

THE USE OF ARTIFICIAL INTELLIGENCE FOR INNOVATION IN THE PUBLIC PROCUREMENT SYSTEM

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Abstract

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Public procurement represents a substantial share of national economies and is increasingly shaped by the deployment of artificial intelligence (AI). The research problem addressed in this study concerns how AI can be integrated into public procurement systems without undermining core principles of transparency, accountability, and legality. The purpose of the paper is to examine the transformative potential of AI in public procurement while identifying the legal, institutional, and ethical challenges it generates. Methodologically, the study adopts a comparative analytical approach based on procurement laws, government reports, and peer-reviewed scholarship, focusing on the United Arab Emirates (UAE), Estonia, and South Korea. The findings indicate that AI can significantly enhance efficiency, transparency, and sustainability in procurement processes, particularly through automation and real-time data disclosure (Organisation for Economic Co-operation and Development [OECD], 2025). At the same time, persistent challenges emerge, including insufficient AI-specific legal frameworks, limited algorithmic explainability, and risks of bias and exclusion (Sharifmousavi et al., 2024). The paper concludes that effective AI adoption in public procurement depends primarily on institutional readiness and hybrid governance models that combine algorithmic tools with meaningful human oversight. The study is relevant for policymakers and regulators seeking to balance innovation with legitimacy, particularly in the Arab context, where coordinated legal reform and open data standards remain essential.

Keywords: Innovation, Good Governance, Transparency, Sustainability, Accountability, Artificial Intelligence

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1. INTRODUCTION

These days, governments think that giving people things is a good way to help them. It is also in

charge of getting the goods, services, and works needed to make sure that these public services are delivered (Zhang et al., 2024; Adjei-Bamfo et al., 2019). Plans for long-term growth include public

procurement because it helps the government be honest, open, and accountable. When the government does these things, people trust it more. Public procurement accounts for 15% to 25% of gross domestic product (GDP) in numerous countries. This shows how important and central it is to public policy (Mathew & Abdulla, 2022; Walker & Brammer, 2012). Countries that have a lot of money care a lot about public procurement, but new countries don't always understand how important it is. There are a lot of problems and issues in the public sector. These countries have a lot of problems and challenges when it comes to buying things for the government. People don't trust the government anymore because they waste money, is corrupt, doesn't give people good value for their money, isn't open and accountable, and loses people's trust. Governments around the world have had to rethink and change how they buy things from the public to keep up with the digital age and new technologies (Mathew & Abdulla, 2022; Wilkinson et al., 2024).

Artificial intelligence (AI) is now one of the most important tools for running the government in general and for buying things for the government in particular (Choi et al., 2016; Bag et al., 2023). Some people think that AI's growth is one of the biggest problems for human resources, but it can't replace them (Ahmed et al., 2023; Adjei-Bamfo et al., 2019). Even though it might be hard, we need to help people get better at what they do. AI can't take the place of people; it can only help and work with them (Dubey et al., 2021; Kassa et al., 2023).

For AI to be useful in public procurement, leaders of all organizations need to make sure they have enough people who can work with data, understand algorithms and predictive models, and explain what they find in a way that is legal in the country. Recent studies have confirmed that a flexible regulatory framework and a robust technological and digital infrastructure within government agencies can foster innovation, improve collective accountability, and ultimately enable effective governance in the public sector (Sava, 2023; Siciliani et al., 2023).

AI can help people decide what to buy for the government by giving them a lot of information and using special predictive models to make strong algorithms. Making an AI model that uses machine learning (Gupta et al., 2023; Andhov et al., 2025) also makes it easier to find fraud, manipulation, and corruption. But using AI in public procurement would speed up and lower the cost of buying things because it would save time. AI algorithms and analytical and predictive models can make public procurement more fair, open, responsible, and honest, as well as reduce corruption, among other benefits (Haas, 2024; Toktaş-Palut et al., 2014; Samadhiya et al., 2023).

People are worried about how AI systems work (Davila et al., 2003; Burger et al., 2023; Manning et al., 2022), but using AI in public procurement might be a good idea. AI-powered decision-making could lead to "black box" systems, which are hard to see and don't have to answer for their actions (Hickok, 2024; Gupta et al., 2023; Zhong et al., 2024). This leads us to a very important question: How can we be sure that AI-based systems for

public procurement will always be responsible? If something goes wrong, there should be a way to find out who is legally responsible. But how can courts and regulatory bodies look over the choices made by AI algorithms about public procurement? Lastly, how can policymakers use AI without infringing on people's rights to fairness, equality, and equal opportunity?

