 8530.

[47] Di Vaio, A., Varriale, L., Trujillo, L. (2023). Measuring green public procurement performance through key indicators: An international review. Sustainable Development, 31(1): 35–50.

[48] Zziwa, G., Namagembe, S., Atuhairwe, D. (2021). Stakeholder engagement in the implementation of green public procurement in Uganda. Uganda Journal of Procurement and Logistics, 6(1): 45–60.

[49] OECD. (2021). Green public procurement: An overview of green procurement practices. OECD Publishing.

# PUBLIC PROCUREMENT IN THE AGE OF AI: CONTRACT ADAPTATION, RENEGOTIATION AND THE LIMITS OF CONTRACTUAL RIGIDITY

Milagros Ibarzabal

***Suggested citation: Ibarzabal, M. (2026). Public procurement in the age of AI: Contract adaptation, renegotiation and the limits of contractual rigidity. International Journal of Public Procurement, 2(1), 68–89.***

**Abstract**

As governments increasingly procure artificial intelligence (AI) and other data-intensive technologies, traditional public contract models based on stable specifications and limited post-award change face growing pressure. The core problem is that AI contracts are shaped by obsolescence, performance variability, data dependency, cybersecurity needs, interoperability requirements, and vendor lock-in risks, making adaptation a recurring condition of performance. Using legal-doctrinal analysis, complemented by contract governance theory and selected comparative references, this paper argues that administrative law should focus less on the immutability of contractual wording and more on preserving the public purpose of the relationship. It concludes that AI procurement requires governed adaptability: predictable, traceable, and auditable mechanisms that preserve transparency, competition, integrity, and value for money.

**Keywords:**

public procurement; artificial intelligence; contract adaptation; ius variandi; governed adaptability; vendor lock-in

---

*Milagros Ibarzabal is a partner in the Public & Administrative Law Department at Marval O'Farrell Mairal (Argentina). She holds a law degree from Universidad Austral, where she graduated with honors, a Master's degree in Administrative Law from Universidad Austral, and an LL.M. from New York University. She specializes in procurement and transactions involving public entities, disputes involving public entities in administrative and judicial proceedings at the national level and across various provincial jurisdictions, as well as regulatory matters, compliance, public ethics, and integrity policies. She has lectured graduate and postgraduate courses in Public Law at Universidad Austral, Universidad Católica Argentina, Universidad de Buenos Aires, and the Attorney General's Office School of Law. She is currently a postgraduate professor of Administrative Procedural Law at Universidad Católica Argentina.*

Copyright © 2026 by IPPA/IPPC

## 1. Introduction

Public procurement is undergoing an accelerated transformation as states incorporate complex technological solutions and, in particular, systems based on artificial intelligence (AI) to deliver services, manage critical infrastructure, and enhance their administrative capacity.

However, a significant portion of procurement regimes and existing contractual models continue to be structured around assumptions characteristic of relatively stable goods and services: specifications that can be defined ex ante, predictable life cycles, and an economic-financial balance preserved through performance "in accordance with the tender specifications." That framework—functional for traditional procurements - faces increasing tensions when the contractual object is a data-intensive technological solution subject to rapid obsolescence, frequent updates, and dynamic performance.

In such scenarios, contractual rigidity may generate two equally problematic effects: on the one hand, it immobilizes contract management and compromises the continuity, quality, or security of the service; on the other, it drives adaptation toward informal or reactive channels (belated addenda, de facto renegotiations, non-transparent expansions), thereby increasing integrity risks, the likelihood of challenges, and the loss of value for money.

In that context, the classical categories associated with the immutability of the administrative contract - and, more broadly, the conception of contractual modification as an exception - prove insufficient for AI and technology-intensive contracts, in which adaptation is often a condition of viability rather than an anomaly. The challenge is not to authorize unlimited changes, but to design adaptation mechanisms compatible with competition, transparency, and oversight.

For purposes of this paper, "public purpose" in AI procurement is used in a concrete and operational sense. It includes at least five dimensions: (i) continuity and reliability of public service; (ii) non-discrimination and fairness in algorithmic outputs; (iii) transparency, explainability and accountability of automated or data-supported decisions; (iv) data security, privacy and lawful data governance; and (v) technological resilience and managed dependence, understood as the ability of the public buyer to audit, maintain, migrate, scale or terminate the solution under contractually defined conditions, without disrupting service continuity and while respecting the supplier's intellectual property, confidentiality and legitimate commercial interests. These dimensions guide the analysis of when contractual adaptation preserves the contract's public purpose and when it instead substitutes the result of the competitive procedure.

On that premise, this paper examines: (i) how the technical and operational characteristics of AI place pressure on traditional contractual tools; (ii) why, in administrative law, the issue cannot be reduced to the notion of immutability, but must also be analyzed in light of the public purpose and the adaptation powers vested in the Administration; (iii) how renegotiation and unilateral modification mechanisms, including the ius variandi, should be reconceptualized in order to preserve efficiency, continuity, and value for money; and (iv) what institutional and contractual design makes such adaptation foreseeable, auditable, and legally reviewable.

## 2. Literature and Theoretical Framework

Recent literature on AI and public procurement increasingly emphasizes that procurement is not merely a purchasing channel but also a governance instrument. Recent EU scholarship has similarly emphasized that public procurement is a central entry point for digital technologies into public-sector infrastructure but has also warned that procurement may be an ineffective regulatory gatekeeper for AI adoption if contracting authorities lack the legal, technical and institutional tools needed to control trustworthy use over time [1].

Empirical work on municipal AI procurement has shown that legacy procurement rules and routines shape which AI systems are acquired, who participates in decision-making, and how algorithmic harms are addressed [2]. AI procurement checklists and risk-management frameworks similarly highlight the need to move from high-level principles to operational requirements, such as risk classification, disclosure, testing, expertise and monitoring [3]. OECD work on public procurement for innovation also stresses that procurement can be used to introduce innovative approaches, solutions and processes into the public sector [4].

This paper builds on that literature but focuses on a specific blind spot: the legal and contractual governance of adaptation after award. The problem is not only how to select trustworthy AI, but how to govern an AI contract whose technical environment, data conditions and regulatory constraints change during performance. In that sense, the proposed framework complements scholarship on trustworthy AI procurement by examining change management, renegotiation and unilateral modification powers as lifecycle governance tools.

The first theoretical anchor is incomplete contracts theory. In complex and uncertain projects, parties cannot specify ex ante every relevant future state, contingency or efficient response; a contract will therefore leave gaps that must later be managed through governance mechanisms [5]. AI procurement is a paradigmatic case of incompleteness: future data distributions, model drift, cybersecurity vulnerabilities, regulatory updates and interoperability needs are partly foreseeable as categories, but not fully specifiable in content, timing or cost.

The second anchor is relational contracting: business exchange relationships are often not governed exclusively by complete contractual planning or legal sanctions; instead, parties frequently rely on informal adjustment, negotiation, non-legal sanctions, commercial norms, reputation, and continuing business relationships to solve problems during performance [6]. This insight is especially relevant for long-term technology contracts, where not every future contingency can be reduced to fixed clauses. In public procurement, however, relational governance cannot displace legality, competition and transparency. It must therefore be translated into auditable procedures: change-control workflows, documented technical evidence, approval gates, and objective limits on scope, price and time.

The third anchor is management control theory and performance-based contracting. Ouchi's framework treats organizational control as the design of mechanisms that move an organization toward common objectives, including through rules, performance measurements, information flows and monitoring [7]. Transposed

to public procurement, this perspective helps frame the contract as a governance device: the public buyer must be able to monitor performance, compare it against predefined standards, and trigger corrective or adaptive measures when deviations occur. Performance-based contracting is particularly relevant because AI contracts should not be governed only by prescriptive specifications. They also require measurable outcomes, thresholds, service levels, risk indicators and remediation mechanisms.

### 1. 3. AI as the Object of Procurement and AI as a Tool for Contract Governance

A distinction is necessary. Most of this paper addresses AI as the object of procurement: the system, model, service or data-intensive solution that the public buyer acquires. In that role, AI creates adaptation needs because the procured object is dynamic, data-dependent and technically evolving. Drift, retraining, model updates, security patches and interoperability adjustments affect the substance of performance.

AI may also function as a tool for contract governance. Procurement authorities may use AI or data analytics to monitor performance, detect anomalies, identify risks, predict delays, verify service levels, or support audit functions. That second role may reinforce governed adaptability by making deviations visible earlier and by generating evidence for change-control decisions. However, it creates its own risks: automated monitoring may be incomplete, biased, opaque or over-inclusive; it may also alter the balance of information between the public buyer and the supplier.

Accordingly, AI-enabled contract governance should not be treated as an automatic substitute for legal reasoning or administrative judgment. It should operate as a control mechanism that helps identify whether an adaptation may be needed, while the legal decision to modify, renegotiate or exercise the ius variandi must remain documented, reasoned and reviewable. This distinction clarifies the paper's central claim. AI systems, as contractual objects, require lifecycle governance because their performance, risks and technical environment evolve over time. AI tools may support that governance by improving monitoring and evidence generation, but they should not replace the legal judgment required to modify, renegotiate or adapt a public contract.

## 4. Particular Features of Procuring AI and Technology-Intensive Solutions

Before proceeding, it is worth clarifying that, in administrative law, the issue cannot be framed in the same terms as in private law. In civil-law systems, private contracts have traditionally been associated with the idea that agreements operate as law between the parties. In administrative contracts, by contrast, that logic is tempered by the centrality of the public interest, service continuity, and the Administration's legally vested powers of adaptation. Spanish case law and civil-law scholarship have therefore distinguished the immutability of contractual wording from the immutability of the contract's purpose or service: while private-law modification powers are generally construed restrictively, administrative modification powers are justified when necessary to preserve the public function underlying the contract [8]. This explains why classical administrative-law doctrine has described administrative contracts as dynamic legal relationships, aimed not at freezing the contractual text, but at preserving the public purpose that justified the procurement in the first place [9–11].

Within that framework, the ius variandi provides the background legal category through which administrative law has traditionally addressed changes required by the public interest. At this stage, it is enough to note that this logic becomes especially relevant when the contracted object is a dynamic technological solution whose public utility depends on its functional adequacy over time. The specific limits of that power are addressed below in Section 9.

Unlike conventional procurements, in which the object can be described and controlled chiefly through static specifications and verification at the time of delivery, the procurement of AI and technology-intensive solutions presents a far more changeable technical and operational dynamic: solutions evolve, depend on data and variable infrastructure, and require frequent adjustments. Hence the need to rethink both tender design and contract management to avoid formal rigidity degrading the service or shifting adaptation toward informal and insufficiently traceable modifications.

### 4.1. Innovation Cycles, Obsolescence, and Managed Technological Dependence

In technological matters - and even more so in AI - innovation cycles advance more rapidly than the usual timelines for planning, tendering, award, and contractual performance in the public sector. Software versions, models, technical standards, and cybersecurity practices are updated frequently; failing to do so in a timely manner may result in loss of functionality, exposure to vulnerabilities, or deterioration in performance. Obsolescence, therefore, does not appear to be an exceptional event, but rather a foreseeable condition of the contractual life cycle.

Added to this is a particular form of technological dependence: the value of the contract lies not only in the initial delivery of a product, but in the maintenance of an ecosystem composed of infrastructure, updates, support, evolutionary maintenance, and compatibilities, control over which is usually distributed among different components and, often, concentrated in the provider or in third parties. In this context, the relevant question ceases to be merely whether delivery occurred and becomes whether the contract allows the solution to remain current, secure, and functional throughout its performance.

### 4.2. Learning Systems: Variable Performance, Drift, Retraining

AI systems based on machine learning introduce a qualitative difference as compared with traditional deterministic software. Their performance is not necessarily stable or fully verifiable ex ante, but is measured through metrics - precision, error, robustness - that may vary depending on the context, input data, usage patterns, and the evolution of the environment. Consequently, contractual compliance is not exhausted by an initial acceptance test, but requires continuous monitoring and sustained performance criteria.

Here, the phenomenon of drift becomes central. Data drift occurs when the distribution of input data changes over time; concept drift occurs when the relationship between inputs and the target outcome changes, or when the phenomenon being predicted evolves. In both cases, a model that was acceptable at deployment may become less reliable during performance, even without any breach by the supplier.

Accordingly, retraining and other model adjustments cease to be extraordinary events and become part of the ordinary operation of the solution.

This dynamic reinforces the need to contractually provide for change-management rules, metrics, thresholds, validation procedures and audit trails that allow the system to be adapted without impairing transparency or the controllability of the process.

### 4.3. Data as a Critical Input: Access, Quality, Governance, and Security

In AI contracts, data constitutes not an accessory element, but the critical input on which performance, robustness, and, in many cases, the very operability of the system depend. The availability, quality, and representativeness of training and operational data directly condition the practical value of the solution.

This requires specific contractual definitions regarding: (i) data access and availability; (ii) applicable quality requirements and standards; (iii) governance, including roles, responsibilities, validation, traceability, and retention; and (iv) security and compliance, particularly in relation to personal data protection, confidentiality, cybersecurity, and incident response. Where these issues are not properly regulated, data-related problems tend to translate into performance disputes, increased costs, delays, and unforeseen adaptations. For that reason, procurement must allocate responsibilities with respect to data with a level of precision equivalent to that traditionally required for technical specifications.

### 4.4. Interoperability, Vendor Lock-In, and Operational Continuity

Another distinctive dimension is the need to ensure interoperability and operational continuity. AI solutions are often integrated with registries, databases, management systems, and critical infrastructure within complex architectures in which dependence on a provider or platform may hinder future competition and the orderly replacement of the service. The risk of vendor lock-in is not merely economic: it may also affect institutional resilience, technological sovereignty, and the State's ability to audit, migrate, or scale a solution without being held captive to conditions imposed ex post.

Interoperability is therefore directly connected to the right to exit or reversibility. Contractual provisions on API standards, open or documented formats, data portability, model or configuration documentation, and transition assistance mitigate lock-in because they preserve the public buyer’s practical ability to migrate the service or organize a new competitive procedure. Without those provisions, termination rights may be legally available but operationally ineffective.

In this context, interoperability is not merely a desirable technical attribute, but a requirement of contractual governance. Likewise, operational continuity requires transition, reversibility, and contingency mechanisms, including extended support, knowledge transfer, and measures to prevent interruptions upon technological changes or at contract termination. These provisions not only protect the State but also reduce uncertainty and conflict for the provider by establishing clear conditions from the outset for the solution’s evolution, scaling, and orderly exit.

At the same time, such provisions should be proportionate and should preserve the supplier's intellectual property, trade secrets, cybersecurity safeguards and legitimate confidentiality interests. Reversibility should not operate as a disguised transfer of proprietary technology, but as a means of ensuring service continuity, data portability and orderly transition under predefined contractual conditions.

### 4.5. Illustrative Scenario: A Public Benefits Triage System

Consider a hypothetical but realistic procurement of an AI-supported prioritization system for social-benefit applications (that is, a system designed to sort incoming applications, identify urgent or high-risk cases, and prioritize files for human review, without replacing the final administrative decision). The tender specifies initial accuracy, response-time and availability KPIs, integrates the system with existing registries, and requires the model to prioritize applications for human review. During performance, three events occur: the agency changes eligibility rules, application patterns shift after an economic shock, and a cybersecurity standard is updated. The model's error rate increases for a vulnerable group, and the original API no longer supports a new registry.

Under a rigid contractual model, each corrective step may be characterized as a modification: retraining, integration changes, additional documentation, new fairness testing and security updates. That characterization can paralyze the project or push the parties toward informal adjustments. Under governed adaptability, by contrast, the tender would have anticipated categories of permissible adaptation, required evidence of drift and disparate impact, established approval thresholds, allocated data responsibilities, and set price bands or service catalogues for recurrent changes. The public purpose would not be reduced to keeping the original code untouched; it would include continuity, fairness, auditability, privacy, security and lifecycle value for money.

## 5. Why the Classical Model of Contractual "Immutability" Is Insufficient

The notion of immutability - or, at least, of strong stability of contractual content - has occupied a central place in modern public procurement. In different legal systems, this translates into a preference for "closed" contracts, in which the object, price, and conditions of performance are defined ex ante, and subsequent modifications are admitted only exceptionally, under specified grounds and strict controls.

That paradigm performs a recognizable function: safeguarding transparency, preserving competition, and preventing, once the contract has been awarded, substantial alterations to the conditions that justified the contractor's selection. In that sense, the principle of equality among tenderers continues to project effects into the performance stage, because the burdens and benefits ultimately assumed by the successful bidder must remain comparable to those that framed the original competition [12]. However, when the contractual object consists of an AI or technology-intensive solution—dynamic, data-dependent, and subject to rapid innovation cycles—that model reveals structural limits.

### 5.1. The Logic of the Closed Contract and Its Assumptions

The “closed” contract rests, essentially, on two assumptions. The first is the stability of the object: it is assumed that what is being procured can be described with sufficient precision before the award and that such description will remain suitable during performance. The second is the possibility of verifying compliance chiefly ex ante or at early stages, through deliverables and initial acceptance tests.

In traditional procurements - standardized goods, public works with a defined engineering design, relatively repeatable services - these assumptions are usually reasonable. In AI and technology-intensive contracts, by contrast, both weaken. The contractual object is often composed of software, infrastructure, data, integrations, and operational processes whose performance can only be fully confirmed during execution and may vary over time. In addition, the value of the solution often depends on its capacity for adaptation: updates, cybersecurity improvements, correction of vulnerabilities, or retraining in response to drift. In this context, rigidity does not suppress change; it merely postpones it, makes it more expensive, or shifts it to less transparent channels.

### 5.2. Undesirable Effects on the Public Interest

The rigid application of that paradigm in technological contracts tends to produce effects contrary to the public interest. When the tender specifications and the contract do not provide clear adaptation mechanisms, the need for change emerges all the same, whether due to obsolescence, cybersecurity requirements, regulatory changes, integration with other systems, or variations in model performance. The Administration is then faced with an unsatisfactory alternative: tolerate service degradation or introduce adjustments through ad hoc means. In either case, continuity, service quality, and value for money are undermined.

To this is added an increase in conflict. The absence of precise rules regarding who bears the cost of certain adaptations, which changes fall within the original scope, and which constitute relevant modifications, or which metrics govern variations inherent to the system, encourages economic claims, disputes during performance, and litigation.

At the same time, the lack of contractual foresight tends to generate additional costs: late changes are usually more expensive than planned changes; correcting failures in production entails greater reputational and operational costs; and service continuity may require extensions or bridge procurements under time pressure, with less competition and worse conditions.

### 5.3. Undesirable Effects on Providers and Innovation

The classical model also generates significant costs from the contractor's perspective, especially for providers operating under serious compliance standards. When the contract has been designed on assumptions of stability that do not correspond to the nature of the procured technology, legal and operational uncertainties arise: it is not always clear which updates are permitted, how they must be authorized, whether necessary retraining may be construed as an improper modification, or whether a cybersecurity improvement alters the agreed scope. Such uncertainty makes pricing, planning, and proper execution more difficult.

In more severe scenarios, rigidity may even translate into a risk of impossible performance. If the contract fixes performance levels and metrics as though they were entirely static, the provider is exposed to breaches stemming from variations intrinsic to the system, such as drift or exogenous changes in the data. Instead of encouraging better practices, such contractual design may induce defensive conduct: increased pricing to cover risk, reduction of the offered scope, or disincentives to participate in innovative public procurements. This point is consistent with incomplete contracts theory: when future contingencies cannot be fully specified ex ante, contracts necessarily leave gaps that must later be addressed through governance mechanisms or renegotiation [5]. In AI procurement, this helps explain why rigid allocation of undefined future risks may lead to higher risk premiums, defensive bidding or inefficient renegotiation rather than better performance.

For that same reason, the logic of immutability may operate as a brake on innovation. If every relevant evolution of the solution becomes trapped in slow, uncertain, or legally ambiguous procedures, tenderers will tend to propose more conservative technologies. The result is suboptimal: the State does not fully leverage the potential of digital transformation, and providers face fewer incentives to invest in solutions oriented toward the public interest.

### 5.4. Immutability of the Contract and Immutability of Its Purpose

In AI and technology-intensive contracts, the central legal tension does not arise between stability and change in the abstract, but between two distinct conceptions of stability. One, rooted more deeply in civil law, associates stability with the ex-ante fixation of the content of obligations and with minimal subsequent alteration. The other, proper to administrative law, links stability to the preservation of the public purpose that justifies the contract.

From the latter perspective, modification does not necessarily constitute an anomaly. It may be the indispensable means of preventing the contract from becoming inadequate, unsafe, or dysfunctional in the face of technological changes, new interoperability requirements, cybersecurity demands, or objective deterioration in system performance. In AI contracts, where obsolescence, drift, retraining, and component updates form part of the normal life cycle of the solution, a rigid defense of the intangibility of the contractual text may end up undermining precisely what administrative law seeks to protect: the continuity, adequacy, and effectiveness of the public service [13].

