PUBLIC PROCUREMENT IN AGE OF AI: CHALLENGES AND OPPORTUNITIES

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Abstract. This study explores the transformative potential of artificial intelligence (AI) in public sector procurement, emphasizing efficiency, transparency, and regulatory compliance. By examining AI-driven innovations, the research highlights their ability to automate market analysis, optimize the preparation of technical specifications, and improve procurement process management while addressing legal and ethical considerations. A mixed-methods research approach was employed, incorporating quantitative and qualitative surveys, a detailed comparative analysis of international best practices, and an experimental "Centralized Procurement Support and Review Model". Data collection included expert interviews, legal framework analysis, and practical tests comparing AI-supported and traditional procurement methods. The experimental findings indicate that AI integration in procurement reduces execution time by up to 50%, improves supplier selection accuracy by 25%, and strengthens compliance with procurement regulations and policies. Additionally, results from a targeted survey among procurement officers indicate a high level of readiness to adopt AI solutions, with 92% expressing interest in AI-assisted decision-making. The pilot project demonstrated a 20% reduction in administrative burden and significantly enhanced process transparency. Furthermore, practical tests revealed that AI-driven specification drafting could reduce preparation time from two hours to 30 minutes, significantly streamlining procurement operations. A comparative study of AI-based procurement solutions in the United Kingdom and Estonia suggests that the proposed model is tailored to Latvia's regulatory environment, ensuring alignment with the European Union's digital transformation objectives. Successful implementation of AI solutions in public procurement requires a practical deployment strategy, which includes enhancing employee qualifications, developing advanced data management systems, and effectively integrating regulatory requirements into procurement processes. Furthermore, this study emphasizes the importance of continuous monitoring and improvement of AI systems to ensure that procurement processes remain efficient, fair, and adaptable to evolving market dynamics and legal frameworks.

Keywords: artificial intelligence, public procurement, efficiency, regulatory compliance, automation, risk assessment, AI governance, green procurement, fairness in AI.

Introduction

Public procurement is critical for allocating public resources and enabling government operations. However, traditional procurement systems often suffer from inefficiencies, including excessive bureaucracy, delays in supplier selection, and challenges in ensuring regulatory compliance. These inefficiencies not only raise administrative costs but also hinder supplier engagement and increase regulatory burdens, necessitating the adoption of technological solutions that enhance procurement efficiency and compliance. Among these, artificial intelligence (AI) enables automation, data-driven decisions, and real-time risk assessment to solve persistent procurement inefficiencies. Additionally, the growing complexity of procurement regulations and the increasing demand for transparency have further accelerated the need for AI-driven procurement optimization. AI plays a pivotal role in modernizing procurement by automating key functions such as market research, supplier evaluation, contract management, and compliance monitoring.

Despite its fundamental role in the public sector, procurement faces significant structural inefficiencies caused by excessive bureaucracy, limited digitalization, and complex regulatory requirements [1]. Manual procurement processes contribute to delays, cost overruns, and a lack of transparency, making the need for AI-driven optimization increasingly urgent. Additionally, fraud and corruption risks persist due to limited oversight in large-scale public tenders [2]. Traditional procurement processes are often labour-intensive and require significant human intervention, leading to delays and inconsistencies in decision-making.

AI-driven procurement systems offer advanced automation capabilities, allowing for predictive analytics, anomaly detection, and improved supplier evaluation [3]. AI enhances key procurement functions, including contract lifecycle automation, supplier risk profiling, and anomaly detection in tendering processes [4]. This transformation reduces administrative burdens, minimizes human bias, and accelerates procurement decision-making, enabling data-driven contracting and improved regulatory

compliance. Moreover, recommender systems powered by AI can match procurement needs with the most suitable suppliers, optimizing competition and reducing costs [5].

Recent studies have also emphasized AI's role in green public procurement (GPP), highlighting its ability to promote sustainable purchasing practices through data-driven decision-making [6]. AI can analyze procurement patterns and environmental impact, helping governments prioritize eco-friendly suppliers and reduce carbon footprints in procurement contracts.

Research Problem and Objectives.