Governments generally care a lot about sustainable development goals, especially when it comes to making sure that public procurement is sustainable. Numerous nations have enacted policies designed to promote sustainable public procurement. AI can improve these practices by using algorithms and predictive models to look at how public procurement processes affect the economy, society, and the environment. AI can look at the whole life cycle of a product to help make sure you get the best deal. Recent studies show that adding AI to sustainable public procurement can help the government meet specific social goals while also making it easier for them to quickly switch to green procurement (El Bhilat et al., 2024; Silsand et al., 2023; Andhov et al., 2025).

Wherefore, this study will examine the potential advantages of using a procurement AI system for innovation and the value of the Public Procurement Service (PPS). It will also deal with problems of equality, equal opportunities, and legal liability, all of which could make AI procurement processes less reliable (Guida et al., 2023; Tran et al., 2011). The main purpose of this paper is to recommend a framework that standardizes the demands for human rights, liability, and transparency, while balancing the advantages and vitality of technology. It will also look at how the government and its agencies might use algorithmic technologies and AI in a way that is effective and legally liable for any mistakes or troubles that these systems may cause.

Existing literature has extensively documented the efficiency-enhancing potential of AI in public procurement, particularly in areas such as process automation, fraud detection, predictive analytics, cost reduction, and support for sustainable procurement objectives. Prior studies have also highlighted general ethical risks associated with algorithmic decision-making, including bias, opacity, and challenges related to accountability and transparency. However, despite these important contributions, the current literature remains fragmented and largely sector-agnostic, offering limited guidance on how innovation driven by AI can be systematically integrated into public procurement systems while remaining consistent with legal liability regimes, human rights protections, and principles of fairness and equal opportunity. In particular, there is a lack of empirically grounded and conceptually integrated frameworks that explain how AI-enabled procurement can simultaneously deliver innovation, value for money, and sustainability, while ensuring that responsibility for algorithmic decisions remains clearly attributable to public authorities.

This gap is especially pronounced in developing and Arab countries, where institutional capacity, regulatory maturity, and trust in public administration differ significantly from those in advanced economies. Addressing this gap is

significant because public procurement operates at the intersection of technology, law, and public policy: without clear accountability and governance mechanisms, the innovative promise of AI risks undermining public trust rather than enhancing it. This study contributes new insights by reframing AI not merely as a technical optimization tool, but as a governance instrument whose deployment requires a coherent alignment between technological design, legal responsibility, and ethical safeguards in public procurement systems.

The structure of this paper will be presented in the following sections. Section 2 looks at the previous literature. Section 3 explains the methodology. Section 4 presents the results. Section 5 provides a discussion, and, finally, Section 6 summarizes the conclusions and recommendations.

2. LITERATURE REVIEW

2.1. Advantages of artificial intelligence use in public procurement

Artificial intelligence has the power to change public administration; on the other hand, AI is no longer just a way to automate and digitize the work of public administration; it is now about using AI's ability to make predictions and analyze data in government processes like public procurement (Qiu & Zhao, 2024; Naudé & Dimitri, 2021). Many literatures have found that using AI in public procurement could make things more open, effective, efficient, and in line with the policies, acts, and regulations. However, these results bring up a lot of problems and serious risks, such as data privacy, human rights, a lack of accountability, and the difficulty of justifying conclusions made by AI (Zuiderwijk et al., 2021).

The benefits and advantages of AI applications and technologies in public procurement have been the subject of numerous recent studies. Predictive model-based government contract award decisions are highly accurate and save time, effort, and money by transparently automating these procedures (Jiménez et al., 2022; Aboelazm, 2025a). In addition, these studies show that traditional public procurement carries fewer risks than procurement by AI. The good prediction models and algorithms enable people to make decisions based on accurate facts and data. Moreover, recent literature shows that using AI has become more effective and efficient by simplifying bureaucratic public procurement procedures and processes, which will save time and effort. For suppliers and contractors that work with the government to procure goods, services, and construction, AI has also increased market competition (Chang et al., 2023; Dubey et al., 2022).