This does not mean that contractual adaptation may rewrite the bargain or substitute the result of the competitive procedure. The point is more limited: in certain technological contracts, preserving the public purpose may require adjustments aimed at keeping the original contractual function effective over time. The legal limits of such adjustments—object, competition, proportionality, reasoning and economic-financial equilibrium—are examined in Section 9.

## 6. Contractual Adaptation as a Governance Instrument (Not as an Exception)

Whereas under the classical paradigm contractual modification appears as an exceptional event, admitted under restricted grounds and subject to enhanced control, in AI and technology-intensive contracts adaptation must be understood as an ordinary function of contractual governance. The question is not whether the contract will change, but how those changes are to be structured, documented, and controlled without affecting the principles of public procurement.

From this perspective, the aim is not to weaken the restrictions on renegotiation, but to distinguish between two situations: on the one hand, adaptations that are necessary and foreseeable in order to preserve the functionality, security, and public value of the solution; on the other, substantive alterations that distort the competitive outcome and therefore must remain prohibited or require a new procedure.

### 6.1. From "Modification" to the Contract's Adaptive Management

In technology, and especially in AI, contractual performance comprises ongoing activities of operation, evolutionary maintenance, and adjustment: updates, cybersecurity measures, integration changes, and, in some cases, retraining in response to drift. Treating all of these dynamics as a "modification" in the classical sense leads to two dysfunctional results: either it paralyzes contract management, or it shifts changes toward informal and less transparent arrangements.

For that reason, it is more appropriate to abandon the binary opposition between immutable contract and modified contract, and to adopt an adaptive management approach: a set of contractual and procedural rules that allows changes to be introduced within a previously defined, verifiable, and controllable framework.

Under this approach, adaptation is not conceived as a departure from the contract, but as a form of performance aimed at preserving its public object: continuity, security, functionality, and performance. Adaptive management thus acts as a bridge between a changing technical reality and the legal and institutional requirements of control, competition, and integrity.

This approach does not eliminate the distinction between adaptations contemplated ex ante and modifications that require a separate legal basis during performance. When the change was sufficiently anticipated in the tender documents or in the contract, its implementation forms part of ordinary contract management. When the adjustment responds to supervening circumstances not adequately foreseen, it must be assessed under the stricter legal framework for post-award modifications, discussed in Section 9.

In AI contracts, both layers must coexist: ex ante contractual design reduces uncertainty, and exceptional recourse to the power of modification makes it possible to address supervening circumstances that cannot be resolved through formal rigidity.

### 6.2. Grounds for Adaptation: Efficiency, Value for Money, Continuity, and Integrity

The basis for this shift is not merely pragmatic. In public procurement, adaptation may be justified as an instrument for safeguarding objectives that, in technological contracts, are especially strained.

First, contractual efficiency and effectiveness. A contract incapable of absorbing foreseeable changes in its technical environment tends to frustrate outcomes or increase the cost of performance. In this context, efficiency is not measured solely by the awarded price, but by the capacity to sustain adequate performance throughout the contractual life cycle.

Second, value for money. In technological solutions, value is not exhausted upon award, but is built over time through improvements, reduction of failures, scalability, and mitigation of risks. A rigid model may prevent the capture of that value and shift costs to less competitive mechanisms, such as extensions, urgent procurements, or temporary solutions. Predefined adaptation, by contrast, makes it possible to organize the contract's evolution under criteria of proportionality and auditability.

Where retraining or another form of adaptation enables an AI system to exceed its original contractual KPIs, incremental lifecycle value for money should be assessed against the performance baseline agreed at award or before the adaptation. The additional public benefit—for example, improved accuracy, timeliness, service coverage, error reduction, resilience, or other public-purpose outcomes—should be compared with the full incremental lifecycle cost, including retraining, validation, data preparation, additional monitoring, cybersecurity, transition, and foreseeable future-dependence costs. Where benefits cannot be monetized reliably, the contract may use predefined weighted outcome indicators and require a documented proportionality assessment showing that the additional expenditure is justified by the expected public benefit, without altering the awarded object or the competitive equilibrium.

Third, continuity and quality of service. AI is often embedded in critical functions, so the possibility of correcting vulnerabilities, updating components, or recalibrating the system is not a matter of convenience, but a requirement of regularity and service security.

Finally, integrity and the safeguarding of competition. The risk does not stem from adapting, but from adapting without rules. A well-designed adaptive management model may reduce discretion, prevent opportunistic renegotiations, and strengthen oversight precisely because it defines ex ante which changes are admissible, under what conditions, on what evidence, and who must approve them.

The issue, then, is not whether to choose between flexibility and transparency, but how to articulate governed flexibility.

Predefined change thresholds also serve an integrity function because they deter low-balling strategies. For example, the tender documents may provide that recurrent technical adjustments remain within the original scope only up to a defined cumulative cap, while any change exceeding a specified percentage of the contract value or timeline—such as 10% of the value or 15% of the original implementation period, subject to local law—requires enhanced approval, market testing or a new competitive procedure. The precise thresholds will depend on the legal system and the nature of the contract, but the governance logic is constant: foreseeable change should be priced and competed ex ante, so that neither party is forced into uncertain, disputed or strategically distorted renegotiations after award.

### 6.3. Guiding Criterion: Predictable, Traceable, and Justified Adaptations

From the foregoing, a guiding principle emerges: in AI contracts, adaptations must be predictable, traceable, and justified.

They must be predictable, because the contract must anticipate, to the greatest extent possible, which changes are expected, what their limits are, and what procedure will govern their approval.

They must be traceable, because every adaptation must leave a sufficient documentary trail for audit: rationale, technical evidence, impact assessment, proportionality analysis, and record of approvals. In AI matters, this also includes, where appropriate, minimum documentation of the model's life cycle.

And they must be justified, because every adaptation must respond to an identifiable public purpose - continuity, security, performance improvement, regulatory compliance - and remain within limits that do not alter the core of the awarded contract or the competitive equilibrium of the procedure.

Understood in this way, adaptation ceases to be a space of defensive exceptionalism and becomes a true instrument of contractual governance: a mechanism for reconciling technological dynamism with the standards of integrity, control, and public value inherent in administrative procurement.

## 7. Risk Map in AI Contracts and Criteria for Allocable Risk Assignment

An AI contract that is performable and compatible with the principles of public procurement requires moving from abstract formulations - such as a generic guarantee of results - to an explicit identification of risks and a coherent allocation of responsibilities. If the contract fails to delimit them properly, it usually produces two undesirable effects: prices inflated by indeterminate risk, or obligations of uncertain performance followed by inevitable renegotiations. An allocable risk assignment does not entail shifting all risk to the provider or assuming it entirely on the State's side but distributing it according to each party's actual capacity to manage it, with verifiable mechanisms and proportionate remedies.

### 7.1. Technical Risks

In AI contracts, technical risks go beyond the mere availability of the system. They include performance, stability in different scenarios, robustness against atypical or adversarial inputs, security, and, in certain cases, the risk of bias or discriminatory outcomes incompatible with the pursued public purposes.

These risks must be translated into measurable obligations: metrics, acceptable thresholds, testing and validation procedures, production monitoring, and mitigation plans. Without such contractual translation, compliance assessment is left to vague notions of proper functioning, which foster conflict.

### 7.2. Data Risks

In AI, data simultaneously constitute an input and a source of risk. It is therefore not enough to treat them as an accessory issue of confidentiality or personal data

protection. The principal risks relate to access, lawfulness of use, protection, retention, and data quality.

A realistic allocation requires defining from the outset which data are supplied by the State, which are provided by the provider, who carries out labeling, and who assumes responsibility for defects in quality or legal restrictions. Many implementation or performance failures actually stem from insufficient, defective, or unavailable data. If the contract does not account for that causal nexus, the controversy tends to shift toward economic claims or mutual allegations of breach. Hence the advisability of incorporating a genuine contractual discipline for data: governance rules, minimum standards, and remediation mechanisms in the event of failures or changes in data sources. In particular, suppliers should not be treated as guarantors of data quality, representativeness or lawfulness where those elements depend on datasets, legal bases, labeling decisions or operational inputs controlled by the public buyer.

### 7.3. Regulatory Risks

AI contracts are performed in a changing regulatory environment, marked by new requirements concerning algorithmic transparency, cybersecurity, data protection, non-discrimination, and sector-specific regulation. This creates a central allocation problem: who bears the cost and effort of compliance when new standards, interpretations, or audit requirements arise.

From an allocable-risk perspective, it is advisable to distinguish between foreseeable and general changes - for example, reasonable updates to security standards - which may be integrated into the ordinary duty of maintenance, and more intense or specific changes, which substantially alter the scope and should trigger adaptation mechanisms with impact assessment. The key is to avoid regulatory risk being absorbed by generic clauses of "total compliance," which then prove unworkable or encourage opaque renegotiations.

The roadmap mechanism discussed below operationalizes this distinction. Foreseeable general updates can be incorporated into planned maintenance and versioning obligations, while more intense or specific regulatory changes should trigger a documented impact assessment covering scope, cost, timing, security, data governance and the effect on the competitive balance of the original tender.

### 7.4. Operational Risks

Many technological projects fail not because of deficiencies in the system, but because of operational risks: lack of internal capabilities, resistance to change, inadequate processes, or critical dependence on third parties. In AI, these risks are aggravated by the need for continuous monitoring, incident management, and frequent updates, as well as by the intervention of cloud providers, external databases, or other essential third parties.

Accordingly, a well-designed contract must treat training, knowledge transfer, and continuity plans as core components of the scope. It must also provide for exit scenarios: orderly transition, data portability, sufficient documentation, and limited post-contract support to avoid interruptions.

### 7.5. Allocation Tools

Once the risk map has been identified, allocation becomes operational through classical contractual tools adapted to the technological context.

First, measurable obligations and standards: SLAs, KPIs, security requirements, data governance rules, periodic reports, reasonable audits, and change management procedures. Second, graduated correction mechanisms, such as remediation plans, cure periods, and scheduled retraining. Third, reasonable limitations of liability and exclusions, which avoid imposing unlimited liability for variables beyond the provider's control, without prejudice to preserving the typical exceptions for particularly serious situations. Finally, continuity and exit clauses should be included, such as portability, reversibility, documentation, and transition support.

Taken together, these tools allow for a balanced allocation of risks: the State preserves continuity, control, and value for money, while the provider obtains predictability and a workable framework within which to operate and evolve the solution. The objective is not a “flexible” contract in the abstract, but an adaptive and controllable contract capable of absorbing technological uncertainty without compromising the principles that legitimize public procurement.

## 8. Ex Ante Adaptation Mechanisms: Designing Change from the Tender Specifications

In AI and technology-intensive contracts, the decisive issue is not whether there will be changes during performance, but whether the tender specifications and the contract foresee, channel, and control them. Designing ex ante adaptation mechanisms makes it possible to reconcile the need to update and evolve the solution with the requirements of transparency, competition, traceability, and expenditure control. The point is not to authorize open-ended renegotiations, but to establish a governance architecture defining what may change, who authorizes it, how it is documented, how it is remunerated, and within what limits.

### 8.1. Change Management and Governance

The first component is a change-management procedure (change control) incorporated into the tender specifications and the contract as a core discipline. Its function is to turn change into a foreseeable and auditable process, avoiding improvisation and reducing the space for informal adjustments.

To that end, it is advisable to provide for: (i) a governance framework with technical officers and, where appropriate, legal intervention; (ii) a standardized workflow for requests, evaluation, decision, implementation, and verification; (iii) categories of changes with different approval levels; and (iv) minimum documentation regarding rationale, technical evidence, operational impact, costs, timelines, and versions. In that way, control can focus on relevant changes without blocking ordinary adjustments indispensable to maintaining the functionality and security of the service.

### 8.2. Roadmaps, Updates, and Life Cycle

In technology and AI, the contract should not be built on the idea of a "final" delivery, but on a life-cycle logic. For that reason, the tender specifications may incorporate phased roadmaps, verifiable milestones, update calendars, and technological-update clauses defining minimum standards of compatibility, security, and performance.

These provisions perform a dual function. For the State, they make it possible to avoid obsolescence and require the adjustments necessary to sustain service continuity. For the contractor, they provide clarity as to which updates are included in the original scope, which require specific approval, and under what criteria their acceptance will be verified. The condition, of course, is that the roadmap should not operate as a generic authorization to expand the awarded object indefinitely.

### 8.3. Modular Procurement and the Reduction of Vendor Lock-In

Another relevant instrument is procurement by components or functional layers. The modular structuring of the object makes it possible to isolate performances, facilitate partial substitutions, and preserve competition in future procurements, thereby reducing the risk of excessive dependence on a single provider.

Modularity will not always be fully viable, but it constitutes a valuable design guideline insofar as it favors interoperability, scalability, and reversibility. From this standpoint, it is not merely a technical decision, but also an instrument of contractual policy aimed at preserving management capacity and future competition.

### 8.4. Adaptive Remuneration

Adaptation is governable only if the contract also provides how it is to be remunerated. In AI contracts, a fixed and undifferentiated price tends to produce two equally problematic results: excessive risk premiums or subsequent claims arising from inevitable changes. To avoid this, the tender specifications may incorporate adaptive remuneration mechanisms within previously tendered parameters.

These may include service catalogues, unit prices for frequent changes, price bands, or caps by category of adjustment. These techniques make it possible to organize the contract's economic evolution without shifting all uncertainty to the time of renegotiation. What matters is that the scheme preserves comparability among tenders and maintains clear limits in order to avoid substantial alterations to the competitive equilibrium.

### 8.5. Portability, Transition, and Exit

Designing change also requires designing exit. In public procurement of technology, service continuity should not depend on improvised arrangements upon contract termination or in the event of a dispute. Hence the importance of providing from the outset for clauses on interoperability, data portability, documentation, knowledge transfer, and transition assistance.

These provisions protect the State, but they also reduce uncertainty for the industry by establishing clear rules on reversibility and the orderly winding up of the contractual

relationship. At the same time, they strengthen future competition and reduce the risk of unplanned or excessive technical dependence.

Ultimately, ex ante adaptation mechanisms allow contractual flexibility to operate under rules. They do not eliminate the classical limits of public procurement, but they make it possible for the contract to evolve without becoming a space for discretionary renegotiation.

## 9. Renegotiation and Ius Variandi: Limits, Conditions, and Good Practices

Ex ante adaptation reduces the scope for improvised renegotiation but does not eliminate it. Even with well-designed tender specifications, AI contracts may require unforeseen adjustments: relevant regulatory changes, new cybersecurity vulnerabilities, alterations in data environments, supervening interoperability requirements, or technical findings that render the originally procured solution inefficient - or inadequate for the public interest.

In that scenario, two complementary categories come into play: renegotiation, as a bilateral readjustment of the contractual relationship, and the ius variandi, as a power of unilateral modification vested in the Administration by virtue of the public interest.

The tradition of administrative law admits that power, but within precise limits: it must respond to a concrete public need, be reasonable and duly reasoned, not alter the essence of the contract or distort equality among tenderers, and preserve the contractor's economic-financial equation when the change imposes greater burdens. In public procurement of AI, therefore, the issue is not to abandon classical categories, but to apply them with special care to dynamic contractual objects.

### 9.1. When Adaptation Is Appropriate—and When It Is Not

In technological contracts, adaptation is justified only when it is necessary and proportionate in order to preserve the contract's public purpose in the face of verifiable circumstances. Broadly speaking, this includes four situations: (i) measures to ensure service continuity and security, such as vulnerability mitigation, or resilience adjustments; (ii) technical adjustments to preserve performance, such as recalibrations or retraining in response to objective degradation; (iii) changes necessary to interoperate with institutional systems or standards; and (iv) adjustments required by new regulatory or oversight obligations, especially in data protection, security, and traceability.

By contrast, adaptation ceases to be legitimate—or requires a new competitive procedure—when it amounts to redefining the contract: incorporating performances with no functional connection to the awarded object, replacing the solution with another of a different nature, substantially altering the economic structure, or progressively expanding a limited procurement until it is transformed into a broader services program. The rule is this: adaptation is admissible when it preserves the contract's purpose; it ceases to be so when it replaces it.

From the perspective of the ius variandi, this requires an objective link between the proposed change and the public interest implicated in performance. Mere

administrative convenience or preference for a technologically superior solution is not enough.

### 9.2. Material Thresholds for Identifying the Core of the Contract

To distinguish legitimate adaptation from a redefinition of the contractual relationship, it is useful to work with material thresholds that make it possible to determine whether the change affects the core of the contract. In technology and AI, that analysis should address, at a minimum, four dimensions: (i) functional scope, in order to verify whether the change adds new functionalities, users, jurisdictions, or use cases that alter the original need; (ii) price and economic structure, in order to assess whether it significantly increases total cost or modifies the remuneration logic; (iii) time, in order to determine whether it materially extends the duration of the contract or transforms a temporary solution into a prolonged relationship without new competition; and (iv) technological core, in order to examine whether it replaces central components - model, architecture, or base platform - with others extraneous to the competitive process.

These thresholds work better when the tender specifications anticipate change typologies, caps, or limits on extension. Even so, an additional qualitative examination is always necessary: if the change could have attracted other tenderers or altered the outcome of the tender, the modification ceases to be competitively innocuous.

For oversight purposes, this can be stated as a key criterion: if the modification, had it been included in the original tender, could reasonably have attracted different tenderers, changed their pricing strategy or altered the award outcome, the modification is not competitively innocuous and should be treated as substantial.

### 9.3. Specific Limits of the Ius Variandi in AI Contracts

In AI contracts, the ius variandi retains its classical limits, albeit with particular sensitivity. First, the modification must respond to a concrete public purpose and be supported by enhanced reasoning; generic invocations of innovation or modernization are insufficient [14]. Second, it may not alter the essential object of the contract or operate as a disguised novation [15]. Third, equality among tenderers must be preserved, avoiding successive expansions or functional additions that distort ex post the original conditions of competition [16,17]. Fourth, adaptation must respect the economic-financial equation of the contract and provide for appropriate compensation when it imposes increased costs, technical complexity, or new compliance obligations [17,18]. Finally, the ius variandi may not cure elementary deficiencies in contractual design: the more foreseeable the technological change, the greater the burden to anticipate it in the tender specifications through update clauses, change governance, adaptive remuneration, and transition mechanisms.

### 9.4. Justification, Traceability, and Safeguards for Competition

The legitimacy of adaptation depends not only on its substance, but also on its procedure. Every renegotiation or exercise of the ius variandi should be supported by three minimum requirements: a complete administrative record, with technical, legal,

and economic assessment; verifiable reasoning, based on evidence concerning continuity, security, performance, or compliance; and sufficient traceability for audit, including documentation of versions, validations, expected impacts, and results obtained. In AI contracts, where ex post control rests especially on technical evidence, these requirements acquire decisive value.

To this must be added specific safeguards for competition. The first consists in verifying whether the modification could have altered the universe of tenderers or the tender result. The second is to avoid cumulative expansions of scope through successive changes that are individually minor but collectively substantial. The third is to privilege solutions compatible with technological neutrality and interoperability, avoiding the reinforcement of lock-in situations without sufficient justification. The fourth, finally, requires adequate transparency in relation to relevant modifications, especially where they have economic impact or extend the term.

### 9.5. An Operational Standard of Control

The intervention of oversight bodies will be more effective if it rests on a clear operational standard oriented to risk. In AI contracts, that standard may be summarized in five questions: (i) what concrete public need the change addresses, and on what evidence; (ii) whether it is proportionate and whether there is a less intrusive alternative; (iii) whether it significantly affects price, time, scope, or technological core; (iv) whether it could have altered the competitive outcome or intensified lock-in; and (v) whether the record, the reasoning, the economic assessment, and the technical documentation make it possible to reconstruct and adequately audit the decision.

Ultimately, renegotiation and the ius variandi should not disappear from technological public procurement but rather be reframed. In AI contracts, institutional quality is not measured by denying change, but by governing it through rules, evidence, and limits that preserve the competitive outcome while, at the same time, ensuring continuity, security, and public value.

