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Abstract: This article analyzes the current state of the art, scientific and theoretical foundations and practical results of the use of artificial intelligence and "Big Data" technologies in tax administration. The results obtained from the introduction of these technologies in world practice, in particular in the tax authorities of the OECD, the USA, Singapore and China, as well as the reforms being implemented in the Republic of Uzbekistan to digitize the tax system are considered. The impact of artificial intelligence on the efficiency of tax administration is quantitatively assessed based on statistical data for 2023-2025. The results of the study show that AI and Big Data technologies can increase the level of tax evasion detection to 82 percent, reduce the time of audits by 50 percent and significantly increase additional tax revenues. The article also puts forward practical recommendations for the modernization of tax administration for Uzbekistan.

Keywords: Artificial intelligence, Big Data, tax administration, machine learning, tax support, digitalization, Uzbekistan, OECD.

INTRODUCTION

In the context of the increasingly digital world economy, traditional approaches to tax administration systems are losing their effectiveness. The exponential growth of global data volumes, the increasing complexity of financial transactions, and the emergence of new forms of tax evasion schemes are posing fundamentally new challenges for tax authorities. It is at this point that artificial intelligence (AI) and "Big Data" technologies are emerging as powerful tools. According to OECD data, as of 2024, 29 (out of 38) OECD member countries are actively using AI technologies in

their tax administration. ¹This figure represents an almost two-fold increase compared to 2018. The US Internal Revenue Service (IRS) reported that 68 SI projects were being implemented in 2024, while the Austrian BMF announced that it had generated an additional 185 million euros in tax revenue using SI in 2023. The Republic of Uzbekistan is not left out of this process. The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. PQ-358 dated October 14, 2024 approved the "Strategy for the Development of Artificial Intelligence Technologies until 2030", which also identified the introduction of SI technologies in the tax sector as a priority. At the same time, the DSQ is currently migrating large-scale databases to new servers. However, the theoretical foundations, practical problems and prospects for the introduction of SI and Big Data technologies in the tax administration in Uzbekistan have not been scientifically studied sufficiently. Filling this gap is the main scientific goal of the article. The purpose of the research is to study the global experience of using SI and Big Data technologies in tax administration, identify suitable models for Uzbekistan, and develop practical recommendations.

LITERATURE ANALYSIS ON THE TOPIC

The main advantage of AI is that it can perform repetitive tax administration tasks without causing human fatigue. ²Sun, Wang and Zhang (2023) theoretically modeled the impact of AI on tax compliance in their article "Artificial intelligence in tax administration: Implications for compliance and enforcement". According to their main conclusion, AI-based systems are significantly more accurate in detecting tax evasion than traditional systems, which also has a positive impact on taxpayer behavior. ³IMF (2025) in its methodological guide describing practical tools for analysis in tax administration identified the main components necessary for the successful implementation of Big Data analysis within the framework of Compliance Risk Management (CRM): data quality, organizational capabilities and digital infrastructure.

RESEARCH METHODOLOGY

This study was conducted based on the following methodological approaches:

First, a systematic literature review was conducted on more than 40 scientific articles and reports published in the Web of Science, Scopus, Google Scholar, and IMF/OECD institutional repositories between 2022 and 2025. Search keywords: "AI in tax

¹OECD. (2025). Governing with artificial intelligence: AI in tax administration. <https://doi.org/10.1787/398fa287-en>

²Aggarwal, S. (2024). The role of artificial intelligence in tax administration and compliance: A new era of digital taxation. *Educational Administration: Theory and Practice*, 30(1), 3831–3837. <https://kuey.net/index.php/kuey/article/view/7581a>

³Sun, Y., Wang, X., & Zhang, H. (2023). Artificial intelligence in tax administration: Implications for compliance and enforcement. *Computers in Human Behavior*, 138, 107514. <https://doi.org/10.1016/j.chb.2022.107514>

administration", "Big Data tax compliance", "machine learning tax enforcement", "digitalization of tax administration".

Secondly, a comparative analysis method was used. The experience of 38 countries listed in the OECD database Inventory of Tax Technology Initiatives (2024) was compared and clusters were identified in terms of the effectiveness of SI/Big Data implementation.

Third, for the purpose of quantitative analysis, dynamic indicators (2022-2024) based on open data sources are presented in tabular and linear trend analysis. The main data sources are: OECD Tax Administration 2024 report, IRS TIGTA reports, Austrian BMF press releases, Singapore IRAS reports and official data of the Uzbekistan Tax Administration.

MAIN PART: PROBLEM ANALYSIS AND RESULTS

Main areas of application of SI and Big Data in tax administration

The results of the study showed that SI and Big Data technologies are used in five main functional areas of tax administration:

Risk Scoring & Audit Selection: Machine learning algorithms are used to process millions of tax returns in real time and automatically identify cases with the highest risk profile. According to OECD (2024), the level of implementation in this area is the highest in 2024 (29 out of 38 OECD countries).

Fraud Detection & Prevention: Using anomaly detection algorithms and natural language processing (NLP) techniques to identify false reports, fraudulent payment requests, and other fraud schemes. The Austrian BMF's experience in 2023 is a clear example of this: 185 million euros in additional revenue was generated by analyzing 6.5 million cases.