Data openness and standardization constitute critical enablers. The Open Contracting Data Standard (OCDS) provides a structured framework for publishing procurement data across the contract cycle, enabling both algorithmic analysis and public scrutiny (Bhattacharya et al., 2024). Studies on procurement transparency demonstrate that e-procurement platforms aligned with OCDS significantly improve accountability and facilitate composite indices such as the Public Procurement Transparency Index (Open Contracting Partnership [OCP], 2022; Khorana et al., 2024).

2.2. Artificial intelligence uses and anti-corruption in public procurement

At the same time, AI-based anti-corruption applications are gaining traction. Systematic reviews show that the most common applications include machine-learning models for detecting collusion and statistical analyses for identifying favoritism (Kossow et al., 2021). However, two persistent gaps remain: limited availability of public datasets and scarce real-world deployments for early fraud detection. Case studies of procurement auctions confirm the accuracy of algorithms in detecting collusion patterns, especially when network indicators are combined with market factors (García Rodríguez et al., 2022).

Legal scholarship stresses the accountability risks posed by the "black box" nature of algorithmic procurement systems (Alvarez-Rodríguez et al., 2014; Köbis et al., 2022). Research proposes procurement frameworks tailored to AI systems that explicitly address privacy, bias, and evidentiary challenges, while other contributions advocate "contracting for algorithmic accountability" by embedding obligations such as auditable decision logs, bias testing, and third-party audit rights directly into procurement contracts (Hickok, 2024; Coglianese & Lampmann, 2021).

Transparency and explainability also feature prominently. Research finds that equipping policymakers with explainability tools bridges longstanding gaps between technical experts, regulators, and the public, enhancing the legitimacy of algorithm-assisted decisions. A lot of recent research stresses how important it is to follow the rules of honesty, openness, fairness, equality, and equal opportunity. These studies emphasize that these principles are ineffectual unless incorporated into the contract terms, including stipulations for bias testing before and following the deployment of AI systems in public procurement. Public administrations have the tools and systems they need to hold people accountable without going to court. They can make the necessary regulatory changes to public procurement processes without needing new laws (Köbis et al., 2022; Papadakis et al., 2025).

2.3. Challenges of public procurement systems based on artificial intelligence

Recent research has underscored the significance of openness in decision-making, including AI technology (Tran et al., 2011; Walker & Brammer, 2012). Policymakers and decision-makers need to be given the tools they need to understand how AI systems work so they can explain this to the public in a way that is clear and easy to grasp, without having to rely on technical expertise. This helps people trust and believe in governments, public administrations, and the algorithms themselves (Toktaş-Palut et al., 2014; Choi et al., 2016).

Quantitative research is beginning to estimate causal impacts. Quasi-experimental designs such as difference-in-differences and interrupted time-series models have been employed to evaluate changes in procurement performance indicators before and after AI adoption (Gilli et al., 2020). Initial findings

point to shorter procurement cycles and improved anomaly detection, though sensitivity to data heterogeneity remains a limiting factor (Andersson et al., 2025).

However, ethical and legal reviews in peer-reviewed platforms caution that algorithmic systems — if left without proper governance — may accumulate data biases and undermine the principle of equal opportunity among suppliers (Philbeck & Davis, 2018). This underscores the need for effective grievance mechanisms, the possibility of reviewing algorithmic decisions, and a clear allocation of human responsibility when decision-making is delegated to AI systems. The literature further stresses that building public trust requires baseline transparency, the availability of operational records, and independent review mechanisms (Bag et al., 2023).

Moreover, transparency-measurement evidence has reinforced the adoption of composite indices to track disclosure quality in procurement, showing that countries with more advanced digital systems achieve significant gains in transparency — thereby benefiting both researchers and policymakers in assessing reform impacts (Guida et al., 2023; Cataleta, 2020). The value of such indices lies in linking data-quality improvements to institutionalized social and academic oversight, paving the way for the wider adoption of trustworthy AI applications (Khorana et al., 2024).

Nonetheless, algorithmic anti-corruption tools face constraints due to the scarcity of public datasets and the difficulty of accessing standardized, reusable data, which limits replicability (Alvarez-Rodríguez et al., 2014). The literature therefore recommends strengthening openness through standards such as OCDS, expanding anonymization and data-masking for protection, and promoting data-sharing agreements with oversight institutions. Documenting data provenance and performing systematic quality audits are also deemed integral to ensuring AI compliance with accountability requirements (Nagitta et al., 2022; Schneider dos Santos et al., 2025).