## 10. Comparative Law and International Frameworks

The proposed framework is compatible with, but more operationally specific than, several influential procurement regimes. These instruments generally accept that contracts may need to be modified after award, while seeking to preserve competition and prevent circumvention of the original procurement procedure. The contribution of governed adaptability is to translate those general limits into AI-specific triggers, evidence, metrics and lifecycle controls.

| Framework | Core approach to modifications | Relevance for AI contracts | AI-specific contribution of governed adaptability |
|---|---|---|---|
| EU Directive 2014/24/EU, Article 72 | Permits modifications without a new procedure in defined cases, | Supports ex ante change clauses and a test focused on | Adds AI-specific typologies: drift, retraining, |

| Framework | Core approach to modifications | Relevance for AI contracts | AI-specific contribution of governed adaptability |
|---|---|---|---|
| | including clear review clauses, unforeseen circumstances, non-substantial changes and de minimis changes; substantial modifications require renewed competition. | whether the modification changes the nature of the contract or the competitive outcome. | cybersecurity, interoperability, data governance and lifecycle auditability. |
| Federal Acquisition Regulation, 48 C.F.R. pt. 43 | Prescribes policies and procedures for preparing and processing contract modifications; change orders may be issued within the general scope of the contract through contracting-officer action. | Provides a useful procedural model for written, authorized and documented changes within scope. | Adds substantive AI controls: technical evidence, model documentation, data-impact assessment and safeguards against lock-in. |
| UNCITRAL Model Law on Public Procurement and general principles | Does not establish a modification regime equivalent to Article 72 of Directive 2014/24/EU, but structures public procurement around value for money, transparency, objectivity, fairness, participation, competition and integrity. | Provides a principles-based benchmark for assessing post-award adaptation: contractual changes should not undermine competition, transparency or integrity, and should remain connected to value for money. | Translates those general principles into AI-specific lifecycle controls: documented triggers for adaptation, technical evidence, metrics, data governance, auditability, and safeguards against vendor lock-in. |

Article 72 of Directive 2014/24/EU is particularly relevant because it codifies a structured distinction between permitted modifications and substantial modifications that require a new procurement procedure. In AI contracts, that distinction should be applied not only to price and time, but also to functional scope, technological core, data dependencies and the practical possibility of exit. Similarly, Part 43 of the Federal Acquisition Regulation (48 C.F.R. pt. 43) reinforces the need for formal written authorization and proper processing of contract modifications, which is especially

relevant for AI contracts insofar as adaptations should be documented, authorized and traceable rather than implemented through informal technical arrangements.

Unlike Article 72 of Directive 2014/24/EU or FAR Part 43, the UNCITRAL Model Law does not provide a detailed, AI-relevant regime for contract modifications during performance. Its relevance lies instead in its principles-based architecture: value for money, transparency, objectivity, fairness, participation, competition and integrity. Governed adaptability builds on those principles by specifying how they should operate when AI contracts require post-award adaptation.

These comparative references also show why the issue cannot be solved through a simple pro-flexibility rule. The law already contains controlled spaces for modification. The challenge in AI procurement is to design the tender and the administrative record so that those spaces are used in a predictable and auditable manner, rather than as a way to re-open the bargain after award.

## 11. Conclusions

Contractual adaptation should not be conceived as a barely tolerated exception, but as a condition for preserving public value in AI projects. In this type of contract, value is not exhausted at the time of award: it is built and sustained throughout the entire life cycle through updates, performance management, data governance, cybersecurity measures, and, in certain cases, retraining in response to drift. Ignoring this dynamic produces a paradox: in the name of integrity, contracts are designed in a way that, in practice, encourages opacity—through de facto renegotiations—or makes it difficult to sustain the service under reasonable conditions of continuity, security, and quality. By contrast, when change is foreseen ex ante and subjected to rules, traceability, and evidence, adaptation becomes an instrument of good administration.

From this standpoint, it is necessary to move toward the standardization of a minimum contractual core for technology and AI, through model clauses and guidelines regulating, among other matters, change management, auditable metrics, data governance, security, portability, and transition. Such standardization reduces discretion, improves comparability among tenders, and lowers transaction costs for both the State and economic operators.

It is likewise necessary to adopt operational standards of modification and control based on risk. In AI matters, the decisive point is to distinguish between adjustments necessary for the maintenance, security, continuity, or performance of the system, and substantive expansions of contractual scope that should give rise to a new competitive procedure.

At the same time, no normative design will be sufficient if the State does not have adequate technological contract-management capabilities. The management of AI contracts requires interdisciplinary teams with technical and legal competencies to assess performance, data governance, technological changes, and evidence of compliance. Strengthening those capabilities - including audit criteria, minimum documentation, metrics, and monitoring tools - is indispensable for adaptation to remain controllable and not become a new zone of opacity.

Ultimately, public AI contracts do not render traditional categories of administrative law obsolete, but they do require them to be reread. Contractual immutability should not be understood simply as the freezing of the contractual text, but rather as the preservation of the public purpose in a changing technological environment. From that perspective, renegotiation and the ius variandi do not constitute anomalies, but instruments for preventing the Administration from becoming tied to solutions that are formally rigid yet functionally inadequate. The key, however, lies in subjecting those tools to the substantive and procedural limits developed above. In AI public procurement, the real dilemma is not between rigidity and change, but between governed adaptation and informal adaptation.

The practical oversight criterion is therefore straightforward: a modification that preserves continuity, security, fairness, auditability or lifecycle value within the awarded object may be legitimate if it is foreseen, reasoned, documented and proportionate; a modification that would have changed the market, the tenderers or the award result should generally be treated as substantial and submitted to renewed competition.

**References**

[1] Sánchez-Graells, A. (2024). Public procurement of artificial intelligence: Recent developments and remaining challenges in EU law. Legal Tech – Zeitschrift für die digitale Anwendung – LTZ, 2, 122–131. https://doi.org/10.2139/ssrn.4706400 (Author manuscript version consulted via SSRN.)

[2] Johnson, N., Silva, E., Leon, H., Eslami, M., Schwanke, B., Dotan, R., Heidari, H. (2024). Legacy procurement practices shape how U.S. cities govern AI: Understanding government employees' practices, challenges, and needs (arXiv:2411.04994) [Preprint]. arXiv. https://arxiv.org/abs/2411.04994

[3] Zick, T., Kortz, M., Eaves, D., Doshi-Velez, F. (2024). AI procurement checklists: Revisiting implementation in the age of AI governance (arXiv:2404.14660) [Preprint]. arXiv. https://arxiv.org/abs/2404.14660

[4] Monteiro, B., Hlacs, A., Boéchat, P. (2024). Public procurement for public sector innovation: Facilitating innovators' access to innovation procurement (OECD Working Papers on Public Governance, No. 80). OECD Publishing. https://doi.org/10.1787/9aad76b7-en

[5] Hart, O., Moore, J. (1990). Property rights and the nature of the firm. Journal of Political Economy, 98(6): 1119–1158. https://doi.org/10.1086/261729

[6] Macaulay, S. (1963). Non-contractual relations in business: A preliminary study. American Sociological Review, 28(1): 55–67.

[7] Ouchi, W. G. (1979). A conceptual framework for the design of organizational control mechanisms. Management Science, 25(9): 833–848. https://doi.org/10.1287/mnsc.25.9.833

[8] Vázquez Lacunza, E. (2016). El equilibrio económico en los contratos de servicios. Aranzadi.

[9] Cassagne, J. C. (1999). Un intento doctrinario infructuoso: El rechazo de la figura del contrato administrativo. El Derecho, 180, 773.

[10] Díez, M. M. (1965). Derecho administrativo (Vol. II). Bibliográfica Omeba.

[11] Garrido Falla, F. (2002). Tratado de derecho administrativo (11th ed., Vol. II). Tecnos.

[12] Barra, R. C. (1975). La intangibilidad de la remuneración del contratista particular en los contratos administrativos. El Derecho, 62, 727.

[13] García de Enterría, E., Fernández, T. R. (1998). Curso de derecho administrativo (6th ed., Vol. I). Civitas.

[14] Granillo Ocampo, R. E. (1990). Distribución de los riesgos en la contratación administrativa. Astrea.

[15] Cassagne, J. C. (1989). El equilibrio económico-financiero del contrato administrativo. Revista de Derecho Administrativo, 1(1): 35.

[16] Gambier, B. (1995). El principio de igualdad en la licitación pública y la potestad modificatoria en los contratos administrativos. Revista de Derecho Administrativo, 19/20.

[17] Cassagne, J. C. (2016). Curso de derecho administrativo (11th ed., Vol. II). La Ley.

[18] Villar Palasí, L. (1977). Apuntes de derecho administrativo: Parte general (Vol. II). Dykinson.

Legal and Institutional Materials

European Parliament and Council. (2014). Directive 2014/24/EU of 26 February 2014 on public procurement and repealing Directive 2004/18/EC. Official Journal of the European Union.

UNCITRAL. (2011). UNCITRAL Model Law on Public Procurement. United Nations.

Federal Acquisition Regulation, 48 C.F.R. pt. 43 (2026). Contract modifications (Federal Acquisition Circular 2026-01, effective March 13, 2026; version consulted September 8, 2026). Acquisition.gov. https://www.acquisition.gov/far/part-43

# TOWARD A CONVERGENT THEORY OF PUBLIC PROCUREMENT: INTEGRATING GOVERNANCE, DIGITALISATION, AND SUSTAINABILITY INTO A UNIFIED VALUE-BASED PROCUREMENT SYSTEM

Joseph M. Ntayi, Beatrice Nyakeishiki, Nabiira Nantongo, Benjamin Tukamuhabwa, Bonny Bagenda

***Suggested citation: Ntayi, J. M., Nyakeishiki, B., Nantongo, N., Tukamuhabwa, B., & Bagenda, B. (2026). Toward a convergent theory of public procurement: Integrating governance, digitalisation, and sustainability into a unified value-based procurement system. International Journal of Public Procurement, 2(1),90-111.***

**Abstract**

Public procurement scholarship is fragmented across governance and integrity, digitalisation, and sustainability or strategic procurement, limiting explanation of how these reform streams jointly create public value. This integrative theory-building review, informed by PRISMA principles, develops the Unified Value-Based Procurement System (UVBPS) as a convergent theory of procurement. Drawing on foundational and contemporary research and international policy frameworks, the article conceptualises governance, digitalisation and sustainability as mutually reinforcing pillars across the procurement lifecycle: governance supplies legitimacy, digitalisation enables execution and learning, and sustainability defines the value to be achieved. Their convergence transforms procurement from a transactional activity into a value-production system. The article contributes a lifecycle-based account of why digitalisation without enforceable governance, or sustainability without data and implementation capacity, cannot reliably deliver sustainable value. It derives theoretical propositions and proposes a research agenda on algorithmic accountability, value measurement and institutional capability, providing a framework for future empirical testing and procurement system design.

**Keywords:**

Public procurement; value-based procurement; public value; procurement governance; digital procurement; sustainable public procurement

---

*Joseph M. Ntayi and Benjamin Tukamuhabwa are affiliated with the Department of Procurement and Supply Chain Management, Makerere University Business School, Kampala, Uganda. Beatrice Nyakeishiki, Nabiira Nantongo, and Bonny Bagenda are affiliated with the Department of Transport and Logistics Management, Makerere University Business School, Kampala, Uganda. The corresponding author is Beatrice Nyakeishiki (email: bnyakeishiki@mubs.ac.ug).*

Copyright © 2026 by IPPA/IPPC

## 1. Introduction

Public procurement is one of the most important interfaces between the state and the market. Its sheer size is a reason why it occupies a central position in discussions of governance, state capacity, market formation, and public value. In all OECD countries, public procurement activities generated 12.7 percent of GDP and 29.9 percent of total government expenditure. This underlines its importance not only as a management process but also as a strategy for service delivery, infrastructure development, competition, and social outcomes (OECD, 2025). Public procurement can no longer be conceived of merely as a legal mechanism of purchasing goods and services. Rather, it has emerged as an important technology of governance, where governments operationalise their policy priorities and allocate public authority. The contemporary literature on public procurement exhibits a fragmented analysis. One school of thought views procurement as a system of good governance and integrity, incorporating transparency, accountability, redress, and anti-corruption measures. A second school of thought discusses e-procurement, e-tools, structured data, and algorithmic technologies. A third school of thought focuses on sustainable and strategic procurement, incorporating life-cycle costing, environmental performance, and social value. Each of these approaches is robust in its own right. Yet, what is still missing in the literature is a unifying theory of how all three pillars of procurement interact to generate or not generate public value.

This is particularly problematic, as the institutional realities of procurement no longer lend themselves to distinguishing between these three bodies of literature. Recent research on the value creation and value assessment aspects of procurement value creation indicates that the conventional price-based and regulatory-based models are no longer tenable, as procurement now seeks to achieve a multiplicity of, at times competing, goals that require simultaneous evaluation [1,2]. Moreover, the major international frameworks on the matter now strongly suggest that value for money, integrity, transparency, fit for purpose, electronic procurement, sustainability, risk management, and evaluation are co-dependent rather than differentiated goals [3–5].

This article addresses this research gap by advancing a theory of a convergent public procurement system also referred to as the Unified Value-Based Procurement System (UVBPS). UVBPS can be understood as a procurement system based on the lifecycle approach, where governance, digitalization, and sustainability are interrelated mechanisms that shape public value creation. UVBPS will be more relevant in public procurement systems where authorities have different goals in mind besides achieving lowest cost, such as integrity, competition, value for money, environmental performance, social value, resilience, and learning. This theory will not be relevant in the case of purely private procurement systems and routine low-risk purchases that do not demand public responsibility or value creation.

Its central argument is that governance, digitalisation, and sustainability are not separate procurement reforms but rather interdependent aspects of a unified value-based procurement system. In this particular understanding, governance provides legitimacy, digitalisation enables execution, and sustainability determines value.

Procurement performance is thus a function of the interplay between these dimensions across the lifecycle of procurement, from start to finish.

The article's first contribution to the field of procurement studies is the introduction of the concept of convergence as a unifying framework for understanding why governance, digitalisation, and sustainability should be understood as interrelated rather than separate reform areas. A second contribution is the reconceptualisation of public procurement as a value-production system in which public value is created through lifecycle alignment among institutional controls, data infrastructures, and normative criteria. Finally, the article introduces the Unified Value-Based Procurement System (UVBPS) as a unifying framework that produces theoretically informed propositions for future research on procurement system performance, resilience, and accountability. In doing so, the article transcends the descriptive approach to synthesis in favour of a more explicitly explanatory approach to understanding the creation of public value in procurement systems.

The article is written as an integrative theory-building review informed by PRISMA principles. In the first part, the article explains its methodology for conducting the review, its position vis-à-vis the extant literature on procurement studies, the historical development of the theory of procurement, the argument for governance, digitalization, and sustainability as the three constitutive elements of a convergent approach to public procurement, the development of the unified value-based procurement system, its application, its theory illustration, and its propositions for future research.

## 2. Methodological Approach and Theoretical Positioning

The study employs an integrative theory-building review informed by PRISMA principles. This methodology is suitable for fields that are fragmented at the conceptual level, heterogeneous at the methodological level, and scattered in the distribution of knowledge. In contrast to the statistical approach to meta-analysis, which seeks to aggregate the effect sizes of different studies to produce a single estimate of the effect, the integrative approach to review seeks to synthesise different forms of knowledge, including conceptual papers, systematic reviews, policy frameworks, regulatory instruments, and institutional studies, to produce a higher-level explanatory framework.

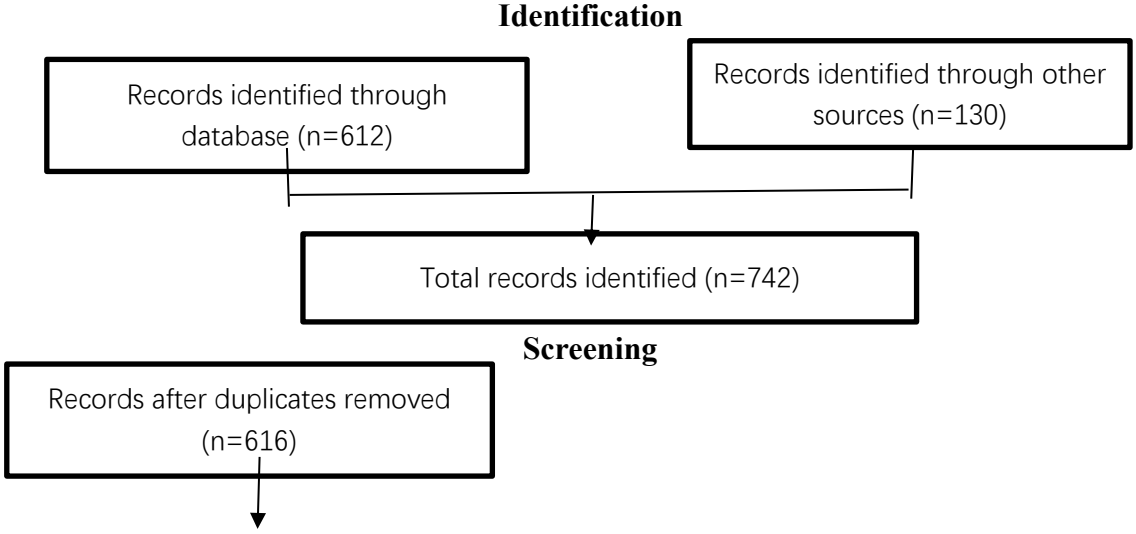
The review draws on scholarship and institutional frameworks that address three key concepts that are at the heart of modern procurement systems: governance and integrity, digital procurement, and sustainable or strategic procurement. Foundational conceptual studies are privileged over more contemporary research articles published in reputable academic journals, with key international frameworks, such as those of the OECD, World Bank, EU, UNEP, and Open Contracting Partnership, considered constitutive institutional evidence.

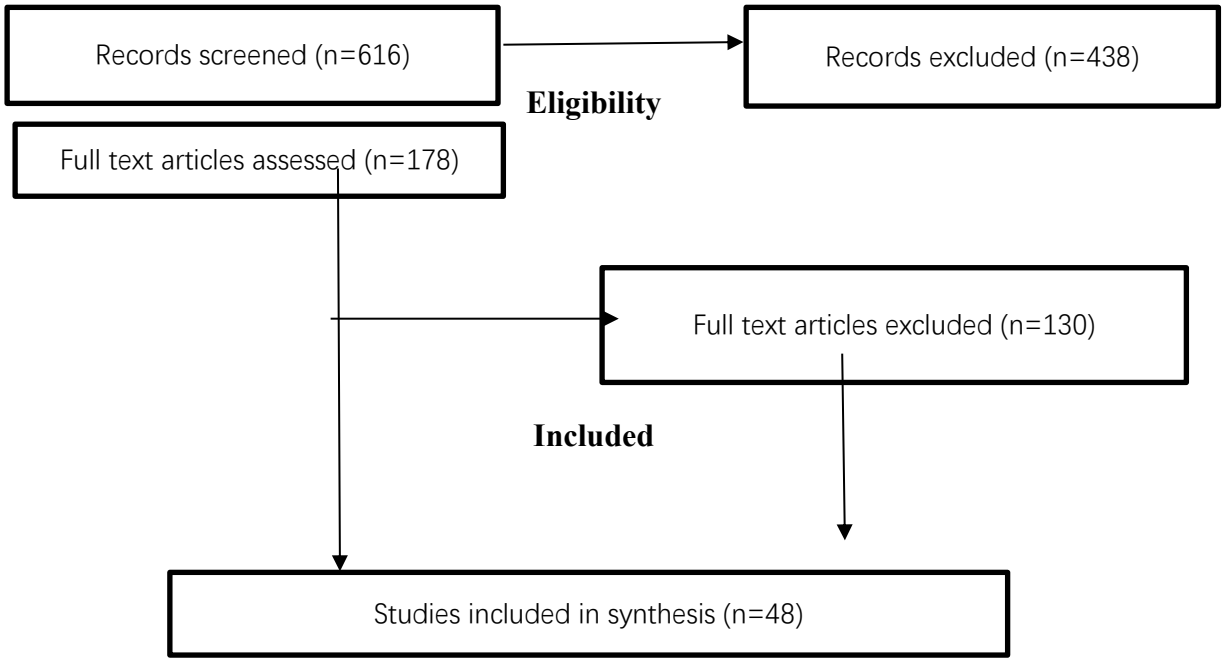
The literature review was designed as an integrative theory-building review informed by PRISMA principles and aimed at developing theories. The searches were carried out in Scopus, Web of Science, Google Scholar and institutional repositories of the OECD, World Bank, UNEP, European Union, UNCITRAL, World Trade Organization, and the Open Contracting Partnership. The search covered the period

from 2000 to 2026 in the English language. Foundational pieces before 2000 were included in case of their theoretical necessity. The following inclusion criteria were applied to the sources: directly related to public procurement; involved at least one of the three central concepts of governance, digitalization, or sustainability; made conceptual or empirical contribution to such procurement issues as value, performance, integrity, transparency, interoperability, life cycle costing, social value, or public value; possessed scholarly and institutional authority. The following exclusion criteria were applied: procurement manuals describing the processes but not contributing conceptually; studies devoted exclusively to private purchasing; duplication; non-English sources; and studies discussing the topic tangentially. As the purpose of the study is not effect-size synthesis but theory construction, the sources were not weighted statistically. Rather, they were evaluated regarding their conceptual contribution, institutional and methodological validity, and contribution to the explanatory structure of the UVBPS. Screening and coding were performed iteratively by the author team with disagreements resolved through discussion and re-checking inclusion criteria. "Lack of conceptual content" means procurement-related reports or descriptions which lack any constructs, mechanisms, relations, and outcomes important for the convergent theory.