Although AI technologies offer a promising solution to inefficiencies in public procurement, their adoption remains limited due to legal uncertainties, integration challenges, and concerns about fairness in automated decision-making [7]. This study seeks to address these issues by systematically assessing the benefits and risks of AI-driven procurement models, examining their impact on efficiency, supplier selection, and regulatory compliance. The research places particular emphasis on Latvia's regulatory framework, evaluating its alignment with AI-driven procurement solutions and identifying key barriers to large-scale adoption.

The aim of this study is to evaluate the impact and practical applicability of AI-driven procurement models in the context of Latvia's public sector. The focus lies on assessing how such systems improve efficiency, accuracy in supplier selection, and regulatory compliance, while identifying legal and ethical challenges to implementation. Special emphasis is placed on alignment with EU-level digital policy frameworks and Latvia's national legislation.

The integration of AI in public procurement has been extensively studied, revealing its capacity to enhance efficiency, automate processes, and ensure compliance with regulatory frameworks [1]. However, its successful adoption requires overcoming legal, technical, and organizational challenges. This section explores key findings from recent research on AI applications in public procurement, focusing on efficiency improvements, risk management, and regulatory considerations, directly linking them to the research objectives of this study.

AI's Role in Public Procurement. AI has demonstrated significant potential in transforming public procurement by streamlining procurement workflows, enabling real-time risk analysis, and improving contract execution efficiency. By integrating machine learning, predictive analytics, and process automation, AI can enhance supplier selection accuracy, optimize resource allocation, and minimize administrative burdens. Machine learning models can analyze procurement data to detect anomalies, predict contract performance, and optimize bidding strategies [3]. Moreover, AI-supported recommender systems facilitate supplier matching, ensuring that procurement officers have access to the most suitable vendors [5]. These findings support this study's objective of evaluating how AI can improve procurement efficiency and transparency in Latvia's public sector.

A growing body of research highlights AI's impact on green public procurement (GPP). AI decision models enhance environmental sustainability in public procurement, allowing procurement teams to assess supplier sustainability credentials, predict environmental impact, and enforce eco-friendly standards in contract evaluations [6]. These models facilitate automated supplier scoring based on carbon footprint analysis, ESG (Environmental, Social, and Governance) compliance, and circular economy principles, ensuring that procurement practices align with both sustainability goals and regulatory frameworks. However, further research is required to determine whether AI-driven GPP can be effectively integrated into procurement policies at the national level.

Regulatory Compliance and Risk Management. Ensuring compliance with regulatory frameworks is a critical concern in AI-driven procurement. AI can assist in automating contract compliance checks, reducing the likelihood of human errors and fraud [4]. However, regulatory challenges persist, particularly regarding bias and fairness in AI decision-making. AI models must be designed to mitigate discrimination and ensure equitable treatment of suppliers [7].

The integration of fairness metrics in AI-driven procurement, such as Predictive Parity Rate, Equalized Odds, and Demographic Parity, has been proposed as a means of mitigating bias in algorithmic decision-making [8]. While these methodologies improve fairness, their implementation requires robust auditing frameworks, human oversight, and standardized regulatory enforcement to ensure compliance with procurement ethics and anti-discrimination laws. This links directly to this

study's objective of assessing how AI-driven procurement systems can comply with legal and ethical standards in Latvia.

Another concern is the ethical implications of AI-based procurement, particularly regarding data privacy and security. The European AI Act and GDPR establish strict requirements for data handling in AI applications, necessitating that public procurement systems integrate privacy-preserving AI methods [9]. Future research should focus on developing standardized protocols to integrate data protection measures in AI-driven procurement.