Finally, the discussion in literature on the legal and moral issues in using AI in public procurement (Samadhiya et al., 2023; Aboelazm & Dganni, 2025; Manning et al., 2022). Without control, privacy, equality, equal opportunities, bias, and discrimination are all more likely to happen. Consequently, a powerful administrative and judicial review system is imperative, characterized by transparent procedures and processes, delineated roles and responsibilities, and precise, current records of data and information (Zuiderwijk et al., 2021). Moreover, these systems need to be controlled and observed by people all the time (Schneider dos Santos et al., 2025).

2.4. Comparative perspectives on artificial intelligence and public procurement: Country contexts

2.4.1. The United Arab Emirates

The literature on public procurement in the United Arab Emirates (UAE) highlights strong political commitment to digital transformation and AI as part of broader smart government and innovation strategies (Aboelazm & Dganni, 2025). Studies emphasize the increasing use of digital platforms to enhance efficiency, value for money, and service

delivery in public procurement (Dahiyat et al., 2023). However, scholars also identify gaps in data governance frameworks, particularly regarding the regulation of algorithmic decision-making and the protection of fairness and equal treatment among suppliers (Dahiyat, 2021). While transparency and openness are policy objectives, the accountability of AI-driven procurement decisions — especially in terms of judicial review and legal liability — remains insufficiently addressed (Dahiyat, 2007). Consequently, the UAE serves as a relevant case for examining how emerging digital economies can reconcile rapid AI adoption with legal certainty and human rights safeguards in public procurement.

2.4.2. South Korea

South Korea is widely recognized in the literature as a global leader in digital and electronic public procurement, particularly through the Korea Online E-Procurement System (KONEPS). Research consistently demonstrates that digitalization has significantly improved transparency, reduced corruption, and strengthened competition among suppliers (Haas, 2024). More recent studies explore the incorporation of AI and data analytics to enhance risk management, supplier evaluation, and decision-making accuracy (Organisation for Economic Co-operation and Development [OECD], 2016). Nevertheless, scholars raise concerns regarding accountability and oversight when algorithmic tools influence procurement outcomes, particularly with respect to administrative discretion and the ability of courts and regulatory bodies to scrutinize automated decisions. South Korea, therefore, offers an advanced model for analyzing the legal and institutional limits of AI-driven procurement systems.

2.4.3. Estonia

Estonia is frequently cited as a benchmark for digital governance due to its advanced e-government infrastructure, strong data governance mechanisms, and emphasis on transparency and interoperability (Zuiderwijk et al., 2021). The literature highlights Estonia's robust legal frameworks for data protection, information sharing, and algorithmic transparency, which support trust in automated public sector decision-making (Wilkinson et al., 2024). In the context of public procurement, studies emphasize openness, traceability, and accountability as core principles (Andersson et al., 2025; Khorana et al., 2024). However, even in Estonia's highly digitalized environment, scholars acknowledge ongoing debates about the appropriate balance between automation and human oversight, particularly concerning liability and explainability of AI-assisted decisions (Sava, 2023). Estonia thus provides a critical reference point for understanding how legal clarity and transparency can enable responsible AI use in public procurement.

3. METHODOLOGY

This study employs a variety of methodological approaches grounded in legal analysis. Its primary goal is to examine the laws and regulations governing digital transformation and AI, as well as

those that establish frameworks for public procurement. Additionally, the research investigates how these legal systems align with principles of honesty, accountability, and transparency.

A comparative legal approach will be used to analyze the public procurement laws, regulations, and policies in the UAE, South Korea, and Estonia as a comparative jurisdiction. This analysis will focus on four key dimensions: data governance, mechanisms that promote fairness in procurement, accountability among judicial and regulatory entities, and the level of openness and transparency in decision-making processes.

The study will employ a descriptive-analytical methodology to scrutinize official documents from administrative and financial regulatory bodies, encompassing both international and national/local organizations. This approach will also be used to review academic literature and research published in peer-reviewed, international scientific journals indexed in global databases such as Scopus and Web of Science, as well as journals published by leading international publishers like Emerald, Springer, Elsevier, and Sage. This ensures access to reliable, trustworthy, and diverse data and information, thus balancing insights from international experiences and relevant observations with the necessary theoretical knowledge.