The search process yielded an initial 742 sources, comprising 612 sources from academic databases and 130 sources from other institutional sources. After eliminating 126 duplicates, 616 sources remained for title and abstract screening. After eliminating 438 sources for irrelevance, 178 remained for full-text evaluation. Following the full-text evaluation, a further 129 sources were eliminated for lacking conceptual content and failing to engage with the three core constructs of interest. A total of 48 sources were retained for this paper, comprising peer-reviewed sources, foundational conceptual works, and authoritative institutional frameworks. The selection process is depicted in Figure 1, a PRISMA-inspired flow diagram adapted for the specific context of an integrative theory-building review methodology. The search and selection process is informed by the core principles of the PRISMA framework, adapted for the specific context of an integrative theory-building review methodology.

**Figure 1: PRISMA-inspired flow diagram of literature selection and search.**






The final dataset was then analysed through iterative thematic coding, focusing on constructs, causal mechanisms, and relationships between governance, digitalisation, and sustainability. This approach facilitated the development of a higher-order theoretical synthesis, rather than an exhaustive cataloguing of the literature. This methodological approach aligns with the evolutionary trajectory of procurement scholarship. Thai [6] conceptualised procurement as a system of interacting elements, while McCrudden [7] showed its role as an instrument of social regulation. Recent research has supported the notion that procurement is a system that interacts between its legal, administrative, informational, and normative dimensions [1,2,8]. The theoretical challenge, therefore, is not to prove the relevance of procurement, but to articulate a theory of the architecture by which these different dimensions interact to create sustainable public value.

## 3. Historical Evolution of Procurement Theory

The initial theoretical approaches to understanding procurement were characterised by a focus on legalism and control. The dominant concern was procedural regularity, including open competition, non-discrimination, transparency, objectivity, and access to remedies. This approach remains essential because, ultimately, decisions on the allocation of public resources and public authority are taken through a contractual framework. As such, they are required to be structurally sound from a legalistic standpoint. Tools such as the UNCITRAL Model Law and global regulation on international procurement have codified this approach, focusing on transparency, objectivity, and reviewability.

A strategic turn was taken when academics and organisations increasingly recognised that procurement does more than just buy goods. Thai's systems approach to procurement was a significant contribution to the field of public administration and

public policy. McCrudden's work was a significant contribution to a systems approach to procurement as a field of public administration and public policy, demonstrating that governments have used procurement to achieve labour standards, equality, and other social objectives. This demonstrated that procurement has always had a regulatory and distributive element. This intellectual shift created space for research on strategic, social, sustainable, and innovative procurement.

The most recent period can be seen as a convergence period. In this period, procurement is no longer just about compliance or strategic intent; it is about creating a system for value creation. Malacina et al. [1] have demonstrated that value creation in procurement is a complex concept that cannot be reduced to simplistic cost savings. Merisalo et al. [2] have demonstrated that procurement value creation must accommodate multiple perspectives on value, not a single approach. However, at the same time, significant international frameworks are increasingly acknowledging that value for money must be considered alongside integrity, fitness for purpose, transparency, sustainability, digitalisation, and performance evaluation [4,5,9]. Procurement theory is shifting towards a more complex yet realistic approach to value creation that recognises value as a product of rules, information, institutions, and outcomes.

## 4. Governance as the Legitimacy and Control Infrastructure

In the proposed convergent theory, governance refers to the legitimacy and control structures of procurement. It refers to all of the legal rules, institutional arrangements, oversight mechanisms, transparency requirements, complaint procedures, audit practices, and risk management practices that make procurement decisions contestable, reviewable, and publicly justifiable. Governance is not a side issue in procurement. It is a constitutive element of whether procurement can generate trust, foster competition, and avoid capture.

The current international consensus is particularly convergent on this issue. The OECD Recommendation on Public Procurement is structured around integrated principles, including transparency, integrity, access, stakeholder participation, e-procurement, capacity, evaluation, risk management, accountability, and integration [3]. The key to the analytical value of the structure lies in rejecting the idea of separate reform tools. In other words, transparency, evaluation, digitalisation, and risks are not conceived as separate blocks. Instead, they are conceived as part of a governance system. In the same vein, the World Bank's procurement regulations conceive value for money, economy, integrity, fit for purpose, efficiency, transparency, and fairness as principles that have to be achieved simultaneously rather than sequentially [5].

The theory of governance in procurement has been enriched by the development of the integrity literature. Corruption and collusion are no longer conceived as the result of individual misconduct. Instead, they are conceived as the result of inadequate institutional design, disclosure, contestability, complaint mechanisms, and monitoring. This is important because it shifts the focus from individual misconduct to system design. If the system is poorly governed, integrity risks may arise not only during the tendering phase but also during implementation. A proper theory of procurement cannot

confine itself to the perimeter of the procurement process. Governance has to be conceived at every gate.

## 5. Digitalisation as the Execution and Intelligence Infrastructure

Digitalisation is often incorrectly conceptualised as a simple shift from paper-based to screen-based procurement processes. More credible evidence points towards a more complex and demanding process. For digital procurement systems to be effective, there is a need for end-to-end integration of planning, tendering, contracting, payments, monitoring, and evaluation, supported by high-quality, standardised data [10]. The key difference between digitalisation and other procurement technologies lies not in automation but in the generation of a 'traceable, analysable, and governable information environment.' This distinction is important because the benefits of digital procurement systems do not follow automatically from adopting technology. OECD research on digital transformation highlights how efficiency, transparency, and risk management are often hindered by a range of barriers, including 'fragmented systems, interoperability challenges, poor governance, insufficient digital skills, and inadequate data standards' [10]. Digital transformation is not simply a technological challenge; it is a challenge of organisational and institutional capacities.

To make the UVBPS work as an effective procurement system, interoperability is a pre-condition that goes beyond mere convenience. Procurement systems need to be seamlessly connected with budget systems, vendor databases, contract management systems, payment systems, auditing systems, beneficial ownership systems, and performance reporting systems. Without interoperability, digitisation could lead to improved online submission but a disconnected procurement process, thus limiting traceability, accountability, and sustainability.

The transparency literature provides further evidence of this challenge. Khorana et al. [8] highlight how e-government procurement systems increase transparency but note how this effect depends significantly on the quality of institutions. Technology and institutions are complementary rather than substitutable concepts. Digital procurement systems are more effective at improving transparency when embedded within a robust institutional framework. This complements the sustainable procurement literature, which highlights how digital procurement systems can play an enabling role by facilitating information flows, disclosure, supplier readiness, and reducing information asymmetries that would undermine strategic purchasing objectives [11].

New governance challenges are also associated with digitalisation. There are concerns about accountability, interpretability, bias, and legal adequacy regarding analytics and artificial intelligence in procurement processes. Cybersecurity is also a concern in procurement processes, as reliance on digitalisation increases vulnerability to manipulation, service disruptions, and data compromise. Digitalisation is meaningful only insofar as it can create traceability, data structure, interoperability, and learning. In this respect, data architecture is not just a supporting component to procurement theory; it is one of its foundational components.

The risk of digitalisation calls for governance instead of just adoption. Decision support algorithms carry the possibility of creating biased procurement practices if

historical procurement data include discriminatory supplier behaviour or poor competition or market structure. Similarly, digital exclusion can take place if small businesses, rural suppliers, female-owned businesses, or low-capability suppliers cannot use e-procurement platforms. Therefore, in the UVBPS framework, governance must actively control the digitalisation pillar by means of auditability, explainability, contestability, cybersecurity, human control, and inclusivity. Digital procurement is valuable only if it is transparent, accountable, accessible, secure, and contestable. All these features correspond to the international emerging guidelines of trustworthy artificial intelligence which emphasize explainability, accountability, fairness, robustness, and human control in algorithm-enabled decision-making (OECD, 2019).

## 6. Sustainability as the Normative Value Logic

If governance tells procurement processes what is legitimate, and digitalisation tells them what is knowable and executable, then sustainability tells them what is valuable. Sustainability is the value logic for modern procurement processes since it extends the conventional meaning of value beyond current prices and near-term compliance. The extension is no longer incremental; it is structural. Sustainable public procurement is now part of Sustainable Development Goal 12.7, which "calls for the promotion of sustainable public procurement practices in accordance with national policies and priorities, and indicator 12.7.1, which institutionalises measurement of progress through national policy frameworks and action plans" [12].

The environmental aspect of procurement has been advanced with the concepts of green public procurement and circular procurement. The literature stresses that it is important to incorporate environmental criteria not only in policy documents but also in technical specifications, award criteria, contractual provisions, and verifications. Life-cycle thinking is an important concept because it enables the procurement system to account for future costs rather than relying solely on price comparisons. Sönnichsen and Clement [13] identify a shift towards circular public procurement and away from the logic of lowest price. European Union law explicitly supports the 'most economically advantageous tender' and 'life cycle costing' as a basis for procurement decisions [14].

The social aspect of public procurement is equally important. McCrudden [7] has shown that public procurement has been used as an instrument for protecting workers' rights, promoting equality, and advancing social regulation more generally. New developments in public procurement policy, such as the 'Social Value Model' adopted in the United Kingdom, reveal how these objectives can be made evaluable in procurement decisions [15]. Sustainability in public procurement is not limited to 'greening the environment.' Sustainability also includes 'inclusion,' 'decent work,' 'human rights,' 'supplier diversity,' 'community well-being,' 'community resilience,' etc. However, these objectives become operational only if governance principles define them clearly and information technology enables them to be observable.

## 7. From Value for Money to Public Value

One important implication of the above analysis is that traditional value-for-money principles must be reassessed. Traditionally, in procurement practice, value for money has been conceptualised as the lowest price compliant bid. However, such an understanding of value for money is not only legally incorrect but also analytically flawed. Under European Union law, decision-making in procurement contracts can be based on factors such as cost-effectiveness, quality-price ratios, life-cycle costing, or environmental or social characteristics [14]. Moreover, recent scholarship has established that procurement value is not unidimensional but rather a multidimensional construct [1,2].

This expanded concept of procurement requires a move beyond transactional efficiency towards public value. This includes aspects of economy and efficiency but also extends to legitimacy, service quality, robustness, environmental performance, social inclusion, market development, and learning. The OECD's performance framework is particularly relevant in this regard. This framework extends beyond savings to compliance, efficiency, and strategic outcomes such as innovation, climate change, employment, and social impact [4]. The convergent theory of procurement value presented in this article follows precisely this multi-dimensional concept of value. Value here is considered a holistic concept resulting from the interplay of governance controls, digital traceability, and sustainability-based decision rules in a procurement process.

## 8. The Unified Value-Based Procurement System (UVBPS)

The novel contribution of this article lies in the development of a Unified Value-Based Procurement System (UVBPS). This system reconceptualises procurement as a convergent architecture for value production. This means a shift from a conventional view of governance, digitalisation, and sustainability as parallel or sequential reform tracks towards a view of these three aspects as mutually constitutive pillars of a procurement system. This reconceptualisation of procurement aligns with a system-oriented procurement theory [6]. It also aligns with contemporary institutional procurement concepts [3,5,9].

The UVBPS does not introduce innovation in terms of repetition of integrated principles already known to scholars and practitioners, but in terms of understanding of the causal structure by which these principles create value. OECD, the World Bank, and the EU frameworks define relevant principles and domains for assessment; the UVBPS adds theoretical value by explaining how governance, digitalisation, and sustainability affect each other in the course of the procurement process. Governance without digital traceability is formality-rich but information-poor; digitalisation without governance can automate opacity; sustainability without lifecycle data can be aspirational; and efficiency without public value can limit procurement to compliance based on price. Therefore, the UVBPS represents a theory of convergence, which is explanatory, configurational, and testable, as opposed to a list of principles for reform.

As opposed to the OECD Recommendation on Public Procurement [3], which offers mostly normative principles and domains of assessment, the UVBPS presents a

causal explanatory theory of public value generation based on different configurations of governance, digitalisation, and sustainability.

Essentially, the UVBPS posits a rather simple yet theoretically significant claim: that value in procurement is not created through the optimisation of each constituent part but through the interplay between governance structures, digitalisation, and value approaches focused on sustainability. Governance provides legitimacy, procedural justice, accountability, and risk management; digitalisation provides the tools for integrating processes, standardising data, ensuring traceability, enabling interoperability, and enabling data analysis; and sustainability provides the normative framework within which value is assessed in environmental, social, and lifecycle contexts. This triadic framework recognises that procurement systems operate simultaneously as legal, informational, and normative systems [1,2].

The causal logic of the UVBPS is configurational rather than additive. Thus, without governance, the digitalisation of procurement may simply accelerate the opaqueness and discretion of the system. Conversely, without digitalisation, sustainability is purely symbolic because the data needed to assess lifecycle value cannot be tracked. Similarly, without sustainability, the system is technically efficient but normatively lacking because it fails to account for the value of the environment and society. The UVBPS rejects the concept of the module and instead sees value in procurement as a function of the convergence of rules, information technologies, and value approaches [8,11].

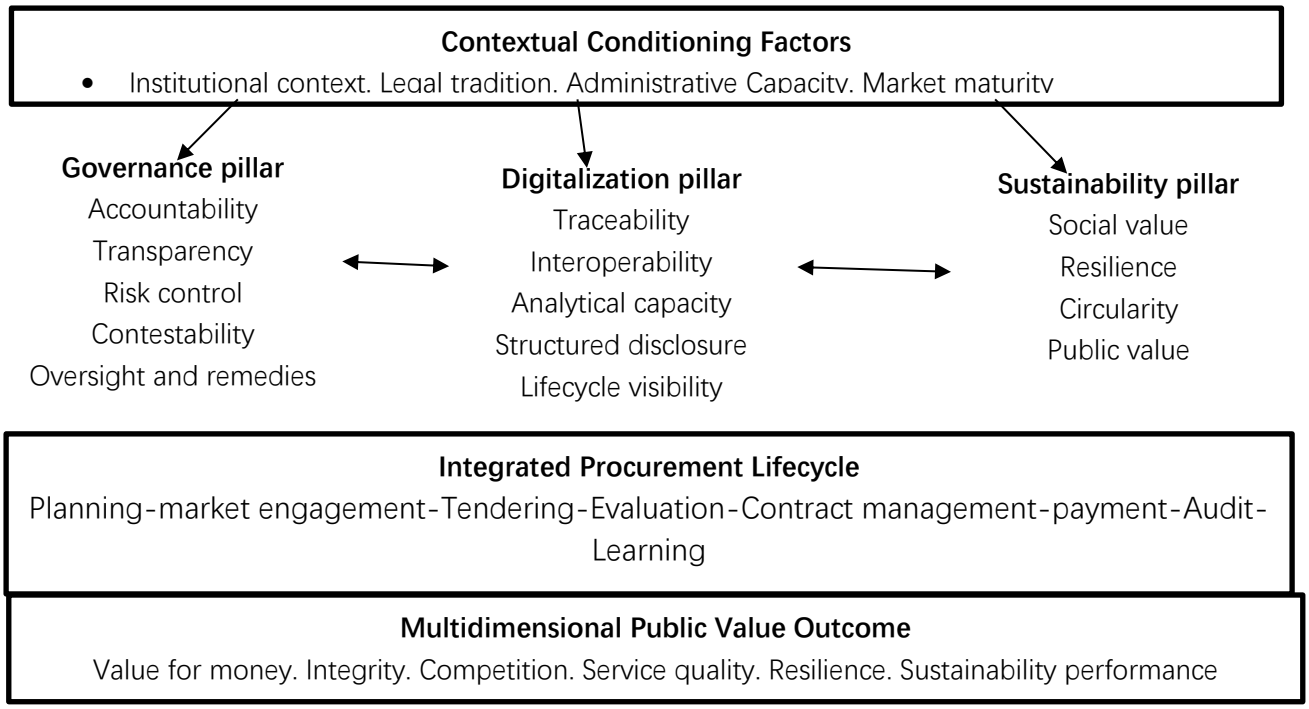
A more precise articulation of the configurational logic is possible. The combination of high governance, high digitalization, and high sustainability is expected to create significant public value since rules, data, and value criteria will support each other. At the same time, the combination of high governance, high digitalization, and low sustainability is expected to result in procurement that is efficient and compliant but poor in terms of its social and environmental value. The combination of high governance, low digitalization, and high sustainability is expected to achieve the intended policy outcome but with weak lifecycle validation. Finally, the combination of low governance, high digitalization, and high sustainability is expected to introduce technocratic or symbolic reforms that will still remain prone to opacity, manipulation, and capture. With such configurations, the UVBPS framework becomes empirically testable since the combination of maturity levels in pillars can be linked to specific outcomes, such as integrity risk, competition, lifecycle cost, sustainability performance, supplier diversity, contract compliance, and trust.

The model's lifecycle approach is key to this argument. In the planning phase, governance is about establishing accountability for needs identification and budget alignment, digitalisation is about market intelligence and data reuse, and sustainability is about value objectives. In the tender design phase, governance concerns procedural fairness and defensibility; digitalisation, standardised disclosures and open data; and sustainability, policy goals, specifications, tender criteria, and contractual conditions. In the evaluation and award phase, governance is about ensuring consistency and remedies; digitalisation is about traceability and decision support; and sustainability is about expanding the advantage beyond price. In the contract management phase,

governance focuses on monitoring compliance and managing change; digitalisation focuses on performance monitoring and payments; and sustainability focuses on making the value created observable through environmental, social, and service-related performance indicators. Finally, in the post-award learning phase, governance is about institutionalising accountability, digitalisation is about generating feedback data, and sustainability is about value benchmarks for future value assessments. This aligns with the OECD's focus on end-to-end procurement systems and the importance of continuous evaluation of procurement performance.

The theoretical framework of UVBPS is provided in Figure 2, where procurement is viewed as a convergent approach to managing the process in which governance, digitization, and sustainability act as inter-related pillars. Conditioning variables such as legal tradition, administrative capacity, and maturity level have also been incorporated in the figure to emphasise that procurement outcomes are context-dependent and not absolute or universal in their application. Significantly, the model also captures feedback mechanisms, risk layers, and data layers to reflect that procurement systems are not static but develop through a process of iterative learning and are exposed to risks that can be operational or systemic.

**Figure 2. The Unified Value-Based Procurement System (UVBPS)**




*Source: Author's synthesis based on Thai [6], McCrudden [7], OECD [3,4,9,10,16–20], European Union [14], Malacina et al. [1], Khorana et al. [8], and Merisalo et al. [2].*

Conceptual representation of procurement as a convergent value-production system. The figure attempts to visually present how governance, digitalisation, and sustainability function as mutually reinforcing pillars throughout the procurement cycle

from planning and market engagement to tendering, evaluation, contract management, payment, audit, and learning. Governance provides legitimacy, accountability, transparency, and risk control; digitalisation provides data integration, traceability, interoperability, and analysis; and sustainability provides the normative standards through which public value is created beyond price. Procurement outcomes are conditioned by the institutional context, legal tradition, administrative capacity, and maturity level; convergence among the three pillars produces multidimensional outcomes of public value, which comprise value for money, integrity, competition, service quality, resilience, sustainability, and trust, among others. Source: Author's synthesis based on Thai [6], McCrudden [7], OECD [3,4,9,10], European Union [14], Malacina et al. [1], Khorana et al. [8], Merisalo et al. [2].

Although Figure 2 captures the conceptual framework for the UVBPS, its theoretical basis is drawn from the broader literature which has been reviewed in this paper. In order to further establish the validity of the framework, Table 1 captures the evidence base behind the UVBPS and shows how different lines of procurement research merge into one coherent value creation theory. In substantiating the UVBPS, the following table is a comprehensive synthesis of the whole evidence base, which includes the clustering of the 48 validated studies according to their analytically coherent groups corresponding to the essential dimensions of the framework.

