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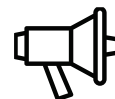


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CONTACTS

Phone: **+998 50 737 87 88**

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ECONOMIC EFFICIENCY OF PUBLIC PROCUREMENT EVALUATION BASED ON TOTAL COST OF OWNERSHIP (TCO)

Turabov Sarvar Abdumalikovich

Doctor of Science (DSc) in Economics, Associate Professor

Tashkent State University of Economics

ORCID: 0009-0005-6133-0008

Email: sarvarbobur0210@mail.ru

Abstract: This article analyzes the economic efficiency of the Total Cost of Ownership (TCO) evaluation methodology in public procurement. The study aims to highlight the theoretical foundations of the TCO methodology, examine international best practices, and assess the prospects for its integration into the public procurement system of Uzbekistan, specifically within the framework of reforms initiated by Presidential Decree No. DP-259. The research employs normative-legal, comparative institutional, and academic literature analysis approaches. The results demonstrate that the TCO methodology allows public procurement to be evaluated based not merely on the initial purchase price, but on the total expenditures incurred throughout the entire lifecycle of a product or service. Furthermore, the article substantiates the future possibilities of integrating AI-driven price monitoring and electronic control mechanisms, as stipulated in Decree No. DP-259, into an advanced AI-TCO model. In conclusion, it is emphasized that the phased implementation of the TCO methodology will serve to enhance economic efficiency in public procurement, reduce hidden costs, and optimize the quality of public fund utilization.

Keywords: public procurement, total cost of ownership, life-cycle costs, economic efficiency, public administration, artificial intelligence, electronic procurement, digital monitoring, procurement evaluation system, most economically advantageous tender.

INTRODUCTION

Public procurement is an important component of the national economy, accounting for 10–15% of GDP in developed countries and 20–30% in developing countries. According to OECD data, In 2022, OECD member countries carried out a total of \$13 trillion in public procurement.¹ While the “lowest price” criterion in traditional public procurement may seem to provide short-term savings, in the long term it can lead to additional costs such as maintenance, operation, energy consumption and repairs. Therefore, in modern public procurement practice, there is increasing attention to evaluation based on life cycle costs and total cost of ownership (TCO).² Public procurement reforms in the Republic of Uzbekistan have entered a new stage. Presidential Decree No. DP-259 of December 26, 2025 “On further measures to ensure a competitive environment and transparency in the public procurement system” introduced relevant mechanisms and set target indicators, such as increasing the level of use of competitive methods in public procurement to 80% by 2030 and achieving savings of 25 trillion soums.³

This article examines the theoretical foundations of the TCO methodology, analyzes international experience, and studies a conceptual model for its integration into the public procurement system of Uzbekistan, in particular, into the reforms under Decree No. PF-259. The research analyzes the advantages of the TCO methodology over the traditional “lowest price” criterion, the mechanisms of its application in international practice, and the possibilities of its gradual implementation in the conditions of Uzbekistan.

1 OECD. (2023). Government at a glance 2023. Paris, France: OECD Publishing. <https://doi.org/10.1787/3d5f5f58-en>

2 Ellram, LM (1993). Total cost of ownership: Elements and implementation. *International Journal of Purchasing and Materials Management*, 29(4), 3–11. <https://doi.org/10.1111/j.1745-493X.1993.tb00015.x>

3 President of the Republic of Uzbekistan. (2025). On further measures to ensure a competitive environment and transparency in the public procurement system (Decree No. PF-259, December 26, 2025). Tashkent, Uzbekistan: Lex.uz.

REVIEW OF RELATED LITERATURE

The concept of Total Cost of Ownership (TCO) is based on assessing the subject of purchase not only on the basis of the initial price, but also as a set of costs incurred throughout its entire life cycle. In academic literature, TCO is interpreted as an approach that covers the direct and indirect costs of the purchased product or service at the stages of purchase, delivery, installation, operation, maintenance, repair and disposal.⁴ Ellram and Siferd consider TCO as an important tool for strategic cost management, dividing costs into pre-purchase, during-purchase, and post-purchase stages.⁵

The TCO methodology is closely related to the Life-Cycle Costing (LCC) approach. The ISO 15686-5:2017 standard defines the principles for assessing the life-cycle costs of buildings and infrastructure (ISO, 2017). The European Union Directive 2014/24/EU, on the other hand, stipulates that, in addition to price, quality, operating costs, environmental and social factors should be taken into account in public procurement by applying the most economically advantageous tender (MEAT) criterion.⁶

From the perspective of institutional economics, the TCO approach serves to reduce the risk of information asymmetry and poor product selection. According to Akerlof's "market for lemons" theory, when information about quality is not equally distributed between buyers and sellers, low-quality products may prevail in the market.⁷ Even in public procurement, relying solely on the "lowest price" criterion can lead to increased maintenance, operation, and repair costs at later stages. Therefore, the TCO methodology is important as a tool for assessing the long-term economic efficiency of the procurement object.