The legal data analyzed in this study are derived from official public procurement laws, regulations, and policy documents issued by competent authorities in each jurisdiction. In the UAE, sources include the Federal Decree-Law No. 11 of 2023 on Public Procurement and related executive regulations issued by the Ministry of Finance. In South Korea, the analysis relies on the Act on Contracts to Which the State is a Party and regulations administered by the PPS. For Estonia, primary sources include the Public Procurement Act (*Rigihangete seadus*) and guidance issued by the Ministry of Finance. These bodies were selected because they hold statutory authority over procurement systems, digital platforms, and accountability mechanisms.

For alternative methodological approaches, several methods could also be suitable for examining AI in public procurement. However, each presents distinct limitations for the objectives of this study. A purely doctrinal legal analysis confined to statutory texts and judicial decisions could clarify legal compliance, but would overlook the institutional and technological dimensions that shape how AI is actually deployed in procurement practice.

4. RESULTS

4.1. Innovation opportunities enabled by artificial intelligence in public procurement

The findings demonstrate that AI is an essential instrument for improving efficiency in public procurement systems (Uzir et al., 2023; Wilkinson et al., 2024). Traditional methods were often slow and heavily reliant on human judgment. AI-driven algorithms, on the other hand, can quickly and

objectively process tenders and evaluation reports. Literatures demonstrate that AI improves assessment precision, minimizes human error, and enables the government to manage substantially with reduced administrative resources (Zuiderwijk et al., 2021; Andersson et al., 2025; Hickok, 2024). The results indicate that AI is a crucial tool for transforming public procurement systems (Uzir et al., 2023; Wilkinson et al., 2024; Aboelazm, 2025b). In the past, processing tenders and evaluation reports took a long time and relied heavily on human judgment. Now, AI-driven algorithms can accomplish this task quickly and objectively. Literature shows that AI makes evaluations more accurate, reduces mistakes made by people, and enables public organizations to handle far larger amounts of procurement with fewer administrative resources (Zuiderwijk et al., 2021; Andersson et al., 2025; Hickok, 2024).

AI can be programmed to publish procurement data in near real time and in open, standardized formats that enable both suppliers and civil society to track the full contract cycle (Siciliani et al., 2023). Comparative evidence shows that jurisdictions adopting open-data standards such as the OCDS achieve higher levels of integrity. Estonia's experience, in particular, demonstrates how real-time disclosure strengthens supplier confidence and reduces favoritism (OCP, 2022; Khorana et al., 2024).

AI also supports the mainstreaming of sustainability in procurement decisions. Algorithms can integrate environmental and social indicators — such as carbon emissions, labor standards, and social impact — into bid evaluation. Empirical work demonstrates that AI-enabled sustainability tools advance the Sustainable Development Goals by aligning contract awards with environmental and social objectives (Zuiderwijk et al., 2021; Andersson et al., 2025).

4.2. Legal, institutional, and ethical challenges

The most immediate challenge concerns legal accountability. When algorithms misclassify or unfairly exclude suppliers, responsibility becomes ambiguous (El Bhillat et al., 2024; Dubey et al., 2021): is it the public officer, the contracting authority, or the technology provider? Scholarship underscores that this legal vacuum undermines due-process guarantees and calls for dedicated legal frameworks for AI-based procurement distinct from conventional software contracts (Zuiderwijk et al., 2021).

Transparency and explainability emerge as further institutional hurdles. Complex models such as deep neural networks often operate as “black boxes” that hinder judicial or administrative review (Gupta et al., 2023; Qiu & Zhao, 2024). Research indicates that inadequate explainability erodes trust and heightens the likelihood of litigation (Schneider dos Santos et al., 2025).

Institutions without a strong technological infrastructure and transparent data are less able to capitalize on AI's potential. Comparative studies and reports demonstrate that institutional maturity differences have a significant impact on outcomes (Khorana et al., 2024; Sava, 2023).

Table 1. Institutional and legal particularities of AI-enabled public procurement

<i>Dimension</i>	<i>UAE</i>	<i>Estonia</i>	<i>South Korea</i>
Central procurement authority	Ministry of Finance (federal)	Ministry of Finance	PPS
Level of centralization	Medium (federal-local hybrid)	Medium (European Union (EU)-aligned national system)	High (fully centralized)
Dedicated AI procurement legislation	No	No (covered by EU and procurement law)	No (regulated through PPS mandates)
Legal emphasis	Innovation and flexibility	Procedural legality and transparency	Efficiency and system integration
Oversight structure	Administrative and contractual	Judicial and regulatory	Administrative and audit-based

Source: Authors' elaboration.