Significance of the Study. This study provides an evidence-based evaluation of AI's role in modernizing public procurement, offering practical recommendations for policymakers and procurement professionals. By analyzing empirical data from Latvia's State Fire and Rescue Service (SFRS), this study highlights real-world applications of AI-driven procurement models. Additionally, a comparative analysis of AI adoption in the United Kingdom and Estonia provides valuable insights into successful AI-driven procurement models, regulatory compliance strategies, and digital transformation frameworks. This comparison will highlight key lessons for Latvia, such as the efficiency gains of centralized AI-supported procurement platforms, as demonstrated in Estonia, and the necessity of robust regulatory frameworks for AI governance, as observed in the UK. The findings will inform policy recommendations for AI integration in Latvia's public procurement, ensuring legal compliance, ethical AI use, and digital transformation alignment with EU objectives. Furthermore, this study contributes to the growing body of research on AI governance in public procurement and provides a foundation for future policy decisions supporting fair, transparent, and sustainable AI deployment in procurement frameworks [8-10]. The novelty of this study lies in the empirical evaluation of AI-supported procurement processes conducted within a real-life institutional setting in Latvia. While previous research has largely focused on theoretical models or secondary data, this study contributes original, primary evidence derived from structured pilot implementation. Furthermore, the comparative analysis with Estonia and the United Kingdom extends the existing body of literature by contextualizing AI deployment within Latvia's unique regulatory environment, highlighting both opportunities and structural constraints.

Comparative Analysis: United Kingdom and Estonia. International case studies provide valuable insights into AI implementation in public procurement. Estonia has developed a centralized e-procurement platform, which incorporates AI to automate supplier evaluation and ensure greater transparency [3]. This approach has significantly reduced procurement processing times and increased efficiency. However, challenges remain regarding the scalability of AI-based procurement systems in smaller economies with distinct regulatory requirements.

In the United Kingdom, AI adoption in procurement is closely regulated, emphasizing risk mitigation and fairness [8]. The UK's regulatory framework promotes responsible AI integration, focusing on explainability and accountability. Lessons from the UK suggest that Latvia could benefit from a hybrid AI procurement model, integrating automated supplier evaluation with strict regulatory compliance mechanisms. Estonia's success with centralized AI-powered procurement systems demonstrates efficiency benefits, while the UK's risk mitigation approach highlights the importance of AI ethics, model explainability, and bias prevention. Applying these insights to Latvia could support the development of an AI procurement strategy that aligns with EU digital transformation objectives and national regulatory frameworks. The UK's approach to AI procurement governance can provide insights into how Latvia can address potential bias risks and regulatory compliance concerns.

Gaps in Existing Research and Future Directions. Despite notable advancements in AI-driven public procurement, several critical research gaps remain. Future studies should address the following areas:

- Scaling AI adoption across diverse procurement sectors and jurisdictions, ensuring that solutions are adaptable to various regulatory environments and identifying context-specific implementation barriers.
- Enhancing the explainability and accountability of AI models to address transparency concerns, especially regarding biases in algorithmic decision-making.

- Investigating the impact of AI on the procurement workforce, with a focus on optimizing human-AI collaboration and identifying training needs related to AI governance and digital competencies.
- Developing procurement models tailored to small economies, ensuring alignment with national legal frameworks, economic constraints, and market realities.
- Identifying best practices for integrating AI into procurement policy while maintaining a sustainable balance between automation, transparency, and human oversight.

By addressing these gaps, future research can support the responsible and effective implementation of AI in public procurement, ensuring legal compliance, ethical robustness, and operational efficiency.

Materials and methods

The data presented in this study were collected during a structured pilot project conducted at the State Fire and Rescue Service (SFRS) in Latvia. The experimental setup included five procurement cycles performed under both traditional and AI-assisted conditions. Each procurement stage (prequalification, evaluation, contract drafting, compliance check) was time-tracked using standardized digital logs. The execution time reduction metrics reflect the average performance difference between these two approaches. Supplier selection accuracy was assessed through comparative analysis of contract award results, evaluating the match rate between recommended and awarded suppliers, as well as compliance with technical and legal requirements. Accuracy rates were calculated as the proportion of successful matches over total evaluated cases. Descriptive statistics (means, medians, ranges) were used to summarize performance metrics. No inferential statistical tests were applied in the current phase, as the sample size remains limited. However, future phases of the project will incorporate hypothesis testing (e.g. paired t-tests or Wilcoxon signed-rank tests) and confidence interval estimation to verify the statistical significance of observed differences. The comparative evaluation with international cases (Estonia, United Kingdom) was based on qualitative content analysis of public policy documentation, performance benchmarks reported in official sources, and interviews with procurement experts. Due to methodological differences across cases, only descriptive alignment (rather than statistical comparison) was pursued.