**Table 1. Evidence base underpinning the Unified Value-Based Procurement System (UVBPS)**

| Evidence Cluster | Representative sources (APA) | Synthesized finding | Contribution to UVBPS (Figure Linkage) |
|---|---|---|---|
| Foundational systems theory of procurement | Thai [6]; Arrowsmith [21]; Erridge [22] | Procurement is a system of interdependent institutional, legal, and operational elements | Establishes the systems architecture underpinning the entire figure |
| Procurement as governance and regulatory instrument | McCrudden [7]; OECD [3]; UNCITRAL [23]; WTO [24] | Procurement embeds transparency, accountability, and competition norms | Forms the governance pillar and legitimacy layer |
| Integrity, anti-corruption, and risk governance | OECD (2016); Basel Institute [25]; ENISA [14] | Procurement risks are systemic and lifecycle-based, not event-specific | Justifies the risk layer (corruption, cyber, collusion) in the figure |

| | | | |
|---|---|---|---|
| Digital procurement and e-government systems | OECD [10]; World Bank [26]; Mohungoo et al. [27]; Dorasamy [28] | Digitalization requires end-to-end integration, data quality, and institutional capacity | Defines the digitalization pillar and lifecycle integration |
| Digital governance, AI, and analytics | Nyadzi & Morris [29]; Mojaki et al. [30]; OECD [10] | Digital tools improve performance but require governance, explainability, and oversight | Supports AI/analytics and traceability in the figure |
| Data governance and interoperability | Open Contracting Partnership (n.d.); European Commission [31] | Procurement effectiveness depends on structured, interoperable, lifecycle data | Validates data/KPI layer and feedback loops |
| Sustainable and green procurement literature | Sönnichsen & Clement [13]; UNEP [32]; Lundberg et al. [33] | Sustainability requires lifecycle costing, circularity, and embedded criteria | Grounds the sustainability pillar |
| Social value and strategic procurement | McCrudden [7]; Grandia & Meehan [34]; UK Government [15] | Procurement delivers social, economic, and policy outcomes beyond efficiency | Expands public value definition beyond price |
| Value for money and lifecycle value theory | ; World Bank [5,35]; European Union [14] | Value for money is multi-attribute (cost, risk, quality, lifecycle, sustainability) | Supports public value outcome layer |
| Public value and multidimensional evaluation | Malacina et al. [1]; Merisalo et al. [2] | Procurement value is plural, contested, and multi-dimensional | Justifies the multidimensional outcome structure |
| Performance measurement and KPIs | OECD [4]; OECD [36] | Procurement performance must include strategic and outcome-based metrics | Supports KPI and performance layer |

| | | | |
|---|---|---|---|
| Institutional and contextual determinants | OECD [9]; Khorana et al. [8]; Nyadzi & Morris [29] | Outcomes depend on institutional quality, legal systems, and capacity | Justifies contextual conditioning layer (top of figure) |
| Market shaping and innovation procurement | Uyarra et al. [37] | Procurement shapes innovation, markets, and economic systems | Extends value outcomes beyond service delivery |
| Operational procurement process literature | Gatobu [38]; Lindgreen et al. [39] | Procurement performance depends on coordination across lifecycle stages | Supports integrated lifecycle block |
| Comparative and global procurement systems | OECD [40]; World Bank [41]; Ksonzhyk et al. [42] | High-performing systems exhibit integration across governance, digital, and policy domains | Empirical validation of convergence logic |

The evidence presented in Table 1 suggests that the UVBPS is not only a conceptual framework but an evidence-informed integration of various strands of procurement research. Systems theory, which serves as a base for the conceptualization of the procurement process, views it as a system comprising several components. Governance theory highlights such factors as transparency, integrity, and accountability, while digitalization theories highlight such factors as interoperability and data integration, and institutional capability. Sustainability theories view the procurement process from the perspective of its lifecycle and multidimensional value.

**Table 2. Points of Intersection between the UVBPS Pillars**

| Intersection of UVBPS pillars | Key mechanisms | Expected public value contribution |
|---|---|---|
| **Governance × Digitalisation** | E-audit trails; Open Contracting Data Standard (OCDS) disclosures; beneficial ownership transparency; automated red-flag monitoring; electronic complaint management; cybersecurity controls; digital auditability | Strengthens transparency, accountability, integrity, fraud detection, procedural fairness, trust, and regulatory compliance. |
| **Digitalisation × Sustainability** | Lifecycle cost databases; emissions and carbon reporting systems; supplier sustainability records; | Enhances evidence-based sustainability decisions, lifecycle value assessment, |

| Intersection of UVBPS pillars | Key mechanisms | Expected public value contribution |
|---|---|---|
| | environmental performance dashboards; circular procurement indicators; social value reporting; sustainability analytics | environmental stewardship, social impact monitoring, and long-term resource efficiency. |
| **Governance × Sustainability** | Legally defensible sustainability criteria; transparent evaluation weights; non-discriminatory sustainability requirements; environmental and social contract clauses; compliance verification mechanisms; remedies and appeals processes | Ensures sustainability objectives are legitimate, enforceable, contestable, equitable, and consistent with procurement law and public accountability principles. |
| **Governance × Digitalisation × Sustainability** | Integrated public value reporting across planning, market engagement, tendering, evaluation, award, contract management, payment, audit, and organisational learning; interoperable data systems; performance measurement frameworks; continuous feedback mechanisms | Produces multidimensional public value through simultaneous achievement of integrity, efficiency, sustainability, resilience, service quality, competition, learning, and trust. |

**Source:** Author's synthesis based on OECD [3,4,9,10,16–20], World Bank [5,35], Open Contracting Partnership [43,44], European Union [14], Adjei-Bamfo et al. [11], Khorana et al. [8], Malacina et al. [1], and Merisalo et al. [2].

Table 2. reflects the convergence approach to UVBPS in that it describes the main interaction processes that create links between governance, digitalization, and sustainability. It should be noted that these three pillars do not work separately but rather interact with each other and produce public value through such interactions. This table shows that governance grants legitimacy and accountability to digital and sustainability initiatives, that digitalization is required to measure and verify the effects of sustainability initiatives, and finally that all three pillars working together produce a procurement process that can produce multi-dimensional public value.

## 9. An Illustrative Application of the Model

To make the theory come alive, let us apply the UVBPS model to a stylised example of a public procurement case for the acquisition of a fleet of buses for urban areas. In the conventional approach, the tender will likely focus on the lowest price among compliant bids. Governance will be limited to the legality of the procedure, and digitalisation will be limited to the electronic submission of tenders. Sustainability will

be limited to a rhetorical appeal for reduced environmental impacts, such as greenhouse gas emissions.

Under the UVBPS approach, the procurement will be different from the start. Governance will involve transparent needs assessments, justified selection criteria, conflict-of-interest management, and remedies. Digitalization will involve a structured market analysis, standardized tender information, supplier management, and auditable evaluation trails. Sustainability will involve the substantive consideration of value in the form of fuel efficiency, maintenance costs, labour practices in the supply chain, and environmental impacts. The tender will not be awarded on the sole consideration of acquisition costs. Instead, the value will be multidimensionally justified. Moreover, the management of the contract will follow the same logic of convergence by linking payments with traceable service and sustainability data.

The importance of the example lies in the fact that the theory is not merely classificatory. Instead, the theory predicts observable differences in the design, implementation, and evaluation of the procurement system. A system that is digitalised but lacks a structure for life-cycle data cannot verify claims for reduced emissions. A system that is informed by sustainability criteria but lacks a mechanism for monitoring the management of the contract. A system that is guided by formal rules but lacks a mechanism for digital traceability. Thus, the example illustrates the core argument of the theory that procurement outcomes depend on the convergence between different elements.

## 10. Theoretical Propositions

The UVBPS model produces a number of theoretical propositions to inform future empirical investigation. Firstly, the quality of governance has a positive conditioning effect on the potential of digital procurement systems to improve transparency, accountability, and trust. This proposition resonates with studies showing that e-procurement effects are maximised in supportive institutional environments [8]. Secondly, digital traceability and data quality have a positive conditioning effect on the potential of sustainability criteria to move beyond mere symbolism towards verifiability. This proposition resonates with studies showing digital procurement systems' potential in supporting sustainable procurement by improving information flows, monitoring, and supplier capabilities [11]. Thirdly, procurement systems maximise public value where value for money is operationalised in terms of multidimensional life-cycle metrics, rather than single-dimensional price-based measures. This proposition resonates with recent studies on public procurement value and competing value logics [1,2]. Fourthly, convergent procurement systems possess greater adaptive capacity given post-award data, evaluation, and audit feed-forward effects. This proposition resonates with recent studies on procurement adaptive capacity and system learning [4]. Fifthly, the level of convergence between governance, digitalisation, and sustainability factors positively conditions procurement system resilience, especially in high-risk or high-complexity contracting situations.

UVBPS is measurable in terms of specific variables across four categories: governance, digitalisation, sustainability and public value outcomes. The governance

category will have specific indicators of measurement such as competition intensity, the number of bidders, conflicts of interest disclosure, complaints resolution times, audit results, red flag indicators, variation rate in contracts and disclosure of beneficial ownership. Indicators of digitalisation will include such items as interoperability of the platform, completeness of procurement data, open contracting standards adoption, e-submissions ratio, contract management integration, payments traceability and machine-readable procurement records. Sustainability will be measured based on such indicators as life cycle cost, the adoption of environmental criteria in specifications, emissions/energy-performance indicators, supplier diversity, labour/human rights criteria and social value realization. Post-award public value outcomes could be measured in such categories as value for money, integrity, service quality, resilience, sustainability performance, competition and trust.

## 11. Discussion and Theoretical Contribution

The primary theoretical contribution of this article is the introduction of convergence as a unifying theory of procurement. Existing literature is extensive but fragmented. Researchers concerned with governance discuss integrity and accountability. Researchers concerned with digital government discuss digital platforms, interoperability, and analytics. Researchers concerned with sustainability discuss green, social, and circular procurement. What has been missing is a framework for understanding why these different streams of research are co-constitutive rather than simply adjacent. UVBPS remedies this by introducing a theory of procurement as a value production architecture rather than a mere cluster of reforms.

The significance of this article is underscored by the fact that many of the failures of procurement reform can be recast as a failure of convergence. For example, failures of digital procurement are often a failure of digitisation without a corresponding improvement in integrity and accountability. Failures of sustainability procurement are often a failure of integration of sustainability criteria into tender documents without a corresponding improvement in contract management and life-cycle data. Failures of governance procurement are often a failure of integrity rules without a corresponding improvement in structured disclosure, interoperability, and evaluation feedback. In each of these cases, the failure is not of a particular pillar, but of convergence between pillars.

In the UVBPS, public procurement is understood against the background of the public value tradition in public administration. According to Moore's model of public value [45], public value is created by aligning the public purpose, legitimacy and support, and operational capacity. The UVBPS applies this idea to the case of public procurement theory, such that sustainability ensures the articulation of public purpose, governance offers legitimacy and accountability, while digitalization improves operational capacity. It means that the model elaborates on the public value theory by showing how procurement systems can turn public power, markets, infrastructure, and policies into public value.

The second theoretical contribution of this article is conceptual. This article advances procurement beyond a doctrine of transactional efficiency towards a theory of public value. This is consistent with the best of the current scholarship and

international best practice. However, the literature on public value is often more rhetoric than reality. The theory of convergence introduces a framework for public value as a result of legally regulated discretion, digitally enabled traceability, and sustainability-driven decision rules. Thus, procurement theory is no longer simply multidisciplinary; it is now integrated.

A third contribution is methodological, in the sense of theory development. The paper shows that a wide range of literatures and institutional frameworks can be synthesized to produce a coherent theory of explanation without collapsing procurement into either formal legal rules, technical systems, or policy aspiration. This is particularly significant for a field like procurement, as it intersects with many other fields such as public administration, law, information systems, and sustainability studies. UVBPS provides a concept that can act as a bridge between these fields to facilitate cumulative research.

In addition to its contribution to theory and methodology, the UVBPS presents a framework for tackling the very practical problems that result when several public goals need to be achieved concurrently.

### 11.1 Managing Trade-offs within the UVBPS

A converged procurement system does not avoid trade-offs, but brings them out into the open where they can be governed and assessed. There might be conflicts between the urgency and transparency, the lowest acquisition cost and the overall value, the efficiency brought about by competition and social targeting, digitalization and inclusivity of suppliers, or ambitious environmental policies and the readiness of markets. Four rules of the UVBPS mediate these conflicts: first, trade-offs need to be identified at the planning phase; second, criteria and weights for assessment need to be clear and legally sound; third, digital documentation makes decisions trackable through the life cycle; fourth, post-award performance needs to be used to check whether the compromise made did create public value. Through such a process, convergence is not an assertion that every goal can always be achieved in full. On the contrary, it is a sophisticated methodology for assessing procurement choices amid different priorities.

## 12. Policy, Managerial, and Measurement Implications

The article has a number of implications for policymakers. A key implication for governments that are contemplating or undertaking procurement system reforms is that such a process needs to be thought of as a single operating model, as opposed to a series of separate initiatives. This means that governments need to think about integrating procurement laws, digital platform architectures, disclosure rules, sustainability criteria, and performance metrics within a single vision for a procurement system. The key implication for governments, therefore, is that there needs to be a co-design of governance, digitalisation, and sustainability, as opposed to a sequential approach where these are added on top of each other.

The article also has implications for procurement authorities and contracting entities. A key implication for these entities is that there needs to be a cross-functional approach to building capabilities. Procurement professionals need to have skills that are

not just legal or commercial in nature but also encompass data governance, sustainability, risk analysis, and digitalisation. This is not a secondary implication. If the convergent theory holds, then it suggests that professionalisation of the workforce is a key element of a modernised procurement system, as a result of the dependency on institutional capabilities to effectively align the three pillars.

In the case of performance management, the article promotes the concept of a lifecycle-based key performance indicator system. The pertinent question is no longer simply the compliance of a tender or the underspending of a budget but rather the promotion of competition, integrity, service quality, sustainability, resilience, and learning through the procurement process. The OECD's framework is a useful starting point for a multidimensional evaluation of the procurement system because it connects the measurement of procurement with strategic and institutional objectives [4].

## 13. Limitations and Future Research

The article is an integrative theory-building review informed by PRISMA principles, with the strengths and weaknesses inherent in this genre. The strengths of the article include its integrative review and connection with peer-reviewed literature and/or institutional frameworks. The article's weaknesses include the absence of a meta-analytic effect size or a fully systematic and PRISMA-compliant review, due to the integrative review's use of mixed methods and heterogeneous forms of evidence. The article is best viewed as a theory-generating article rather than a causal effects article.

More causal research is needed on the interaction effects of governance quality and digital procurement maturity. The governance of artificial intelligence in procurement should be a new stream of research. There should be more operational measures of sustainability outcomes, social value realisation, and life-cycle value creation in procurement theory. More comparative studies of interoperability between procurement systems, financial management systems, supplier registries, and audit systems would greatly strengthen the empirical basis of convergent theory. There should be more studies of whether high-convergence systems outperform fragmented systems in terms of trust, competition, robustness, and long-run public value.

## 14. Conclusion

Public procurement theory has reached a level of development where fragmentation can no longer be considered an appropriate level of analysis. The cumulative evidence suggests that procurement cannot be understood in terms of legal compliance, digital modernisation, or sustainable purchasing. Rather, it is a value production system in which discretion is disciplined by governance, digitalisation structures information and execution, and sustainability redefines what constitutes success. The theory of convergent procurement presented here brings all of these elements together in a Unified Value-Based Procurement System. In doing so, it offers a more robust conceptual basis for future procurement scholarship, reform, and performance evaluation. If procurement is one of the state's most potent market-shaping instruments, then theory must be commensurate with that potential. Forthcoming

procurement reforms need to take the form of an integrated programme consisting of governance, digitalization, and sustainability, as opposed to separate initiatives. Success in transforming procurement processes would not rest so much on achieving perfection in any one of the pillars, but on how the pillars are integrated to create value. The direct policy recommendation from the foregoing discussion is that procurement officials must strive towards public value reporting as part of procurement processes. Such public value reporting must incorporate the rationale behind planning and tendering, digitalization, sustainability, contract performance, payments, audit findings, and learning from award processes. The way forward is convergence.

**References**

[1] Malacina, I., Karttunen, E., Jääskeläinen, A., Lintukangas, K., Heikkilä, J., Kähkönen, A.-K. (2022). Capturing the value creation in public procurement: A practice-based view. *Journal of Purchasing and Supply Management*, *28*(2): Article 100745.

[2] Merisalo, M., Hyytinen, K., Oksanen, J., Pihlajamaa, M., Uyarra, E. (2024). Navigating the multiple views of value in assessing public procurement. *Science and Public Policy*, *51*(3): 463–476.

[3] OECD. (2015). *Recommendation of the Council on Public Procurement*. OECD Legal Instruments.

[4] OECD. (2023). *Public procurement performance: A framework for measuring results*. OECD Publishing.

[5] World Bank. (2025). *Procurement regulations for IPF borrowers (7th ed.)*. World Bank.

[6] Thai, K. V. (2001). Public procurement re-examined. *Journal of Public Procurement*, *1*(1): 9–50.

[7] McCrudden, C. (2004). Using public procurement to achieve social outcomes. *Natural Resources Forum*, *28*(4): 257–267.

[8] Khorana, S., Caram, S., Rana, N. P. (2024). Measuring public procurement transparency with an index: Exploring the role of e-GP systems and institutions. *Government Information Quarterly*, *41*(3): Article 101952.

[9] OECD. (2025b). *Implementing the OECD Recommendation on Public Procurement in OECD and partner countries*. OECD Publishing.

[10] OECD. (2025c). *Digital transformation of public procurement*. OECD Publishing.

[11] Adjei-Bamfo, P., Maloreh-Nyamekye, T., Ahenkan, A. (2019). The role of e-government in sustainable public procurement in developing countries: A systematic literature review. *Resources, Conservation and Recycling*, *142*, 189–203.

[12] United Nations Environment Programme (UNEP). (2012). *The impacts of sustainable public procurement: Eight illustrative case studies*. https://www.unep.org/resources/report/impacts-sustainable-public-procurement-eight-illustrative-case-studies

[13] Sönnichsen, S. D., Clement, J. (2020). Review of green and sustainable public procurement: Towards circular public procurement. *Journal of Cleaner Production*, *245*, Article 118901.

[14] European Union Agency for Cybersecurity (ENISA). (2014). *Security guide for ICT procurement*. https://www.enisa.europa.eu/publications/security-guide-for-ict-procurement

[15] UK Government. (2012). *The Public Services (Social Value) Act 2012*. https://www.legislation.gov.uk/ukpga/2012/3/enacted

[16] OECD. (2016a). *Preventing corruption in public procurement*. OECD Publishing.

[17] OECD. (2016b). *The Korean Public Procurement Service: Innovating for effectiveness*. OECD Publishing.

[18] OECD. (2019a). *OECD principles on artificial intelligence*. OECD Publishing.

[19] OECD. (2019b). *Government at a glance 2019*. OECD Publishing.

[20] OECD. (2025a). *Government at a glance 2025*. OECD Publishing.

[21] Arrowsmith, S. (2010). Horizontal policies in public procurement: A taxonomy. *Journal of Public Procurement*, *10*(2): 149–186.

[22] Erridge, A. (2007). Public procurement, public value and the Northern Ireland unemployment pilot project. *Public Administration*, *85*(4): 1023–1043.

[23] United Nations Commission on International Trade Law (UNCITRAL). (2011). *UNCITRAL model law on public procurement*. https://uncitral.un.org/en/model-laws/procurement

[24] World Trade Organization (WTO). (n.d.). *Overview of the Agreement on Government Procurement*. https://www.wto.org/english/tratop_e/gproc_e/gp_gpa_e.htm

[25] Basel Institute on Governance. (2016). *Preventing corruption in public procurement*. Basel Institute on Governance.

[26] World Bank. (2014). *e-Procurement reference guide*. World Bank.

[27] Mohungoo, I., Brown, I., Kabanda, S. (2020). A systematic review of implementation challenges in public e-procurement. In Responsible design, implementation and use of information and communication technology (pp. 46–58). Springer.

[28] Dorasamy, N. (2013). Conditions determining the success of public e-procurement. In Z. Mahmood (Ed.), *Developing e-government projects: Frameworks and methodologies* (pp. 185–209). IGI Global.

[29] Nyadzi, B. K., Morris, J. C. (2026). E-Government and public trust in developing countries: A systematic review and research agenda. *International Journal of Public Administration*, *49*(3): 178–202. https://doi.org/10.1080/01900692.2025.2597453

[30] Mojaki, L. M., Tuyikeze, T., Ndlovu, N. K. (2024). Revolution of South African public procurement in the Industry 4.0 era. *Journal of Transport and Supply Chain Management*, *18*, Article a1079.

[31] European Commission. (2023). eForms. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. https://single-market-economy.ec.europa.eu/public-procurement/eforms_en

[32] United Nations Environment Programme (UNEP). (2017). *Global review of sustainable public procurement 2017*. https://www.unep.org/resources/report/global-review-sustainable-public-procurement-2017

[33] Lundberg, S., Marklund, P.-O., Strömbäck, E. (2016). Is environmental policy by public procurement effective? *Public Finance Review*, *44*(4): 478–499.

[34] Grandia, J., Meehan, J. (2017). Public procurement as a policy tool: Using procurement to reach desired outcomes in society. *International Journal of Public Sector Management*, *30*(4): 302–309.

[35] World Bank. (2023). *Procurement guidance: Value for money*. World Bank.

[36] OECD. (2018). *Methodology for assessing procurement systems (MAPS)*. https://www.mapsinitiative.org/

[37] Uyarra, E., Flanagan, K., Magro, E., Zabala-Iturriagagoitia, J. M. (2017). Anchoring the innovation impacts of public procurement to place: The role of conversations. *Environment and Planning C: Politics and Space*, *35*(5): 828–848.

[38] Gatobu, F. H. (2020). Influence of procurement process on the performance of public entities (A case study of Nairobi County Government). *The International Journal of Academic Research in Business and Social Sciences*, *10*(4): 40–61.

[39] Lindgreen, A., Swaen, V., Maon, F., Walker, H., Brammer, S. (2009). *Sustainable procurement* in the United Kingdom public sector. *Supply Chain Management: An International Journal*, *14*(2): 128–137.

[40] OECD. (2017). *Public procurement in Chile: Policy options for efficient and inclusive frameworks*. OECD Publishing.

[41] World Bank. (2016). *Benchmarking public procurement 2017*. World Bank.