4.3. Building effective accountability frameworks

To enhance transparency and integrity in AI system for public procurement issues, it is good practice to. This essay comes to the conclusion that accountability requires contractual procedures. The government and its organizations have the authority to require that contractors and suppliers maintain auditable decision logs, provide an explanation of evaluation procedures, and submit to bias testing (Silsand et al., 2023; Liu et al., 2022). There is only one method to integrate transparency requirements directly into governmental contracts: the idea of "contracting for algorithmic accountability" (Coglianese & Lampmann, 2021; Hickok, 2024; Zuiderwijk et al., 2021).

External oversight is a supplementary precaution. Independent audit institutions and courts should be able to evaluate automated conclusions. Scholars advocate establishing public algorithmic registries to reveal the systems utilized, thereby increasing public accountability (Papadakis et al., 2025; Schneider dos Santos et al., 2025).

Advance disclosure is another pillar of accountability. Prior to system deployment, publishing evaluation criteria and algorithmic rationale increases legitimacy and offers a foundation for supplier appeals (Sharifmousavi et al., 2024; Kassa et al., 2023). Research shows that increasing transparency leads to fewer disagreements and more acceptance of AI-assisted judgments (Andersson et al., 2025; Khorana et al., 2024; Hickok, 2024).

Table 2. Accountability mechanisms in AI-enabled procurement

<i>Mechanism</i>	<i>UAE</i>	<i>Estonia</i>	<i>South Korea</i>
Algorithmic explainability	Limited	Strong (procedural)	Partial
Auditable decision logs	Emerging	Mandatory	System-based
Right to appeal AI-assisted decisions	General administrative law	Explicit procurement remedies	Available but technically complex
Third-party audits	Contract-based	Regulatory and judicial	Internal and external audits

Source: Authors' elaboration.

4.4. Institutional readiness for digital transformation

Findings highlight that readiness is multidimensional, encompassing infrastructure, governance, and human capacity (Riahi et al., 2021; Chang et al., 2023). Frameworks such as technology-organization-environment (TOE) and unified theory of acceptance and use of technology (UTAUT) offer analytical lenses to assess organizational enablers and user acceptance dynamics (Hržica et al., 2025; Neumann et al., 2024; OECD, 2025).

Data governance emerges as a cornerstone. Open data standards, data provenance, and quality assurance mechanisms ensure that algorithmic systems operate reliably and are subject to verification (Ahmed et al., 2023; Davila et al., 2003).

The OCDS exemplifies how structured data publication enhances both machine readability and auditability (OCP, 2022).

Estonia provides a model of advanced readiness: procurement data is published as open OCDS-compliant datasets, supporting algorithmic monitoring and external audits (Mathew & Abdulla, 2022). This aligns with OECD recommendations on integrating digital procurement with AI-enabled oversight (Estonian Ministry of Finance, 2024; OCP, n.d.; OECD, 2025).

In South Korea, the KONEPS platform demonstrates how integrated e-procurement systems can embed transparency and efficiency at scale (Haas, 2024). OECD reviews and case studies confirm that KONEPS has improved integrity outcomes, though its effectiveness still depends on institutional safeguards and data quality (OECD, 2016).

Table 3. Functional use of AI in public procurement

<i>Function</i>	<i>UAE</i>	<i>Estonia</i>	<i>South Korea</i>
Tender publication and management	High	High	High
Automated bid evaluation	Limited	Limited	Extensive
Risk and fraud detection	Emerging	Moderate	Advanced
Supplier performance analytics	Moderate	Moderate	High
Human override mechanisms	Strong	Strong	Moderate

Source: Authors' elaboration.

4.5. Balancing efficiency and good governance

The findings affirm that efficiency gains alone are insufficient without governance safeguards. Systematic reviews stress that AI's benefits depend on embedding accountability and explainability to maintain legitimacy (Zuiderwijk et al., 2021; Hickok, 2024).

Hybrid governance models are highlighted as optimal (Burger et al., 2023). These combine algorithmic tools with human-in-the-loop oversight, ensuring transparency and responsibility are not sacrificed for speed (Papadakis et al., 2025; Zuiderwijk et al., 2021).

Open data remains a linchpin for reconciling efficiency with accountability. Research demonstrates that procurement systems using OCDS and composite transparency indices improve both performance and trust (OCP, 2022; Duguay et al., 2023; OECD, 2025).