Results and discussion

The following section presents the results of the empirical pilot study conducted by the authors at the State Fire and Rescue Service (SFRS) of Latvia. The findings are based on primary data collected through five structured procurement cycles and are complemented with a comparative policy analysis. Tables and performance indicators reflect original evaluations performed by the research team and are not derived from secondary literature sources. The findings of this study demonstrate the significant impact of AI integration in public procurement, particularly in terms of efficiency, supplier selection accuracy, regulatory compliance, and transparency. This section explores how AI-driven procurement models influence key aspects of procurement management, compares these findings with previous research, and highlights challenges that need to be addressed for effective AI adoption.

Efficiency Gains and Administrative Burden Reduction

The implementation of AI-driven procurement models has led to a significant transformation in efficiency, reducing execution time by 50% compared to traditional procurement methods. AI-powered automation enables real-time data processing, predictive contract analysis, and workflow optimization, thereby accelerating supplier evaluation and minimizing manual intervention in contract processing [3]. Furthermore, AI-assisted specification drafting was tested in SFRS procurement operations, showing a notable efficiency improvement by reducing document preparation time from two hours to 30 minutes.

As shown in Table 1, AI-driven procurement significantly decreases the time required for each stage of the procurement cycle, demonstrating efficiency improvements across supplier prequalification, tender evaluation, contract drafting, and compliance checks.

These findings align with previous research emphasizing AI's role in eliminating repetitive manual tasks, allowing procurement professionals to focus on strategic decision-making [5]. However, adapting AI systems to complex procurement scenarios that involve multiple regulatory layers remains a challenge [8].

Table 1

Comparison of Traditional vs AI-Driven Procurement Efficiency

Procurement Stage	Traditional process (manual)	AI-driven process	Percentage time savings
Supplier Prequalification	5-7 days	1-2 days	60-80%
Tender Evaluation	10-15 days	5-7 days	50-66%
Contract Drafting	3-5 days	1 day	66-80%
Compliance Checks	7-10 days	3-5 days	50-57%
Total Procurement Cycle Time	~30-37 days	~10-15 days	60-67%

The integration of AI-driven analytics has enhanced procurement decision-making by improving supplier selection accuracy by 25%, utilizing historical procurement trends, risk profiling, and real-time market assessments to optimize supplier evaluation. By automating bidder evaluation processes, AI systems reduced human biases, ensuring more objective and data-driven supplier assessments [4]. Additionally, AI-enhanced procurement tools increased supplier participation, giving small and medium enterprises (SMEs) better access to public tenders [7].

As shown in Table 2, AI-driven procurement systems not only improved selection accuracy but also increased SME participation rates and sped up supplier risk assessment processes.

Table 2

AI-Driven Supplier Selection: Accuracy and Competition Impact

Metric	Traditional procurement	AI-driven procurement	Percentage improvement
Supplier Selection Accuracy	75%	94%	25%
SME Participation Rate	40%	60%	50%
Supplier Risk Assessment Speed	10-15 days	5 days	50-66%

While AI improved supplier selection fairness and efficiency, concerns were raised regarding the transparency of AI-driven decision-making. In some instances, algorithms appeared to favour vendors with extensive historical data, potentially creating barriers for new market entrants. This raises ethical considerations regarding fair competition and bias mitigation strategies, which require additional regulatory oversight [9].

AI-driven compliance monitoring significantly strengthened adherence to procurement regulations, reducing compliance-related administrative tasks by 20%. Automated alerts provided procurement officers with early warnings on potential legal risks, ensuring that all procurement decisions aligned with GDPR and AI Act guidelines [6]. Additionally, AI-assisted market analysis identified emerging risks, such as geopolitical supply chain disruptions, allowing procurement teams to proactively adjust sourcing strategies [11].

However, the opacity of black-box AI models poses significant accountability risks, as procurement officers may find it difficult to trace the reasoning behind automated supplier recommendations. Research has emphasized the need for explainable AI (XAI) frameworks that enable human oversight and provide interpretable decision-making pathways, ensuring that procurement remains transparent, auditable, and aligned with regulatory expectations [8]. Future implementations should focus on explainable AI (XAI) frameworks, enabling procurement professionals to interpret AI-driven suggestions effectively and ensuring compliance with legal and ethical standards.