Reforms aimed at digitizing the public procurement system in the Republic of Uzbekistan and increasing economic efficiency are creating an institutional framework for the introduction of the TCO methodology. In particular, Decree No. DP-259 provides for the introduction of an electronic module that calculates the average market price of the procurement object based on artificial intelligence technologies.⁸ This mechanism may become a methodological basis for the future automatic assessment of TCO components and determination of the long-term economic efficiency of purchases.

RESEARCH METHODOLOGY

This study used regulatory, comparative institutional, and scientific literature analysis approaches to assess the economic efficiency of the TCO (Total Cost of Ownership) methodology in public procurement. The main sources of the study were the Decree of the President of the Republic of Uzbekistan No. PF-259, OECD reports, European Union Directive 2014/24/EU, ISO 15686-5:2017 standard, and classical scientific literature on TCO and life-cycle costing.

The study analyzed the theoretical foundations of the TCO methodology based on institutional economics and strategic cost management approaches. The economic limitations of the "lowest price" criterion in public procurement, hidden operating costs, and quality-related risks were explained. The possibilities of further integration of artificial intelligence-based price monitoring and electronic control mechanisms into the AI-TCO model, as provided for in Decree No. PF-259, were assessed based on a scientific-analytical approach.

ANALYSIS AND RESULTS

Analysis of the practice of public procurement in Uzbekistan shows that currently, when evaluating procurement, priority is given mainly to the initial contract price. The establishment of target indicators in Decree No. DP-259 to increase the use of competitive procurement methods to 80% by 2030 and achieve significant economic savings in public procurement indicates the need to improve the existing system in terms of economic efficiency. In this regard, the TCO (Total Cost of Ownership) methodology allows evaluating public procurement not only on the basis of the initial price, but also on the basis of the set of costs incurred throughout the entire life cycle of a product or service.

The analysis shows that the artificial intelligence-based price monitoring, risk indicators and electronic control mechanisms envisaged in Decree No. DP-259 can create an institutional basis for the introduction of

4 Ellram, LM (1993). Total cost of ownership: Elements and implementation. *International Journal of Purchasing and Materials Management*, 29(3), 2–11. <https://doi.org/10.1111/j.1745-493X.1993.tb00013.x>

5 Ellram, LM, & Siferd, SP (1998). Total cost of ownership: A key concept in strategic cost management decisions. *Journal of Business Logistics*, 19(1), 55–84.

6 International Organization for Standardization. (2017). ISO 15686-5:2017: Buildings and constructed assets—Service life planning—Part 5: Life-cycle costing. Geneva, Switzerland: Author.

7 Akerlof, GA (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3), 488–500. <https://doi.org/10.2307/1879431>

8 President of the Republic of Uzbekistan. (2025). On further measures to ensure a competitive environment and transparency in the public procurement system (Decree No. PF-259, December 26, 2025). Tashkent, Uzbekistan: Lex.uz.

the TCO methodology in the future. In particular, the electronic module that calculates the average market price of the procurement object can be gradually transformed into an AI-TCO model that also takes into account indicators such as maintenance costs, energy consumption and service life. This will serve to transition from the “lowest price” principle to the “most optimal economic value” principle in public procurement (Figure 1).