4.6. Institutional design, legal maturity, and accountability mechanisms in public procurement systems in the UAE, Estonia, and South Korea

This section presents the empirical and doctrinal findings of the comparative analysis of AI-enabled public procurement in the UAE, Estonia, and South Korea. The results demonstrate that while all three jurisdictions actively integrate digital technologies into procurement, they diverge significantly in terms of institutional design, legal maturity, and accountability mechanisms. These differences shape how AI is adopted, governed, and legitimized within public procurement systems.

4.6.1. The innovation-driven strategic model in the United Arab Emirates: Limited legal institutionalization of algorithmic accountability

The findings indicate that the UAE's approach to AI in public procurement is strategic and innovation-driven, but still legally under-institutionalized. Procurement digitalization is embedded within broader smart government and AI strategies rather than a dedicated procurement-specific AI framework. Federal procurement is regulated by the Ministry of Finance, while emirate-level authorities retain significant discretion in implementation.

AI-related tools are primarily used for process optimization, such as supplier registration, tender management, and compliance monitoring. However, decision-making authority largely remains with human officials, reflecting a cautious governance approach. The absence of explicit statutory obligations on algorithmic transparency or explainability means that accountability relies mainly on contractual safeguards and internal administrative controls.

4.6.2. Legally structured digital integration in Estonia: Rule-based automation and EU-embedded procedural oversight

Estonia demonstrates a legally structured and system-integrated model of AI-assisted procurement. The Public Procurement Act, aligned with EU law, provides a clear legal basis for digital procurement and embeds transparency, equal

treatment, and reviewability as binding principles. AI use in procurement operates within a highly interoperable digital ecosystem supported by national data infrastructure.

The results show that Estonia emphasizes rule-based automation rather than discretionary algorithmic decision-making. Procurement platforms prioritize traceability and auditability, facilitating *ex post* review by oversight bodies and courts. Strong data protection supervision further constrains algorithmic use, reinforcing procedural legitimacy.

4.6.3. Advanced technological centralization in South Korea: Operational efficiency versus challenges of algorithmic transparency and oversight

South Korea exhibits the most technologically advanced and centralized model among the three cases. The PPS exercises exclusive authority over national procurement through KONEPS, an integrated e-procurement platform incorporating AI-driven evaluation, risk detection, and supplier analytics.

The findings indicate that AI tools in South Korea play a substantive role in decision-support and operational control, significantly reducing procurement cycle times and transaction costs. However, this efficiency-oriented model raises concerns about institutional concentration and the opacity of algorithmic processes, particularly for suppliers seeking to challenge automated outcomes.

5. DISCUSSION

The findings of this study confirm much of the emerging literature: AI offers significant potential to enhance efficiency, transparency, and sustainability in public procurement. These results are consistent with systematic reviews highlighting that AI can strengthen predictive capabilities and enable data-driven oversight when embedded within appropriate governance structures (Zuiderwijk et al., 2021). At the same time, the study underscores that efficiency gains do not automatically translate into legitimacy or public trust without accountability. This aligns with scholarly warnings about the risks of algorithmic "black boxes" in procurement (Hickok, 2024).

The research also demonstrates that accountability gaps are not hypothetical but immediate and pressing. The ambiguity regarding liability for algorithmic decisions exposes governments to legal risks and undermines due process. This resonates with AI and society analyses stressing the need for AI-specific procurement frameworks (Hickok, 2024) and empirical studies showing how biased data reproduces inequities (Schneider dos Santos et al., 2025). The comparative perspective in this study adds value by illustrating how institutional maturity differs: while Estonia has advanced open-data frameworks, Korea's hybrid oversight model demonstrates a different pathway to reconciling AI with accountability.

The study further finds that institutional readiness remains a decisive factor. Frameworks such as TOE and UTAUT are supported by the evidence: AI adoption is effective only when infrastructure, leadership, skills, and regulatory culture are aligned (Hrčica et al., 2025). In the UAE, readiness is manifest in the development of

e-procurement portals, while Korea's KONEPS shows how integration can produce large-scale efficiency gains. These insights reinforce the notion that governance outcomes are mediated by institutional context.