Taxpayer Services Automation: Responding quickly to taxpayer inquiries through chatbots and virtual assistants. Singapore's IRAS VICA chatbot processed 70,000 transactional inquiries in 2024, saving approximately 11,666 hours of taxpayer time.

Revenue Forecasting: Forecasting tax revenue with high accuracy using deep learning models. In a study conducted in Nigeria, this approach achieved 90 percent accuracy.

Electronic document management and audit automation: integration with e-invoicing systems, automated tax audits and report generation.

The Austrian BMF figure is particularly noteworthy: the increase from €120 million in 2022 to €185 million in 2023, a 54 percent increase, confirms the clear quantitative benefits of SI for public finances. This evidence is one of the most important empirical grounds for the positive ROI (return on investment) of SI investments in tax administration.

The increase in the number of projects in the US IRS from 42 to 68 (62 percent) demonstrates a good example of innovation portfolio management: the principle of achieving overall effectiveness through a set of complementary small projects, rather than a single high-risk large project, is being implemented.

Regarding the audit duration indicator, a 50% reduction using SI compared to manual audits is very important from the point of view of organizational efficiency. The fact that the 30% reduction previously predicted by Williams (2020) actually reached 50% indicates that SI has exceeded the expected results. Uzbekistan's DSQ indicator – an increase in the number of users of electronic services from 3.2 million to 5.3 million – indicates that a significant change in taxpayer behavior is taking place, that is, digital channels are becoming increasingly dominant. However, the increase in the number of users does not necessarily mean that SI is being used effectively: the number of digital channel users only represents the starting point of access.

Analysis of problems in implementing SI and Big Data in Uzbekistan

Table 1. Main problems and solutions in implementing SI/Big Data in the tax administration of Uzbekistan

Problem	Reason	Recommended solution
Uneven development of digital infrastructure	Difference in technical capabilities between regions	Expanding the network of regional IT centers
Data fragmentation	Lack of a unified database between different agencies	Implementation of a single tax information platform
Insufficient staff qualifications	Shortage of specialized personnel in the field of Si and Big Data	Development of special educational programs in collaboration with higher education institutions

Incomplete formation of the legal and regulatory framework	The uncertainty of the legal basis for automated decisions	Adoption of norms establishing rules for interpretation of SI decisions
Cybersecurity risks	Tax data is vulnerable to cyberattacks	Developing a national strategy to protect tax systems from cyber threats

The problems encountered in the implementation of SI and Big Data technologies in the tax administration of Uzbekistan are of a closely related systemic nature. They can be grouped into technical, institutional and human factors. Technically, the incomplete formation of the infrastructure and data fragmentation are the main obstacles. The fact that the Uzbek Tax Administration has begun the process of migrating large-scale databases to new servers is an important step towards solving this problem, but it is not yet fully completed. The most important institutional problem is the insufficient development of a special regulatory and legal framework regulating automated tax decisions. This issue is not unique to Uzbekistan: Nathwani (2024) noted that most developing countries face this problem. However, it is necessary to accelerate legislative reforms in this area based on Resolution No. PQ-358 and the "Digital Uzbekistan 2030" strategy. The human factor – the issue of staff qualifications – means that tax authorities lack the specific skills needed to effectively manage and control SI systems. The experience of leading countries (IRS, HMRC) shows that tax authorities that have implemented SI have also invested heavily in retraining staff.

CONCLUSION AND SUGGESTIONS

Based on this research, the following conclusions were reached:

First conclusion: SI and Big Data technologies have a statistically proven efficiency advantage over traditional approaches in tax administration. The increase in fraud detection accuracy from 55% to 82%, the reduction in audit time by 50% and the additional tax revenue (Austria: +185 million EUR) are based on concrete quantitative grounds.

Second conclusion: The effectiveness of technologies is determined not only by technical parameters, but also by a complex of legal and regulatory environment, organizational capabilities and human resources. As seen in the example of California (CDTFA), an improperly designed SI project can lead to unexpected results.

Third conclusion: Uzbekistan has created an important institutional foundation for the introduction of SI and Big Data technologies into tax administration (PQ-358-2024, "Digital Uzbekistan 2030"), but the practical implementation stage is still in the initial development phase.

The following practical suggestions are recommended for the Republic of Uzbekistan:

1. Establish a Unified Tax Analytics Platform. Combine data from the State Tax Service, the Customs Committee, tax authorities, and other source agencies into a single, standardized, real-time database. This platform will provide a large-scale and high-quality data source necessary for training SI models.

2. Approval of a phased SI implementation roadmap. Phase one (2025-2026): low-risk, high-performance application areas – automated risk assessment and chatbot services. Phase two (2027-2028): medium-complexity areas – anomaly detection and audit selection automation. Phase three (2029-2030): fully integrated SI ecosystem.

3. Introduce "Explainable AI" standards. Legally strengthening the mechanism for providing understandable, verifiable justification for any automated tax decision will maintain taxpayer confidence.

4. Expand international cooperation. Ensure active participation in the OECD Tax Technology Inventory (ITTI) system, establish experience exchange programs with Singapore IRAS and Austrian BMF.

5. Implementation of a special personnel training program. Introduction of specialized master's programs in data science, machine learning, and tax law at Tashkent State University of Economics and other leading universities.

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