[42] Ksonzhyk, I., Matskiv, H., Sorochan, N. (2022). European experience with the operation and control of the procurement mechanism for goods, works, and services using budget funds. *University Economic Bulletin*, *55*, 97–105.

[43] Open Contracting Partnership. (n.d.-a). *Global principles for open contracting*. Open Contracting Partnership.

[44] Open Contracting Partnership. (n.d.-b). *Open Contracting Data Standard*. Open Contracting Partnership.

[45] Moore, M. H. (1995). *Creating public value: Strategic management in government*. Harvard University Press.

# FORGING A NEW PARADIGM IN PUBLIC ADMINISTRATION: REFRAMING PUBLIC PROCUREMENT EFFECTIVENESS THROUGH A MID-RANGE SYSTEMS THEORY IN THE DIGITAL GOVERNANCE ERA

Aida Nyenje Lubwama, Abdu Mutanje

***Suggested citation: Lubwama, A. N., & Mutanje, A. (2026). Forging a new paradigm in public administration: Reframing public procurement effectiveness through a mid-range systems theory in the digital governance era. International Journal of Public Procurement, 2(1),112-134.***

**Abstract**

Public procurement is a strategic administrative function through which governments convert public resources into infrastructure, services and wider public value [1–4]. Yet repeated legal, managerial and digital reforms often fail to produce consistent procurement effectiveness. This article develops a mid-range systems theory to explain the conditions under which effectiveness emerges in contemporary digital governance environments. It uses a theory-building integrative literature review and an illustrative Uganda case, rather than claiming empirical validation of the proposed framework. The analysis integrates administrative capacity, governance quality and digital integration as interacting subsystems whose complementarities, feedback and boundary conditions shape procurement outcomes. It thereby moves beyond explanations that privilege competition, collaboration or technology in isolation. The article contributes an emergent-systems account of procurement effectiveness, specifies mechanisms through which administrative and digital reforms reinforce or weaken one another, and converts the framework into propositions and an operationalisation scheme for future research. The Uganda illustration demonstrates the framework's analytical use while retaining a clear distinction between conceptual development and causal testing.

**Keywords**

public procurement; systems theory; digital governance; administrative capacity; procurement effectiveness; Uganda

---

*Dr. Aida Nyenje Lubwama and Abdu Mutanje are affiliated with the Uganda Management Institute (UMI), Kampala, Uganda. Dr. Lubwama is a Senior Lecturer in Public Administration and Management and holds a PhD in Educational Administration and Management. Her research interests include educational management, public administration, governance, organizational management, and public-sector accountability. Abdu Mutanje is a public administration and policy practitioner and facilitator whose interests include public policy analysis, monitoring and evaluation, local government service delivery, and management. Corresponding author: Aida Nyenje Lubwama (aidalubwama@gmail.com)*

Copyright © 2026 by IPPA/IPPC

## 1. Introduction

Public procurement is not merely a purchasing procedure. It is an administrative mechanism through which states allocate substantial public resources, acquire infrastructure and services, regulate relationships with suppliers, and pursue public-value objectives. Its importance follows from both its fiscal scale and its institutional position: procurement decisions sit at the intersection of budgeting, technical planning, regulation, contract management and service delivery [1–3]. Consequently, procurement performance provides a useful window into the capability of public administrations to convert formal rules and public resources into operational results.

The persistence of procurement problems after repeated waves of legal reform, professionalisation, oversight and digitalisation creates an important theoretical puzzle. Evidence from Uganda, for example, identifies unrealistic cost estimates, incomplete technical specifications, limited contract-management capacity, weak supervision and delayed payments as factors affecting contract delivery [4]. More recent government reforms have also placed increasing emphasis on electronic government procurement. PPDA's 2026 communication indicates that Uganda's e-GP 2.0 was scheduled for national rollout from 1 July 2026, with electronic bid submission, e-contract management, audit trails, reporting dashboards and integration with procurement plans and payment systems. These developments indicate substantial reform activity, but they do not by themselves establish that procurement effectiveness will improve.

Existing explanations tend to privilege one reform lever at a time. New Public Management highlights competition, efficiency and performance management; New Public Governance emphasises interdependence among public, private and civil-society actors; and Digital Era Governance focuses on the transformative potential of information technologies [5–8,18,19]. Each captures an important mechanism, but their separation makes it difficult to explain why comparable reforms produce different outcomes across organisations and countries. A systems perspective is useful because it directs attention to relationships among components, not merely to the presence of components [9–11,17].

This article therefore asks: How can a mid-range systems theory explain the conditions under which public procurement effectiveness emerges in contemporary digital governance environments? The article makes three linked contributions. First, it theorises procurement effectiveness as an emergent property of interacting administrative subsystems. Second, it specifies the mechanisms and boundary conditions through which administrative capacity, governance quality and digital integration reinforce or weaken one another. Third, it converts the framework into propositions and an operationalisation scheme that can support future empirical testing. The paper is deliberately presented as a theory-building integrative review with an illustrative Uganda case; it does not claim that the evidence reviewed constitutes an empirical validation of the proposed theory.

## 2. Methodology

### 2.1 Research design and epistemic position

The study uses a theory-building integrative literature review. Integrative reviews are appropriate when a research problem spans several bodies of scholarship and the objective is to generate a new conceptual synthesis rather than estimate a single pooled effect [12]. The approach was selected because procurement effectiveness crosses public administration, institutional theory, governance, digital transformation and public-sector management. The analysis therefore treats existing empirical findings as theoretically informative evidence from which mechanisms, contingencies and relationships can be abstracted. It does not treat the literature as a homogeneous evidence base capable of supporting meta-analytic effect estimation.

The analytical sequence comprised four linked operations: identification of relevant theoretical and empirical literatures; thematic abstraction of recurring mechanisms; integration of the mechanisms into a systems architecture; and derivation of propositions and measurable indicators. This logic follows the integrative-review principle that synthesis should generate a new explanatory contribution rather than merely catalogue existing studies [12,13].

**2.2 Search strategy and source identification**

The original review searched Scopus, Web of Science, ScienceDirect, Emerald Insight, SpringerLink and Google Scholar. The core search families were: ("public procurement" OR "government procurement" OR "public purchasing") AND (effectiveness OR performance OR "value for money") AND ("administrative capacity" OR "state capacity" OR "institutional capacity"); ("e-procurement" OR "electronic government procurement" OR "digital procurement") AND (transparency OR accountability OR governance); and ("systems theory" OR "complex systems" OR "adaptive governance") AND ("public administration" OR "institutional reform" OR governance). Searches covered 1990–2025, while foundational works published earlier were retained where they were necessary to define the theoretical architecture.

The conceptual search and official-source verification were updated on 6 September 2026. Database-specific field settings were title, abstract and keywords where the interface permitted field restriction; otherwise the default scholarly search field was used. English-language literature was prioritised because the manuscript is written and interpreted in English. Books were retained where they were foundational to systems, institutional or public-administration theory, while institutional reports were retained where they supplied official procurement, audit or digital-government evidence. Backward and forward citation checking was used to identify seminal or directly relevant sources missed by keyword searches.

An important methodological qualification is necessary. The database export files and original search logs from the first review were not preserved, so the historical database-by-database retrieval counts cannot now be reconstructed reliably. Instead, this article records the exact search families, date of the compliance update, eligibility rules, screening logic, coding procedure and final source corpus, and it provides a literature-selection audit table. The authors regard this transparent acknowledgement of the limitation as preferable to reconstructing unreliable counts. Future empirical users of the framework can reproduce the search from the recorded strings and dates.

### 2.3 Eligibility, screening and selection

Sources were eligible when they addressed public procurement systems, procurement reform, procurement performance, institutional or administrative capacity, governance and accountability, digital procurement or e-government procurement, or theoretical mechanisms relevant to procurement effectiveness. Empirical studies from national, organisational and comparative settings were eligible. Private-sector procurement studies were excluded unless they contributed a clearly transferable theoretical mechanism. Studies focused solely on technical optimisation without public-governance implications, unsupported opinion, or material outside the research question were excluded.

Screening was undertaken first at title and abstract level and then at full-text level. Duplicate records were removed where multiple database searches returned the same publication. The final theory-building corpus comprised the sources retained in the reference list after conceptual relevance, evidential traceability and theoretical contribution were assessed. Because the review is integrative rather than a conventional systematic review, the selection process is reported as PRISMA-inspired rather than as a claim of full PRISMA compliance.

**Table 1. Literature-selection audit for the integrative review**

| Stage | Procedure | Record count | Compliance note |
|---|---|---|---|
| Database identification | Scopus, Web of Science, ScienceDirect, Emerald Insight, SpringerLink and Google Scholar using the recorded search families. | Historical count not recoverable | Original export logs were not retained. |
| Supplementary identification | Backward/forward citation checking and official-source verification for Uganda, Rwanda and Kenya. | Not separately logged | Sources were retained only where they met the eligibility criteria. |
| Deduplication | Exact and near-duplicate publications removed before conceptual screening. | Not separately logged | The revised method specifies the rule but cannot recreate the original database export. |

| Stage | Procedure | Record count | Compliance note |
|---|---|---|---|
| Title/abstract screening | Relevance to procurement effectiveness, public administration, governance, digital procurement and systems theory. | Not separately logged | Screening criteria are stated in Section 2.3. |
| Full-text assessment | Assessment of theoretical relevance, evidential traceability and contribution to the framework. | Not separately logged | Sources failing the criteria were excluded. |
| Final theory-building corpus | Sources retained and cited in the final manuscript. | 42 sources | Includes peer-reviewed articles, books and authoritative institutional sources. |

This audit is intentionally transparent about the missing historical counts. The final corpus contains 42 sources, but that number should not be interpreted as the number of records initially retrieved. The distinction matters because the purpose of the review is theory construction rather than quantitative estimation.

**2.4 Coding and theory-development process**

Both authors participated in the conceptual interpretation of the literature. The coding framework was developed from the research question and then revised iteratively as recurring mechanisms became visible. Initial concepts included professional competence, procurement planning, organisational routines, leadership, ethical climate, transparency, audit, sanctions, complaints handling, e-procurement, information flows, interoperability, monitoring, learning and corrective action. These were abstracted into higher-order constructs through repeated comparison across sources.

Coding was primarily qualitative and matrix-based rather than dependent on a specialist software package. The authors compared interpretations through discussion and resolved disagreements by returning to the underlying source and the definition of the construct. No claim of statistical inter-coder reliability is made. Conceptual sufficiency was reached when additional sources largely reinforced the existing architecture rather than requiring a new core subsystem. Uganda and the comparative evidence were used as plausibility checks: they did not create the theory independently, but they exposed where propositions required boundary conditions or more cautious wording.

The analytical architecture distinguishes core subsystems from cross-cutting capabilities. Administrative capacity, governance quality and digital integration are the three primary subsystems. Organisational culture is embedded within administrative capacity because it conditions whether competence, rules and learning become routine practice. Feedback capacity is treated as a cross-system capability because learning can operate through capacity development, oversight, digital redesign and organisational adaptation simultaneously.

### 2.5 Case-selection rationale

Uganda is selected as an analytically informative illustrative case, not as a critical, most-likely or least-likely case. The selection criterion is a combination of substantial reform exposure and continuing implementation friction. Uganda provides a long reform trajectory beginning with the establishment of PPDA under the 2003 Act, subsequent regulatory amendments and professionalisation, and the progressive development of e-procurement, while recent evidence continues to identify contract-management and implementation weaknesses [4,14,15]. This combination gives the theory an analytically useful setting in which formal reform and implementation capability can be considered together.

The period covered is 2003–2026. The lower boundary captures the institutional consolidation associated with the PPDA Act, while the upper boundary captures the transition toward e-GP 2.0. Rwanda and Kenya are retained as bounded comparators because they illuminate different points on the digital-reform trajectory. Rwanda offers a relatively mature e-procurement system: the World Bank's procurement-system assessment describes Umucyo as rolled out to government procuring entities and integrated with an e-GP complaints module [16], while Rwanda's current procurement authority continues to use Umucyo for procurement and contract monitoring. Kenya is analytically useful because its end-to-end e-GP rollout was launched nationally in 2025, followed by mandatory-use measures whose legal status was subsequently contested [34–37]. The comparison therefore concerns institutional configuration and reform stage, not causal performance ranking.

Uganda is not assumed to be representative of East Africa, and Rwanda and Kenya are not treated as controls. The comparative material is used to identify plausible scope conditions: mature digital infrastructure does not eliminate contract-management problems, and rapid digital rollout does not itself establish improved outcomes. The case therefore supports analytical reasoning about mechanisms while leaving causal testing to future comparative research.

### 2.6 Methodological limitations

The principal limitation is the loss of the original database-level search logs, which prevents exact reconstruction of historical retrieval counts. A second limitation is that the illustrative case evidence is documentary and citation-based rather than generated through new fieldwork. A third limitation is that the framework contains interaction and feedback propositions that cannot be established causally through an integrative review.

These limitations are addressed by narrowing the claims, documenting the search and coding logic, and presenting the propositions explicitly as empirical expectations.

## 3. Theoretical Results: The Public Administration–Procurement Systems Model

### 3.1 Core architecture

The Public Administration–Procurement Systems Model (PAPSM) conceptualises procurement effectiveness as an emergent outcome of three interdependent subsystems: administrative capacity, governance quality and digital integration. Emergence is used in the strict analytical sense that the system-level outcome cannot be adequately located in any single component. A procurement platform may generate information, a regulation may define responsibilities, and a professional officer may possess technical competence; effectiveness arises when these elements interact in ways that permit information, authority and capability to be converted into coordinated action.

The model therefore rejects an additive logic in which capacity + governance + technology automatically equals effectiveness. It proposes instead a complementarity logic. A digital system can increase the volume and speed of information while producing little accountability if institutions cannot interpret or act upon that information. Conversely, strong oversight may identify irregularities without producing improvement if responsible entities lack technical and managerial capacity to correct them. The theoretical object is consequently the relationship among subsystems.

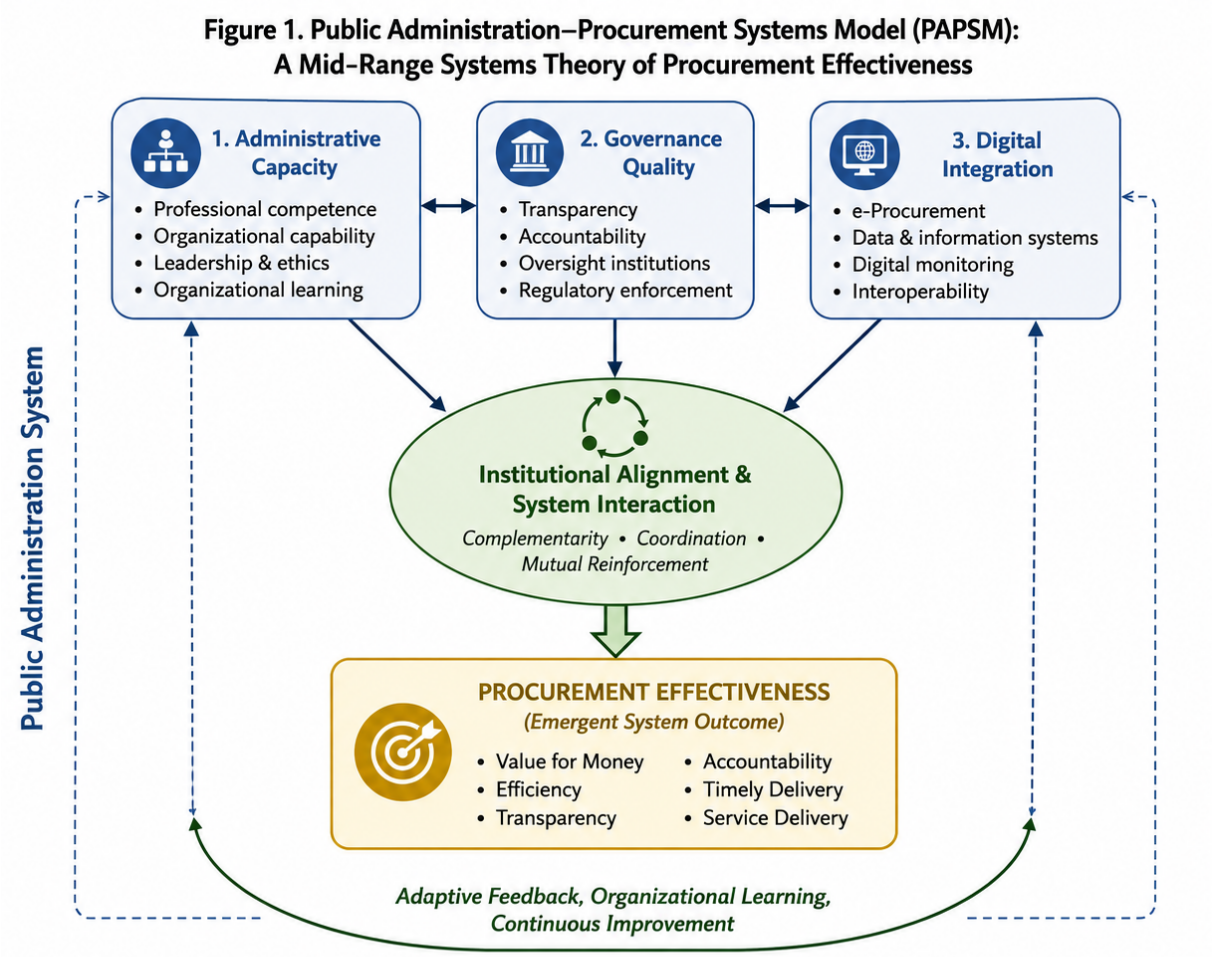



**Figure 1. Public Administration–Procurement Systems Model (PAPSM): A mid-range systems theory of procurement effectiveness.**

Note. The figure depicts direct and conditioning relationships among the three core subsystems, their interaction through institutional alignment, and feedback from procurement outcomes to system capabilities. The model is authors' conceptual synthesis, informed by systems and public-administration scholarship. Solid arrows represent proposed interaction or conditioning relationships; dashed arrows represent adaptive feedback.

### 3.2 Administrative capacity and organisational culture

Administrative capacity is defined as the organisational ability to translate procurement rules, professional knowledge and resources into competent action. It includes professional expertise, staffing adequacy, procurement planning, contract

management, leadership, institutional memory and organisational learning. Bosio et al. [1] show that procurement regulation and public-sector capacity jointly shape procurement outcomes, while the Uganda contract-management study identifies thin staffing structures, weak technical specifications, unrealistic estimates and limited supervision as practical constraints [4]. The broader public procurement literature likewise treats professional capability and implementation competence as important conditions for realising procurement policy objectives [20,21].

Organisational culture is treated as an internal dimension of this subsystem rather than as an independent fourth pillar. Professional norms, ethical expectations, leadership support and openness to learning influence how officials interpret rules and use information. A compliance-oriented culture may produce technically correct documentation while discouraging questioning, adaptation or early escalation of emerging contract risks. A learning-oriented culture, by contrast, can convert audit findings and performance information into changes in routines. This specification incorporates the human element without fragmenting the theoretical architecture.

### 3.3 Governance quality

Governance quality concerns the institutions and practices that make procurement decisions transparent, reviewable and accountable. It includes disclosure, audit, complaints and review mechanisms, regulatory oversight, sanctions and enforcement credibility. The central theoretical distinction is between information availability and accountability action. Transparency creates the possibility of scrutiny, but scrutiny becomes accountability only when an institution can interpret information, assign responsibility and implement corrective measures. This follows the broader quality-of-government literature, which links institutional quality to impartial and capable exercise of public authority [22–24].

The model therefore predicts a conditioning relationship rather than a simple direct effect: the value of digital transparency should be greater where governance institutions can act on the information produced. Where enforcement is weak, digitisation may increase the visibility of irregularities without increasing deterrence. This is an important boundary condition for digital-governance claims.

### 3.4 Digital integration: functional versus symbolic digitalisation

Digital integration refers to the extent to which digital technologies alter procurement workflows, information flows, monitoring and decision-making. It is broader than platform adoption. Functional digitalisation occurs when e-procurement changes organisational routines, increases the reliability and accessibility of information, reduces unnecessary manual handling, and enables monitoring or corrective action. Symbolic digitalisation occurs when a platform is formally adopted but underlying practices, capabilities or incentives remain largely unchanged. The distinction is consistent with evidence that e-procurement implementation is shaped by organisational, technological and contextual conditions, including skills, leadership, resistance to change and regulatory fit [25–27].

Uganda's current transition illustrates why adoption and integration should not be conflated. PPDA's 2026 e-GP communication describes a national rollout of e-GP 2.0 from July 2026, including e-bidding, e-contract management, digital audit trails and integration with procurement plans and payment systems. The reform is therefore capable of improving information and traceability, but the theory predicts that its substantive effect will depend on the capability of procuring entities and oversight bodies to use the new information.