6. CONCLUSION

This study suggests that the integration of AI technologies into public procurement systems has evolved beyond being merely a technological advancement; it has become a complex management challenge that requires comprehensive solutions at the legal, regulatory, and ethical levels. The study focused primarily on the innovative potential of AI, the challenges of accountability and transparency, the ability of institutions to adapt to the digital transformation, and the difficulty of balancing procedural efficiency with the requirements of integrity and transparency in public administration. The study employed a comparative methodology to examine the similarities and differences in the responses of South Korea, Estonia, and the UAE to these issues.

According to the findings, AI presents several opportunities to enhance the efficiency, accountability, liability, transparency, and sustainability of public procurement procedures and processes. The opportunities can be realized through the simplification of contracting procedures, cost reduction, real-time data access, or the incorporation of social and environmental factors into review and evaluation procedures.

However, these benefits are outweighed by the absence of a clear legal framework regulating AI-based procurement, the challenge of interpreting algorithm outputs, and the risks of bias and exclusion posed by historically unbalanced data. The results of this study indicate that to achieve a balance between efficiency and transparency, effective accountability frameworks must be established that combine contractual measures, such as requiring system providers to commit to transparency, with regulatory protections, including external audit mechanisms and mandatory disclosure requirements. The findings also highlight the significance of institutional readiness, which includes technical capabilities, institutional culture, political will, and human resource development.

The contribution of this study lies in linking theoretical scholarship with a comparative analysis of international and Arab experiences, thereby offering a more holistic understanding of how AI can be integrated into such a sensitive domain as public procurement. At the practical level, the study provides clear recommendations for policymakers, including the enactment of specialized legislation, adoption of open data standards, development of multi-layered accountability mechanisms, and pursuit of regional strategies in the Arab context.

In light of the foregoing, the study affirms that the future of public procurement will not be measured solely by its ability to generate cost savings or accelerate contracting cycles, but rather by its capacity to embed technological innovation within a legal and ethical framework that consolidates good governance and strengthens public trust. AI, therefore, does not represent an endpoint but the beginning of a new phase in

the interaction between technology and governance — one that requires sustained and in-depth research into the social and constitutional dimensions of this transformation.

The paper concluded with some recommendations; first, specialized legislation is required to regulate AI-enabled procurement. Such legislation should go beyond traditional information technology contracts, establishing clear lines of duty among public officials, contracting bodies, and technology providers. They should require auditable decision records and explainability systems to facilitate judicial and administrative scrutiny. This would make national practice consistent with international accountability requirements.

Second, institutional measures are necessary. To improve procurement, governments should create digital governance units, use hybrid supervision models that combine algorithms and human committees, and boost supplier appeal channels. Investing in human capacity development, especially in data governance and algorithmic literacy, is crucial for properly interpreting and managing AI systems.

Thirdly, technical precautions must be implemented. Governments should enforce the use of open-data standards, such as OCDS, throughout all stages of procurement to ensure machine-readable disclosure and independent monitoring. To increase trust in the system, bias testing should be required on a regular basis, with the results made public.

Fourth, research and academic collaboration should be promoted to close evidence gaps. Prioritize comparative, quasi-experimental studies on the influence of AI on procurement outcomes. Support interdisciplinary research in law, public administration, and computer science to build complete governance frameworks.

Finally, in the Arab environment, regional collaboration is encouraged. A digital procurement strategy based on EU expertise can accelerate progress and ensure interoperability with national systems. Sharing best practices and lessons learned would contribute to a larger collective knowledge base and more resilient regional governing institutions.

Regarding future research and limitations, this study contributes to future research by providing a structured comparative legal framework for analyzing the use of AI in public procurement across jurisdictions with differing levels of digital maturity. By integrating legal accountability, human rights protection, and innovation into a single analytical model, the paper offers a foundation for subsequent empirical, doctrinal, and interdisciplinary studies. Future research may build on this framework by examining additional jurisdictions, incorporating quantitative procurement data, or assessing the real-world performance of AI systems through case studies and judicial decisions. The findings also open avenues for exploring the interaction between procurement law, administrative law, and emerging AI governance regimes at regional and international levels.

Despite its contributions, this study has several limitations. First, it relies primarily on legal texts, policy documents, and secondary literature, rather than empirical data on the operational use of AI in procurement systems. Second, the comparative

analysis is limited to three jurisdictions, which constrains the generalizability of the findings. Finally, given the rapid evolution of AI technologies and regulatory responses, some legal frameworks analyzed may require ongoing reassessment. These limitations, however, highlight opportunities for future research rather than undermining the study's relevance.

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