One of the fundamental benefits of AI-driven procurement is its ability to enhance transparency. AI-generated audit trails allowed real-time tracking of procurement decisions, reducing corruption risks and improving stakeholder trust [3]. In the experimental setup, AI-enhanced transparency mechanisms led to increased public confidence in procurement processes.

However, achieving full transparency requires a well-defined regulatory framework for AI-driven decision-making in procurement [7]. While AI can improve accountability, improper implementation may exacerbate existing biases and introduce new risks related to unfair supplier treatment [9].

The comparative analysis of AI procurement solutions in the United Kingdom and Estonia provides key insights into successful AI adoption strategies. Estonia's centralized e-procurement platform has demonstrated AI's potential in reducing administrative costs and improving efficiency, while the UK's regulatory framework prioritizes responsible AI deployment and bias mitigation [3].

Findings suggest that Latvia could benefit from a strategic hybrid AI procurement framework, combining AI-driven automation with robust legal oversight mechanisms to ensure transparent, explainable, and ethically aligned procurement decisions. Estonia's experience emphasizes the importance of interoperable AI systems, while the UK approach highlights the necessity of continuous AI ethics assessments in procurement processes.

Despite the demonstrated benefits of AI, several challenges remain.

- Adapting AI models to diverse procurement environments – AI-driven procurement tools must be localized to align with jurisdiction-specific regulatory frameworks, economic constraints, and sector-specific procurement requirements.
- Ensuring AI transparency and explainability – Procurement professionals must undergo specialized training to effectively interpret AI-driven insights, minimizing reliance on black-box decision-making and ensuring procurement accountability.
- Developing AI-driven risk management frameworks – future research should explore AI's role in mitigating procurement fraud and enhancing cybersecurity measures.
- By addressing these challenges, AI can be further refined to meet public procurement requirements, ensuring long-term sustainability, compliance, and effectiveness.

Conclusions

This study demonstrates that the integration of AI-based systems in public procurement can lead to measurable efficiency gains, improved supplier evaluation, and enhanced regulatory compliance. Based on the empirical pilot conducted at the State Fire and Rescue Service (SFRS) in Latvia, the following conclusions can be drawn:

1. AI-supported procurement reduced total cycle time from approximately 30-37 days to 10-15 days, representing an average time saving of 60-67% across all stages of the procurement process.
2. The use of AI in supplier selection increased selection accuracy from 75% to 94% and improved SME participation rates by 50%.
3. AI-assisted compliance checks reduced the time needed for legal review by up to 57%, while also enabling earlier identification of potential regulatory violations.
4. The results support the adoption of Explainable AI (XAI) models as essential for increasing transparency and accountability, particularly when applied to supplier scoring and bid evaluation.
5. The findings indicate that AI tools are not only technically effective, but also acceptable to procurement officers, as 92% of surveyed participants expressed readiness to adopt AI-assisted decision support systems.
6. The comparative analysis with Estonia and the UK confirms that AI implementation strategies must be adapted to national regulatory environments and supported by clear legal frameworks.

These conclusions are based on original data gathered through structured testing and analysis, and they provide evidence for the practical viability of AI in public sector procurement in Latvia.

To maximize the benefits of AI in public procurement while mitigating risks, the following recommendations should be considered.

- Developing clear AI regulatory guidelines – Policymakers must define AI governance frameworks that align with public procurement objectives, ensuring AI-driven decision-making adheres to the AI Act, GDPR, and ethical AI principles. This requires continuous assessment and adaptation of legal mechanisms to address emerging AI challenges in procurement governance.

- Enhancing procurement workforce training – Government officials and procurement officers must be trained in AI ethics, transparency, and risk assessment to effectively interpret AI-driven decisions.
- Implementing Explainable AI (XAI) models – Public procurement should integrate AI models that provide clear justifications for decision-making, improving stakeholder trust and accountability.
- Adopting a hybrid approach for AI deployment – Lessons from Estonia and the UK suggest that Latvia should balance AI automation with legal oversight, ensuring ethical procurement while benefiting from efficiency gains.
- Scaling AI adoption across various procurement sectors – AI should be adapted to different procurement categories, including green public procurement (GPP), ensuring that sustainability goals align with AI-driven automation.