### 3.5 Interaction, complementarity and adaptive feedback

The model specifies three principal interactions. First, administrative capacity conditions the effect of digital integration because skilled officials are better able to interpret data and use digital workflows. Second, governance quality conditions the effect of digital transparency because information has greater accountability value where institutions can investigate and correct irregularities. Third, digital integration can strengthen administrative learning by making performance information more timely and accessible. These are reciprocal relationships rather than one-directional effects.

The feedback mechanism is also specified more precisely. A negative outcome such as repeated contract delay can generate an information signal through audit, complaints, contract-performance reporting or e-GP records. If the organisation has feedback capacity, the signal can trigger revised planning, staff development, closer supervision or system redesign. If it lacks that capacity, the same signal may be recorded repeatedly without institutional learning. Positive feedback operates when successful practices generate confidence, legitimacy and further investment in effective routines. Feedback capacity therefore acts across all three subsystems rather than constituting a separate pillar.

A negative digital-governance feedback loop can be illustrated without claiming that it is uniquely Ugandan. Suppose a procuring entity introduces an e-procurement platform but user competence and interoperability remain weak. Duplicate data entry, incomplete records or reliance on parallel manual processes can reduce confidence in the platform. Users then bypass parts of the system, weakening the completeness of the digital record. Reduced data quality limits oversight, which in turn makes corrective action harder. The result is a reinforcing cycle in which nominal digital adoption produces less rather than more usable accountability information. The example is a theoretical mechanism; it is not presented as an empirical finding from Uganda.

### 3.6 Theoretical propositions

P1 — Administrative capacity effect. At the organisational level, higher administrative capacity is expected to be positively associated with procurement effectiveness because professional competence, staffing adequacy and contract-management capability improve planning, implementation and monitoring.

P2 — Governance-quality effect. At the organisational and system levels, higher governance quality is expected to be positively associated with procurement effectiveness because transparent procedures, credible oversight, complaints

mechanisms and enforceable sanctions reduce opportunities for opportunistic behaviour and increase corrective action.

P3 — Digital-integration effect. At the organisational level, greater functional digital integration is expected to be positively associated with procurement effectiveness, particularly through reductions in avoidable process delays and improvements in information availability, provided that the system is substantively used rather than merely formally adopted.

P4 — Administrative-capacity moderation. The positive association between functional digital integration and procurement effectiveness is expected to be stronger in organisations with higher administrative capacity. Administrative capacity therefore moderates, rather than mediates, the digital-integration effect.

P5 — Governance conditioning of digital transparency. The positive association between digital transparency and accountability outcomes is expected to be stronger where governance institutions possess the authority and capability to interpret information, investigate irregularities and implement corrective action. Governance quality therefore conditions the transparency-to-accountability relationship.

P6 — Alignment and sustainability. At the organisational and system levels, procurement reforms that simultaneously strengthen administrative capacity, governance quality and functional digital integration are expected to produce more persistent improvements in procurement effectiveness than isolated interventions. Sustainable improvement is defined here as improvement that persists across successive procurement cycles through institutionalised routines, learning and corrective feedback rather than a short-term change following a single intervention.

### 3.7 Operationalisation of the model

The operationalisation table translates the propositions into indicators that could be tested using procurement-administrative data, organisational surveys, audit records and e-GP records. The table also resolves the concern about construct architecture: organisational culture is measured within administrative capacity, while feedback capacity is measured as a cross-cutting capability linked to P6.

| Construct | Conceptual definition | Operational definition | Level | Indicators | Measurement | Data source | Expected relationship | Prop. |
|---|---|---|---|---|---|---|---|---|
| Administrative capacity | Ability to implement procurement competently | Composite of competence, staffing, planning and contract-management capability | Organisation | % certified staff; staff/workload ratio; plan completion; contract-management score | Index/ratio; administrative records | HR/procurement records; survey; audit | Positive; moderates digital effect | P1,P4,P6 |
| Organisational culture | Norms supporting integrity, professionalism and learning | Embedded subdimension of administrative capacity | Organisation | Ethical climate; leadership support; learning orientation | 5-point Likert scale; validated composite | Staff survey/interviews | Positive; strengthens capacity effects | P1,P6 |

| Construct | Conceptual definition | Operational definition | Level | Indicators | Measurement | Data source | Expected relationship | Prop. |
|---|---|---|---|---|---|---|---|---|
| Governance quality | Capacity to make decisions transparent, reviewable and accountable | Composite of oversight, complaints, audit and enforcement | Organisation/system | Audit findings implemented; complaint-resolution time; sanctions; disclosure completeness | Rates/time/indices | PPDA; OAG; appeals records | Positive; conditions digital transparency | P2,P5,P6 |
| Digital integration | Extent to which digital systems transform procurement | Share and quality of procurement processed and managed electronically | Organisation/system | % e-GP procurements; e-bid use; e-contract use; interoperability; data completeness | Proportions/index | e-GP logs; ICT records | Positive when functional | P3,P4,P5,P6 |

| Construct | Conceptual definition | Operational definition | Level | Indicators | Measurement | Data source | Expected relationship | Prop. |
|---|---|---|---|---|---|---|---|---|
| Feedback capacity | Ability to convert performance information into adjustment | Extent to which findings trigger documented corrective action and learning | Organisation/system | % audit recommendations implemented; corrective-action closure time; documented process changes | Rate/time/index | Audit and institutional records | Positive for persistence | P6 |
| Procurement effectiveness | System-level procurement performance | Composite outcome across efficiency, competition, accountability | Organisation/system | Cycle time; bidder participation; contract-variation rate; value for | Days, %, counts, ratios; composite index | e-GP; procurement files; finance/service data | Outcome | P1-P6 |

| Construct | Conceptual definition | Operational definition | Level | Indicators | Measurement | Data source | Expected relationship | Prop. |
|---|---|---|---|---|---|---|---|---|
| | | and service delivery | | money; service-delivery performance | | | | |

## 4. Theoretical Analysis: Uganda and Comparative Evidence

### 4.1 Uganda's reform trajectory and analytical leverage

Uganda's procurement reform trajectory provides an analytically useful setting because reform has not been absent; rather, reform has accumulated across law, regulation, institutional oversight, professionalisation and digitalisation. The PPDA Act 2003 established a dedicated regulatory architecture, while subsequent reforms expanded standardisation and oversight. The present transition toward e-GP 2.0 adds a further layer of digital integration. The theoretical question is consequently not whether Uganda has reformed, but whether the components of reform are sufficiently aligned to produce durable performance [3,28].

The World Bank's 2023 study of contract management in Uganda is especially relevant because it links performance problems to mechanisms within the proposed model. The study identified unrealistic cost estimates, incomplete technical specifications, inappropriate qualification criteria, unfair practices in evaluation and inadequate due diligence before contract implementation. During implementation it identified thin staffing structures, limited provider capacity, insufficient monitoring resources, delayed payments and land-acquisition delays. It also identified weak supervision and contract-management oversight structures. These findings map directly onto administrative capacity, governance quality and the feedback mechanisms of the PAPSM.

Recent official procurement digitisation evidence adds a second layer. PPDA's 2026 e-GP programme describes the transition to e-GP 2.0, with national rollout from July 2026 and features intended to increase traceability, transparency and integration [14]. The reform is therefore consistent with the digital-integration component of the model, but the theory cautions against treating rollout as equivalent to effectiveness. The key empirical question is whether procuring entities use the information and controls generated by the system to improve planning, competition, contract management and corrective action.

Current audit evidence similarly reinforces the distinction between formal compliance and operational capacity. The Office of the Auditor General's 2025 thematic procurement audit and its Electoral Commission audit provide current reference points [29,30], while the World Bank's Uganda contract-management study supplies more detailed mechanism-level evidence [4]. A sector-specific Ugandan study of UNRA likewise reports significant associations between contract-management practices and operational performance [31]. These findings are not treated as proof of the PAPSM; they are documentary observations that make the proposed interaction mechanisms empirically plausible and identify measurable outcomes for future testing.

### 4.2 Rwanda: mature digital integration with continuing implementation demands

Rwanda provides a useful comparator because its e-procurement system, Umucyo, reached a substantially more mature stage earlier than Uganda's current national rollout. The World Bank's procurement-system assessment reported that Umucyo was rolled out to government procuring entities and included an e-GP complaints-review module [16]. Rwanda's procurement authority continues to use Umucyo in procurement and

contract monitoring, while its monitoring programme documents continuing implementation challenges [32,33].

The comparison is deliberately limited. Rwanda is not presented as a benchmark that Uganda should copy, nor is the evidence used to claim that Umucyo caused superior performance. The analytical contrast concerns reform configuration: Rwanda provides a mature digital environment against which the theoretical distinction between platform adoption and system integration can be examined.

### 4.3 Kenya: rapid national e-GP rollout

Kenya provides a second comparator because its national end-to-end e-GP rollout was formally launched in April 2025 [34]. The mandatory-use Circular 04/2025 was subsequently annulled by the National Assembly, with further parliamentary action concerning related executive circulars [35–37]. PPRA's 2026 training programme nevertheless continued to provide training on e-GP, procurement planning and digital records [38]. This makes Kenya analytically different from Rwanda's longer-running system and from Uganda's 2026 e-GP 2.0 national rollout.

The Kenya comparison strengthens the boundary condition rather than proving a causal effect. Both countries demonstrate that national digital mandates create an institutional opportunity for integration, but neither rollout announcement establishes realised improvements in cycle time, competition or service delivery. Those outcomes require empirical measurement. The comparison therefore supports the article's insistence that implementation stage and system capability should be distinguished from outcome performance.

### 4.4 Comparative interpretation

The three cases illuminate different configurations of the same theoretical problem. Uganda combines a long reform trajectory with a major transition to e-GP 2.0; Rwanda offers a more mature e-procurement architecture but continues to manage implementation risks; Kenya illustrates a recent end-to-end national digital rollout. The analytical implication is that procurement effectiveness should be studied as a relationship among institutional components rather than inferred from the presence of a reform instrument. This is precisely the explanatory space occupied by the proposed mid-range theory.

## 5. Discussion

### 5.1 From reform adoption to reform alignment

The central theoretical implication is a shift from adoption to alignment. Procurement reform is often evaluated by asking whether a law was enacted, a regulator established, staff trained or a digital platform introduced. The PAPSM proposes a different diagnostic question: do these components reinforce one another in the organisational setting where procurement decisions are made? This reframing explains why formal institutional change can coexist with weak operational performance, a problem also identified in broader public-sector reform scholarship [39,40].

The model also refines rather than rejects NPM, NPG and DEG. NPM contributes the logic of efficiency and competition; NPG draws attention to interdependence and coordination; DEG explains the transformation of information and administrative processes through digital technologies. The mid-range theory specifies the conditions under which these mechanisms become complementary. It therefore adds an interaction architecture rather than proposing another standalone reform paradigm.

5.2 Human agency, culture and implementation

A second contribution concerns the human element. Procurement systems are operated by officials who interpret rules, assess information, exercise discretion and respond to incentives. Organisational culture therefore affects whether reforms become routines or remain symbolic. The same digital interface can be used differently in organisations with different leadership practices, skills, incentives and learning cultures. This insight prevents the framework from becoming technologically deterministic and links systems theory to the organisational foundations of administrative behaviour.

**5.3 Feedback as a mechanism of sustainability**

The theory's strongest dynamic claim concerns feedback. Sustainable reform requires more than a positive initial outcome; it requires institutions capable of learning from performance. An audit finding that leads to revised planning, staff development and monitoring changes the system. An audit finding that is repeatedly recorded without corrective action does not. Feedback capacity therefore provides the mechanism connecting short-term performance signals to longer-term institutional change. Proposition 6 is consequently narrower than the earlier formulation of 'sustainable improvements': persistence requires observable institutionalisation across successive procurement cycles.

This also clarifies the meaning of negative feedback. In systems theory, negative feedback is not synonymous with a bad outcome; it refers to corrective information that can counter deviations from desired performance. The framework distinguishes the performance problem from the feedback response. A procurement failure can either trigger corrective learning or become a repeated failure if the system cannot process the signal. This distinction makes the proposed mechanism empirically testable.

**5.4 Practical implications**

The framework implies that procurement regulators should complement conventional compliance assessments with annual system-alignment assessments. Such assessments could examine whether procurement plans are realistic, whether certified staff capacity is proportionate to workload, whether audit findings are acted upon, whether e-GP data are complete, and whether complaints are resolved within defined periods. This would operationalise the theory without requiring a new regulatory institution.

Second, digital investments should be accompanied by organisational-readiness assessments covering user competence, data governance, interoperability and accountability responsibilities. Third, procurement professionalisation should include analytical and contract-management capability rather than focusing solely on procedural knowledge. Fourth, audit and monitoring systems should track closure of

recommendations and organisational learning, not simply the number of findings generated. Fifth, procurement-performance dashboards should combine process indicators with service-delivery outcomes so that faster processing is not mistaken for better public value. This approach is consistent with recent evidence that procurement digitalisation creates greater value when data systems are integrated with finance, audit and other administrative systems [41,42].

### 5.5 Implications for empirical testing

The propositions support several empirical designs. Administrative procurement data can be used to estimate cycle time, bidder participation and contract-variation rates before and after e-GP implementation. Interaction models can test whether the digital-integration effect varies with administrative capacity. Organisational surveys can measure culture, leadership and learning orientation. Longitudinal case studies can trace whether audit findings generate corrective action. Comparative designs can examine whether the same digital reform produces different outcomes under different capacity and governance conditions. These designs would directly test the mechanisms proposed rather than merely measuring whether reform instruments are present.

## 6. Conclusion

This article develops a mid-range systems theory that explains public procurement effectiveness as an emergent outcome of interacting administrative capacity, governance quality and digital integration. The framework does not claim that any one component is sufficient. Its central proposition is that procurement reforms become effective when the institutional components required for implementation, accountability, information use and learning reinforce one another.

Uganda provides an analytically informative illustration because it combines a substantial reform trajectory with continuing implementation challenges and a major transition toward national e-GP 2.0. Rwanda and Kenya provide bounded contrasts in digital-reform maturity and rollout. None is treated as a causal test. The comparative evidence instead helps identify the boundary conditions that should be examined empirically.

The paper's contribution is therefore conceptual and cumulative. By specifying six propositions, measurable indicators and a feedback mechanism, the PAPSM provides a researchable explanation for why similar procurement reforms can yield different results. Its practical implication is equally specific: governments should evaluate procurement reform as a system of mutually dependent capabilities rather than as a portfolio of isolated interventions. The next step is empirical testing using procurement transaction data, audit records, organisational measures and longitudinal evidence.

**Declarations**

Funding: No external funding was reported for this article.

Conflict of interest: The authors declare no conflict of interest.

Data availability: No original human-subject or proprietary transaction dataset was generated for this theory-building review. The study relies on published scholarship and publicly accessible institutional documents identified in the reference list.
Ethics: Ethics approval was not required because the study did not collect primary data from human participants.
Author contributions: Aida Nyenje Lubwama contributed to conceptualisation, literature interpretation and manuscript development. Abdu Mutanje contributed to conceptualisation, evidence synthesis, methodological revision and manuscript development. Both authors reviewed and approved the final manuscript.
Declaration of generative AI:
During the preparation and revision of this manuscript, the authors used OpenAI ChatGPT for targeted source searching and verification; language and structural editing; organisation of literature-audit materials and screening matrices; source summarisation and cross-checking; assistance in organising the qualitative coding and analytical matrices; refinement of proposition wording; internal-consistency checking; and preparation and revision of Figure 1. The authors independently reviewed and checked substantive claims, retained sources, bibliographic details and documentary page references against the underlying materials, and retained responsibility for all analytical decisions, interpretations, propositions and final wording. The authors take full responsibility for the accuracy, originality and integrity of the published article.

**References**

[1] Bosio, E., Djankov, S., Glaeser, E. L., & Shleifer, A. (2022). Public procurement in law and practice. American Economic Review, 112(4), 1091–1117. https://doi.org/10.1257/aer.20200738
[2] Grandia, J., & Meehan, J. (2017). Public procurement as a policy tool: Using procurement to reach desired outcomes in society. International Journal of Public Sector Management, 30(4), 302–309. https://doi.org/10.1108/IJPSM-03-2017-0066
[3] OECD. (2015). Recommendation of the Council on public procurement. OECD Publishing. https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0411
[4] World Bank. (2023). Uganda—Factors affecting contract management: A study on implications and factors affecting contract management in public procurement in Uganda (Report No. AUS0003314). World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099051123102020145
[5] Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead—Long live digital-era governance. Journal of Public Administration Research and Theory, 16(3), 467–494. https://doi.org/10.1093/jopart/mui057
[6] Hood, C. (1991). A public management for all seasons? Public Administration, 69(1), 3–19. https://doi.org/10.1111/j.1467-9299.1991.tb00779.x
[7] Klijn, E. H., & Koppenjan, J. (2016). Governance networks in the public sector. Routledge. https://doi.org/10.4324/9781315887098

[8] Osborne, S. P. (Ed.). (2010). The new public governance? Emerging perspectives on the theory and practice of public governance. Routledge.
[9] Christensen, T., & Lægreid, P. (2011). Complexity and hybrid public administration—Theoretical and empirical challenges. Public Organization Review, 11, 407–423. https://doi.org/10.1007/s11115-010-0141-4
[10] Katz, D., & Kahn, R. L. (1978). The social psychology of organizations (2nd ed.). Wiley.
[11] Meadows, D. H. (2008). Thinking in systems: A primer. Chelsea Green.
[12] Torraco, R. J. (2016). Writing integrative literature reviews: Using the past and present to explore the future. Human Resource Development Review, 15(4), 404–428. https://doi.org/10.1177/1534484316671606
[13] Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039
[14] PPDA Uganda. (2026, April). Press statement: Uganda to roll out e-GP to all entities on 1 July 2026. Public Procurement and Disposal of Public Assets Authority. https://www.ppda.go.ug/download/press-statement-uganda-to-roll-out-e-gp-to-all-entities-on-1st-july-2026/
[15] Pollitt, C., & Bouckaert, G. (2017). Public management reform: A comparative analysis—Into the age of austerity (4th ed.). Oxford University Press.
[16] World Bank, & Government of Rwanda. (2022). Rwanda: Assessment of the public procurement system (MAPS), Volume I—Main report. World Bank. https://www.mapsinitiative.org/en/countries/rwanda.html
[17] Checkland, P. (1981). Systems thinking, systems practice. Wiley.
[18] Osborne, S. P. (2006). The new public governance? Public Management Review, 8(3), 377–387. https://doi.org/10.1080/14719030600853022
[19] Bannister, F., & Connolly, R. (2014). ICT, public values and transformative government: A framework and programme for research. Government Information Quarterly, 31(1), 119–128. https://doi.org/10.1016/j.giq.2013.06.002
[20] Thai, K. V. (2009). International handbook of public procurement. CRC Press.
[21] OECD. (2019). Reforming public procurement: Progress in implementing the 2015 OECD Recommendation. OECD Publishing.
[22] Fukuyama, F. (2013). What is governance? Governance, 26(3), 347–368. https://doi.org/10.1111/gove.12035
[23] Rothstein, B., & Teorell, J. (2008). What is quality of government? A theory of impartial government institutions. Governance, 21(2), 165–190. https://doi.org/10.1111/j.1468-0491.2008.00391.x
[24] Adam, I., Dávid-Barrett, E., & Fazekas, M. (2025). The political economy of open contracting reforms in low- and middle-income countries. Governance, 38(2), e12897. https://doi.org/10.1111/gove.12897
[25] Mohungoo, I., Brown, I., & Kabanda, S. (2020). A systematic review of implementation challenges in public e-procurement. In M. Hattingh et al. (Eds.), Responsible design, implementation and use of information and communication technology (pp. 46–58). Springer. https://doi.org/10.1007/978-3-030-45002-1_5

[26] Uyarra, E., Edler, J., Garcia-Estevez, J., Georghiou, L., & Yeow, J. (2014). Barriers to innovation through public procurement: A supplier perspective. Technovation, 34(10), 631–645.
[27] Wu Chebili, B., La Cascia, H., Collineau, F., Salomon, A., Calvet, B., & Moreau, Y. (2022). Electronic government procurement implementation types: Options for Africa. World Bank. https://doi.org/10.1596/36891
[28] United Nations Commission on International Trade Law. (2011). UNCITRAL model law on public procurement. United Nations.
[29] Office of the Auditor General Uganda. (2025a). Public procurement and disposal management: Thematic audit report, financial year 2024/25. Office of the Auditor General.
[30] Office of the Auditor General Uganda. (2025b). Report of the Auditor General on Electoral Commission for the audit year ended December 2025. Office of the Auditor General.
https://www.oag.go.ug/storage/reports/PAS_CG_AGCY_2024_25_1775574637.pdf
[31] Muheesi, A., Kasenge, M., Ssebagala, C., & Namuli, J. (2023). Contract management and operational performance of the road construction sector in Uganda: Evidence from the Uganda National Roads Authority. Journal of Research Innovation and Implications in Education, 7(2), 105–113.
[32] Rwanda Public Procurement Authority. (2023). Annual coaching and mentoring programme for 2023–2024. RPPA.
[33] Rwanda Public Procurement Authority. (2024). Plan for large contracts monitoring for the first semester of 2024–2025. RPPA.
[34] National Treasury Kenya. (2025, April 9). The launch of the electronic government procurement system. Government of Kenya.
[35] PPRA Kenya. (2025). Circular 04/2025: Enforcement of compliance with the mandatory use of the electronic government procurement system (e-GPS) by all public procuring entities. Public Procurement Regulatory Authority.
[36] National Assembly of Kenya. (2025a, August 19). Report of the Committee on Delegated Legislation on its consideration of Public Procurement Regulatory Authority Circular No. 04/2025 on the enforcement of compliance with the mandatory use of the electronic Government Procurement System (e-GPS) by all public procuring entities. Parliament of Kenya.
[37] National Assembly of Kenya. (2025b, November 6). Hansard: Motion on adoption of the Fourth Report on implementation status of Public Procurement Regulatory Authority Circular No. 04 of 2025. Parliament of Kenya.
[38] PPRA Kenya. (2026). Training calendar 2026. Public Procurement Regulatory Authority.
[39] Andrews, M. (2013). The limits of institutional reform in development: Changing rules for realistic solutions. Cambridge University Press. https://doi.org/10.1017/CBO9781139060974
[40] North, D. C. (1990). Institutions, institutional change and economic performance. Cambridge University Press.