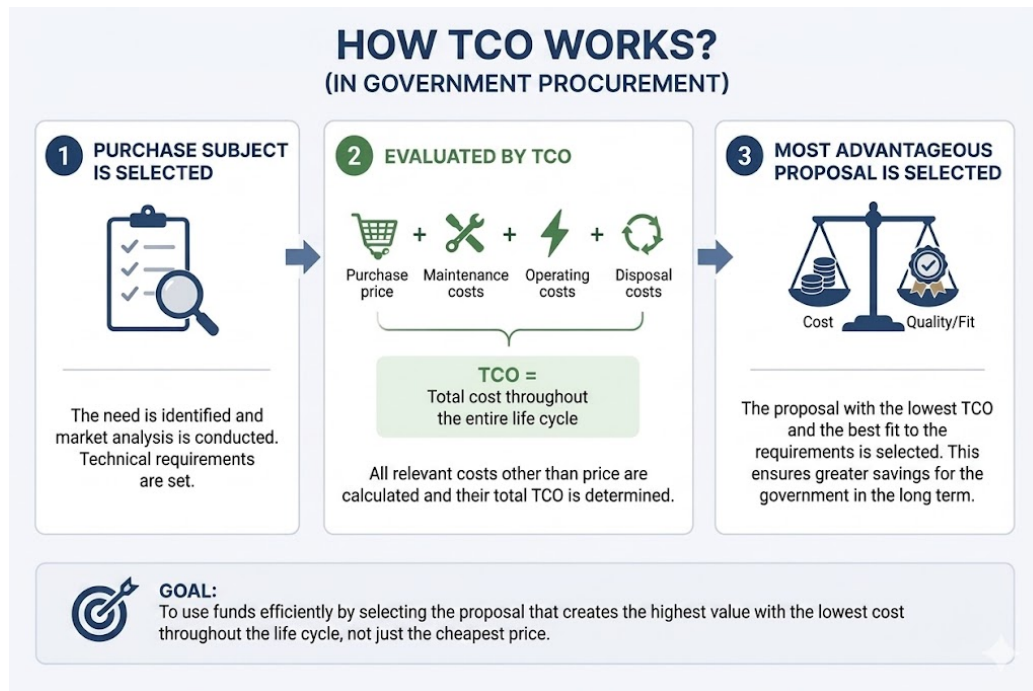


Figure 1. The working mechanism of the TCO (Total Cost of Ownership) methodology in public procurement

Source: Compiled by the author on the basis of Decree No. DP-259 of the President of the Republic of Uzbekistan.

International experience shows that the TCO methodology has the potential to increase economic efficiency in public procurement. In countries such as Denmark, the Netherlands, Germany and South Korea, the application of TCO and life-cycle costing approaches in public procurement has yielded results related to the optimization of operating costs, the quality of procurement and the increase in the service life of assets.⁹ On this basis, a model for the phased introduction of the TCO methodology for Uzbekistan is proposed. It is advisable to initially implement pilot projects in IT and medical equipment procurement, and in subsequent stages to apply it to infrastructure, transport and energy procurement. In this case, improving the regulatory framework, developing TCO methodologies across sectors, and improving the skills of procurement specialists will be among the important institutional conditions.

CONCLUSION AND SUGGESTIONS

The results of the study show that the traditional evaluation system in public procurement, based only on the initial contract price, cannot fully reflect long-term economic efficiency. The TCO (Total Cost of Ownership) methodology, on the other hand, allows for a comprehensive assessment of the costs incurred throughout the entire life cycle of a product or service, creating a methodological basis for moving from the “lowest price” principle to the “best economic value” principle in public procurement. Analyses conducted based on Ellram, Akerlof, and international standards have shown that the TCO approach serves to reduce hidden operating costs, increase procurement quality, and long-term economic efficiency.

Analysis of international experience shows that TCO and life-cycle costing methodologies are successfully used in public procurement in countries such as Denmark, Germany, the Netherlands and South Korea. In these countries, the TCO approach has yielded positive results in terms of improving the quality of procurement, optimizing operating costs and increasing the efficiency of using public funds. In this regard, the gradual introduction of the TCO methodology in the public procurement system of Uzbekistan can be an important instrument for increasing economic efficiency.

The artificial intelligence-based price monitoring, electronic control and risk indicators envisaged in

⁹ European Commission. (2021). Buying green! A handbook on green public procurement (4th ed.). Luxembourg: Publications Office of the European Union.

Decree No. PF–259 will create an institutional basis for the future formation of the AI-TCO model. However, for the effective implementation of the TCO methodology, it is necessary to improve the regulatory framework, develop cross-sectoral methodologies, expand the open database on public procurement, and improve the skills of professional buyers. In future studies, it is advisable to assess the real economic efficiency of the TCO methodology based on data from the public procurement portal using empirical and econometric approaches.

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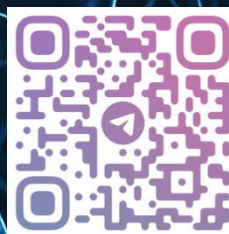
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