While this study provides practical evidence of AI's benefits in procurement, it is limited in scope to a single institutional case in Latvia. The findings are based on a limited number of procurement cycles and should be validated across different public sector domains and larger sample sizes.

Future research should focus on:

- Testing AI tools across multiple institutions and procurement categories to verify generalizability of efficiency and compliance improvements.
- Incorporating formal statistical validation, including significance testing and confidence intervals for performance indicators such as execution time and selection accuracy.
- Exploring the long-term sustainability of AI-driven procurement tools, including system adaptability to regulatory changes and market dynamics.
- Studying the human-AI interaction aspect, especially how procurement professionals adjust to AI-assisted decision-making in daily practice.

These directions will help deepen understanding of the conditions under which AI provides tangible value in public procurement and support informed policy design.

Author contributions

Conceptualization, M.I.; methodology, V.P. and M.J.; software, M.I.; validation, V.P. and J.P; formal analysis, V.P.,M.J. and J.P..; investigation, M.I.,V.P., M.J., J.P. and M.Z.; data curation, M.I., V.P. an J.P.; writing – original draft preparation, M.I.,V.P.; writing – review and editing, V.P. and M.I.; project administration, J.P.; funding acquisition, M.Z. All authors have read and agreed to the published version of the manuscript.

References

[1] Aboelazm K. S., Dganni K. M. Public procurement contracts futurity: Using of artificial intelligence in a tender process. Corporate Law & Governance Review, 7(1), 2025, pp. 60-72. DOI: 10.22495/clgrv7i1p6

[2] Nai R., Meo R., Morina G., Pasteris P. Public tenders, complaints, machine learning and recommender systems: A case study in public administration. Computer Law & Security Review, 51, 2023, 105887. DOI: 10.1016/j.clsr.2023.105887

[3] Salazar A., Pérez J.F., Gallego J. VigIA: prioritizing public procurement oversight with machine learning models and risk indices. Data & Policy. 2024;6:e75. DOI: 10.1017/dap.2024.83

[4] Nogueira L. A., Moltubakk S. T., Fagervik A., Langfeldt I. B. Cutting through the noise: Assessing tools that employ artificial intelligence. IFLA Journal, 0(0). 2025. DOI: 10.1177/03400352241304121

[5] Siciliani L., Taccardi V., Basile P., Di Ciano M., Lops P. AI-based decision support system for public procurement. Information Systems, 119, 2023, 102284. DOI: 10.1016/j.is.2023.102284

[6] Tan W., Teng M., Teng R. The impact of green public procurement on corporate green innovation: evidence from machine learning and text analysis. Journal of Environmental Planning and Management, 2024, pp. 1-24. DOI: 10.1080/09640568.2024.2407938

[7] Teixeira S., Nogueira A.R., Gama J. Fairness Analysis in Causal Models: An Application to Public Procurement. In: Meo, R., Silvestri, F. (eds) Machine Learning and Principles and Practice of

Knowledge Discovery in Databases. ECML PKDD 2023. Communications in Computer and Information Science, vol 2134. Springer, Cham, 2025. DOI: 10.1007/978-3-031-74627-7_14

[8] Gallego Córcoles I. Trustworthy Artificial Intelligence and Public Procurement. In: Gill-Pedro, E., Moberg, A. (eds) YSEC Yearbook of Socio-Economic Constitutions 2023. YSEC Yearbook of Socio-Economic Constitutions, vol 2023. Springer, Cham, 2024. DOI: 10.1007/16495_2023_67

[9] Coglianese C. "Chapter 18: Procurement and artificial intelligence". In Handbook on Public Policy and Artificial Intelligence. Cheltenham, UK: Edward Elgar Publishing, 2024. DOI: 10.4337/9781803922171.00026

[10] Andersson P.E., Arbin K., Rosenqvist C. Assessing the value of artificial intelligence (AI) in governmental public procurement Journal of Public Procurement, 25(1), 2025, pp. 120-139. DOI: 10.1108/JOPP-05-2024-0057

[11] Hickok M. Public procurement of artificial intelligence systems: new risks and future proofing. AI & Soc 39, 2024, pp. 1213-1227. DOI: 10.1007/s00146-022-01572-2