[41] OECD. (2025a). Digital transformation of public procurement: Good practice report. OECD Public Governance Policy Papers, No. 77. OECD Publishing, Paris. https://doi.org/10.1787/79651651-en
[42] OECD. (2025b). Government at a glance 2025. OECD Publishing. https://doi.org/10.1787/0efd0bcd-en

Author biographies

Dr Aida Nyenje Lubwama is a Senior Lecturer in Public Administration at Uganda Management Institute. Her academic and professional work spans public administration, educational management, governance, research methods and institutional development, with experience in postgraduate teaching, research supervision and scholarly publication in Ugandan contexts.

Abdu Mutanje is an Associate Consultant (Lecturer) at Uganda Management Institute and a doctoral researcher in Political Science and Public Administration at Moi University, Kenya. His research interests include public administration, governance, public policy, institutional capacity, digital governance, decentralisation and public-sector performance. His professional experience spans local government administration, electoral administration, public institutions, policy work, monitoring and evaluation, and postgraduate teaching.

# INFORMATION FOR CONTRIBUTORS
## Manuscript preparation

**a. Language**

The journal publishes articles in English. Authors may use either British or American spelling and terminology, but the chosen convention must be applied consistently throughout the manuscript. The language should be clear, idiomatic, and grammatically correct. Authors must carefully avoid spelling and grammatical errors to ensure that the manuscript meets accepted standards of professional written English. The journal's editors are not responsible for correcting grammatical or spelling errors. Manuscripts requiring substantial English revision may be rejected without peer review.

**b. Manuscript Length**

There is no strict page limit for research articles or review papers. However, authors are encouraged to be concise and keep the manuscript length within 4,000 to 10,000 words, excluding tables, figures, and references.

**c. Text Formatting**

Authors are advised to prepare their manuscript drafts using Microsoft Word. Please use a standard font (e.g., 12-point Times New Roman), double-spacing, and a single-column layout. Page numbers should be added using the automatic page numbering function. Do not use field codes. Indentation should be done using tab characters or formatting commands, not the spacebar. Tables should be created using the table function in Word, rather than importing from spreadsheet software. Mathematical equations should be prepared using the Equation Editor or MathType.

**d. Order and content of sections**

Manuscripts should be arranged in the following order: title page, abstract, keywords, main text (including tables and figures), appendices (if any), acknowledgments, declaration of competing interests, references, author biographies, graphical abstract, and electronic supplementary materials (if applicable).

**d.1. Title Page**

The title page should include the following:

- A concise and informative title. The title should be brief, objective, engaging, and grammatically correct. The use of abbreviations, acronyms, or formulas in the title is strongly discouraged. All letters must be capitalized.
- Author names, with superscript numbers indicating institutional affiliations and an asterisk (*) identifying the corresponding author. The author list should include only those who have made substantial scientific contributions to the manuscript. Individuals who contributed in other ways should be acknowledged in the Acknowledgments section.
- Author affiliations and postal codes. All affiliations should be clearly indicated using superscript numbers placed after each author’s name and before the corresponding institution. Provide the full postal address for each institution, including the country name.

- The email address of the corresponding author.

Any changes to the author list between initial submission and revision must be explained in the cover letter accompanying the revised manuscript, along with a completed "Authorship Change Request Form" provided by the editorial office. Such changes are subject to editorial approval and may lead to rejection of the manuscript. No changes to authorship or author order will be accepted after the manuscript has been accepted for publication.

**d.2. Abstract and Keywords**

Regular research articles and review papers must include a concise, factual abstract that clearly states the main objective and research question, methodology, key results, and principal conclusions of the study. The abstract should be between 120 and 250 words in length. Footnotes, references, figures, and tables are not permitted in the abstract. Immediately following the abstract, please provide 4 to 6 keywords that can be used for indexing purposes.

**d.3. Main Text**

Manuscripts describing original research typically include the following sections: Introduction, Literature Review, Methods, Results and Discussion, and Conclusion. Submissions with significant theoretical or mathematical components may require an additional section to present analytical developments.

**d.4. Headings and Section Numbering**

For research and review articles, a decimal numbering system for headings is required. Divide the manuscript into clearly defined and consecutively numbered sections and subsections. Sections should be numbered as 1, 2, etc., and subsections as 1.1, 1.1.1, 1.1.2, etc. These numbers should also be used for internal cross-referencing—avoid vague references like "in the text". Each section and subsection must have a brief, descriptive heading placed on a separate line. Review articles should begin with an Introduction and end with a Conclusion or Summary.

**d.5. Abbreviations**

All abbreviations must be defined at first mention and used consistently thereafter. Abbreviations defined in the abstract should be redefined when first used in the main text.

**d.6. Footnotes**

Necessary footnotes to the main text should be numbered consecutively and placed at the bottom of the page on which they appear. Footnotes in tables should be indicated using superscript lowercase letters (or asterisks) and placed immediately below the table.

**d.7. Units**

Follow internationally accepted standards and conventions, such as those defined by the International Organization for Standardization (ISO). If non-standard units are used, provide their equivalents in internationally recognized units.

**d.8. Mathematical Symbols and Notation**

All formulas, symbols, subscripts, superscripts, Greek letters, and special characters must be clearly distinguishable and carefully checked. Use standard

mathematical notation. All symbols must be clearly defined. If needed, a list of symbols may be provided before the Introduction.

**d.9. Equations**

Equations that are displayed separately from the text and are referenced explicitly should be numbered consecutively and cited as Eq. (1), Eq. (2), etc. Simple inline equations should use a slash (/) to denote small fractional terms (e.g., x/y) instead of a horizontal line. Exponential functions involving e should be written using "exp" for clarity. In general, variables should be set in italic type.

**d.10. Figures**

All figures, including graphs, photographs, diagrams, and flowcharts—should be embedded in the text close to where they are first mentioned, and not placed on separate pages at the end of the manuscript. Figures must be numbered consecutively using Arabic numerals (e.g., Fig. 1, Fig. 2), and each figure must include a descriptive caption. All elements within a figure should be clearly labeled and referenced in the caption. Figures must be cited in the text in numerical order. Color figures will be reproduced in color in both the print and online versions at no charge. Authors are encouraged to use color figures in their submissions.

**d.11. Tables**

All tables should be numbered consecutively using Arabic numerals and accompanied by a concise title that clearly explains their content. Tables should not duplicate results presented elsewhere in the manuscript, such as in figures. Tables must be cited in the text in numerical order (e.g., Table 1, Table 2).

**d.12. Appendices**

If appendices are included, they should be presented without numbering or, if multiple, labeled consecutively (e.g., Appendix A, Appendix B). Equations in appendices should be numbered separately from those in the main text, using the appendix letter (e.g., Eq. A1, Eq. A2), and each appendix should have its own numbering scheme.

**d.13. Acknowledgments**

The Acknowledgments section should include individuals who contributed to the work but are not listed as authors, as well as a full list of funding sources that supported the research. Funding agency names should be written in full. Acknowledgments should not appear on the title page, as a title footnote, or be placed in any alternative location.

**d.14. Citations & references**

Citations in the text are numbered in square brackets at appropriate locations (before a period, comma, etc.). Some examples: (i) Negotiation research spans many disciplines [3]. (ii) This result was later contradicted by Becker and Seligman [5], who… (iii) This effect has been widely studied [1–3,7].

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text. Papers accepted for publication are cited by their DOIs. Do not use footnotes or endnotes as a substitute for a reference list.

References are compiled in a numbered list in the order of their first citation in the text. Each numbered reference may contain only one literature citation. Please ensure references are given in the correct format, including titles of journal articles/book chapters with initial and final page numbers, in order to avoid delays in typesetting your article. The examples below illustrate different reference types.

**Journal articles (if the number of authors exceeds 10, after the tenth author we use et al.)**

[1] Chen, X., Zhu W. Y., Zhang Q. M. (2023). Electrocaloric cooling technologies for a sustainable world. iEnergy, 2(2): 100–108.

[2] Slifka M K, Whitton J L. (2000). Clinical implications of dysregulated cytokine production. J Mol Med, https://doi.org/10.1007/s001090000086.

**Books and articles in books**

[3] Peyret, R., Taylor, T. D. (1983). Computational Methods for Fluid Flow, 2nd edn. New York: Springer-Verlag Berlin Heidelberg.

[4] Volpe, R. (1994). Techniques for collision prevention, impact stability, and force control by space manipulators. In: Teleoperation and Robotics in Space. Skaar, S. B., Ruoff, C. F., Eds. Washington DC: The American Institute of Aeronautics and Astronautics.

**Articles in proceedings**

[5] Poirazis H, Kragh M, Hogg C. (2009). Energy modelling of ETFE membranes in building applications. In: Proceedings of the 11th International IBPSA Building Simulation Conference, Glasgow, UK.

**Reports, theses, and individual papers**

[6] Chapman, G. T., Tobak, M. (1984). nonlinear problems in flight dynamics. NASA TM-85940. 6

[7] Steger, J. L., Nietubicz, C. J., Heavey, J. E. (1981). A general curvilinear grid generation program for projectile configurations. Report No. ARBRL-MR03142. U.S. Army Ballistic Research Lab., Aberdeen Proving Ground MD.

[8] Yang, X. (1999). Study of building material emissions and indoor air quality. PhD Thesis, Massachusetts Institute of Technology, USA.

**Patent style**

[9] Lenz, J. R. (2004). Compact tribology tester. U.S. Patent 6 817 223, Nov. 2004.

**Standard**

[10] US-ASTM. (2014). ASTM D974-2014 Standard test method for acid and base number by color-indicator titration.

**Non-English publication style**

[11] Jia, W., Zhang, Q., Bai, Z., Ma, S. Y., Yao, D. Wang, Y. (2007). Progress on manufacturing techniques of shaped charge liners. Rare Metal Mater Eng, 36(9): 1511–1516 (in Chinese).

**Others**

[12] Information on http://www.adobe.com/technology/projects.html. [13] Mishra, A., Sefene, E. M., Tsegaw, A. A. (2021) Process parameter optimization of friction stir welding on 6061AA using supervised machine learning regression-based algorithms. arXiv preprint: arXiv: 2109.00570 [cs.LG].

If electronic supplementary materials (ESM) are submitted, they will be published exactly as provided by the authors, without any conversion, editing, or reformatting. ESM should consist of peer-reviewed content that is directly relevant to the conclusions of the paper. Please note that the purpose of ESM is to provide additional, not essential, support for the article's conclusions. Authors are strongly encouraged to integrate all critical information into the main manuscript to ensure that the content can be fully understood without referring to the ESM. If ESM is provided, it must be explicitly cited in the main text in the same manner as figures or tables (e.g., "Fig. S1 in the ESM"). Additionally, a separate paragraph should be inserted before the References section, such as:

Electronic Supplementary Materials: Supplementary materials (brief description) are available in the online version of this article.

## Submission

### a. Ways of submission

Authors must submit their manuscripts via email directly to the Editor-in-Chief (Dr. Fuguo Cao) at: caofuguo@cufe.edu.cn

### b. Documents to include in submissions.

- Cover letter (mandatory)
- Manuscript formatted according to the journal's template (mandatory)
- Author biographies (mandatory)
- Declaration of Competing Interests: The authors declare that there are no competing interests related to the content of this article.Authors must disclose any financial or non-financial interests that may be directly or indirectly related to the submitted work. Please note: If there are no competing interests to declare, authors must include the following statement:
- Electronic supplementary materials (optional)
- Other necessary materials not intended for peer review (optional)

### c. Legal Responsibility

Submission to the *International Journal of Public Procurement* (IJoPP) confirms that the work described has not been published previously in any form, including in languages other than English, and is not under consideration for publication elsewhere; furthermore, it confirms that the sender(s) is/are the sole and exclusive authors of the paper, and will bear responsibility for any plagiarism, breach of intellectual property, or academic ethics violation (including inappropriate AI use). Authors must explicitly declare the use of generative AI or AI-assisted technologies in the writing process (excluding basic tools like grammar checkers) via a dedicated statement titled "Declaration of generative AI and AI-assisted technologies in the writing process" placed before the references in both submitted and published manuscripts if such tools were used solely to improve readability/language, requiring human oversight, review, and full author accountability for final content – AI must not be listed as an author. Submission and publication require consent from all co-authors and institutional approval where applicable, and the publisher assumes no legal responsibility for claims arising from the submission.

## Peer Review Process

The journal follows a double-blind peer review procedure. The standard review process for each submission consists of three stages: initial screening, preliminary evaluation, and peer review.

### a. Initial Screening

All submitted manuscripts undergo an initial screening by the Editor-in-Chief. At this stage, manuscripts that do not comply with the guidelines outlined in this document will be desk-rejected without external review. In addition, all submissions are subject to a text similarity check. Manuscripts with a high level of text similarity may also be

rejected at this stage without further evaluation. Please note that the journal does not provide detailed reports of the similarity check.

**b. Preliminary Evaluation**

Manuscripts that pass the initial screening are then subject to a preliminary evaluation by the Editor-in-Chief, followed by assessment by the Editor. At this stage, the Editor-in-Chief has full discretion to decide whether a manuscript will proceed to external peer review or be rejected without review. Special emphasis is placed on the readability and appeal of the manuscript. Submissions with unengaging abstracts and/or lacking a comprehensive and compelling introduction are likely to be rejected at this stage without detailed comments.

**c. Peer Review**

IJoPP implements a rigorous peer review process. All submissions first undergo an editorial assessment to determine whether the manuscript aligns with the journal's scope, focus, and minimum academic quality standards. Manuscripts that pass this initial screening are then to be sent to three anonymous reviewers with relevant expertise for double-blind peer review. The typical review period is 8 to 12 weeks.

Once a submission has received at least two usable review reports (or in exceptional cases, at least one), Editor will make a publication decision based on the reviewers' evaluations. Possible outcomes include acceptance, revision (major or minor), or rejection. The key evaluation criteria include alignment with the journal's mission, the perceived quality and originality of the work, its potential interest to IJoPP's readership, and the overall presentation—particularly the standard of written academic English and the clarity of figures and tables.

In rare cases, after multiple rounds of reviewer invitations, the journal may still be unable to receive any peer review reports. Under such circumstances, the manuscript may be rejected at the editor's discretion.

## Post-Acceptance Information

**a. Publication Fee**

A publication fee of USD 200 is payable via bank transfer upon acceptance of the article. Please note: Articles based on papers presented at IPPC conferences are exempt from this fee.

**b. Copyright Agreement**

Authors will be required to sign an Open Access (OA) copyright agreement. This ensures the broadest possible dissemination and legal protection of the work under applicable copyright laws.

**c. Proofreading**

Proofs are provided to allow authors to check for typesetting errors and verify the completeness and accuracy of the content, including text, tables, and figures. Substantive changes, such as new results, corrections to data, changes in titles, or

modifications to the author list, are not permitted at this stage unless approved by the Editor-in-Chief. After online publication, any further corrections must be made in the form of a formal corrigendum, which will be linked to the original article.

**d. Online First Publication**

Articles will be published online as soon as the corrected proofs are received. When citing the article, please use the recommended citation format.

## Authorship Principles

These guidelines outline the principles of authorship and good authorship practices that are expected of all contributors to the journal.

## Authorship Clarification

The journal and publisher assume that all listed authors have agreed to the content of the manuscript, have explicitly consented to its submission, and have obtained approval from the relevant institutional authority prior to submission.

The publisher does not prescribe specific types of contributions that qualify an individual for authorship. Authors are encouraged to follow authorship guidelines relevant to their specific research disciplines. In the absence of field-specific standards, the following criteria are recommended:

All individuals listed as authors should meet all of the following conditions:

- Have made a substantial contribution to the conception or design of the work; or to the acquisition, analysis, or interpretation of data; or to the creation of new software used in the work;
- Have drafted the manuscript or revised it critically for important intellectual content;
- Have approved the version to be published; and
- Agree to be responsible for all aspects of the work, ensuring that any questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## Disclosures and Declarations

All authors are required to include the following information, where applicable: sources of funding, any financial or non-financial conflicts of interest, a statement confirming ethical approval from a relevant committee for research involving humans and/or animals, a statement of informed consent for studies involving human participants, and an animal welfare statement for studies involving animals.

The inclusion of such information depends not only on the journal's scope but also on the nature of the article itself. If the submitted work has potential implications for public health or welfare, **it is the responsibility of all authors** to provide the appropriate disclosures and declarations.

## Data Transparency

All authors are expected to ensure that **all data, materials, software applications, or custom code** that support their published findings are available and in compliance with the standards of their respective disciplines.

## Role of the Corresponding Author

One author must be designated as the corresponding author, acting on behalf of all co-authors and ensuring that any issues related to the accuracy or integrity of any part of the work are appropriately addressed.

The corresponding author is responsible for the following duties:

- Ensuring that all listed authors have approved the manuscript prior to submission, including agreement on the author names and their order of appearance;
- Managing all communication between the journal and the co-authors before and after publication;
- Providing transparency regarding any reuse of materials in the cover letter to the editor, and disclosing any unpublished content included in the manuscript (e.g., manuscripts under review or in press);
- Ensuring that all required author disclosures, declarations, and data transparency statements (as outlined above) are properly included in the manuscript, where applicable.

## Author Contributions

In disciplines where individual contributions can be clearly described and no specific authorship guidelines exist, the publisher encourages authors to include a contribution statement in the manuscript to promote transparency. This statement should be listed on a separate title page.

Examples of such statements include:

Conceptualization: [Full Name], …; Methodology: [Full Name], …; Formal analysis and investigation: [Full Name], …; Writing – original draft: [Full Name], …; Writing – review & editing: [Full Name], …; Funding acquisition: [Full Name], …; Resources: [Full Name], …; Supervision: [Full Name], …

For review articles where contribution descriptions may not follow the standard structure, authors should specify who initiated the idea for the article, who conducted the literature search and data analysis, and who drafted and/or critically revised the manuscript.

## Affiliations

Each author's primary affiliation should reflect the institution where the majority of their research work was conducted. If an author has since moved to a different institution, their current address may be noted separately. Addresses will not be updated or changed after publication.

## Changes to Authorship

Authors are strongly advised to confirm the author list, corresponding author designation, and the order of authors at the time of submission. Changes to authorship, including adding or removing authors, changing the corresponding author, or rearranging the author order, will not be permitted after the manuscript has been accepted.

Please note: Author names will be published exactly as they appear in the accepted manuscript. It is the authors' responsibility to ensure that all names are accurate and correctly spelled, and that all addresses and affiliations are up to date.

Adding or removing authors during the revision stage is generally not allowed, but may be considered in exceptional cases. In such cases, the reasons for the authorship change must be clearly explained, and final approval is at the discretion of the Editor-in-Chief.

## Confidentiality

Authors must treat all communications with the journal as confidential. This includes correspondence with journal representatives (e.g., the Editor-in-Chief or Managing Editor) and reviewer reports, unless explicit permission has been granted to share such information.

## Compliance with Ethical Standards

To ensure the objectivity and transparency of research, and to confirm adherence to recognized standards of ethical and professional conduct, authors must include relevant statements regarding funding sources, potential conflicts of interest (both financial and non-financial), informed consent for studies involving human participants, and animal welfare for studies involving animals, where applicable.

At the time of submission, authors must provide the following declarations, under a separate section titled "Compliance with Ethical Standards", as applicable:

- Disclosure of potential conflicts of interest
- Statement on research involving human participants and/or animals
- Statement of informed consent

The corresponding author must be prepared to collect and, if requested, provide documentation verifying compliance with ethical standards, either during peer review or after publication.

The editors reserve the right to reject manuscripts that do not comply with these guidelines. Authors are fully responsible for the accuracy of these statements and for any failure to meet the stated requirements.