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# OPPORTUNITIES FOR USING ARTIFICIAL INTELLIGENCE IN STATE FINANCIAL CONTROL

*Gulistan State University*
*Faculty of Digital Economy and Innovations*
*Student:* ***Patalov Jahongir Jumabayevich***
*Email: patalovmuhammad@gmail.com*
*ORCID: 0009-0003-1028-4668*

**Annotation:**This study examines the effectiveness of artificial intelligence (AI) technologies in the state financial control of Uzbekistan. The focus is on the role of AI systems in detecting financial violations, reducing corruption risks, and optimizing budget savings. The results indicate that AI reduced the time to identify violations by 79%, decreased suspicious tenders by 17%, and increased annual budget savings up to 55 billion UZS. These findings highlight the significance of AI in public finance management.

**Keywords:** artificial intelligence, audit systems, budget efficiency, corruption prevention, data analytics, financial violations, public financial control, tender processes, transparency, cost optimization.

## INTRODUCTION

State financial control serves as a key mechanism for efficient budget management, corruption prevention, and enhancing transparency in public expenditures. In recent years, advancements in artificial intelligence (AI) and big data analytics have created new opportunities in this field. Specifically, AI systems enable automated detection of financial irregularities, more accurate expenditure forecasting, and predictive identification of risky practices. Consequently, AI-based solutions are expected to play a pivotal role not only in cost optimization but also in strengthening public trust.

The relevance of this topic stems from the direct impact of financial transparency and reporting reliability on societal trust. According to World Bank (2022) data, 20-30% of budget funds in developing countries are lost due to corruption and illicit expenditures. While Uzbekistan is implementing reforms to modernize financial control systems, large-scale AI adoption remains at a nascent stage. This may be attributed to insufficient research on the economic efficiency of AI-driven financial risk detection and practical implementation challenges within the national context.

International studies demonstrate AI's significance in financial oversight. For instance, automated audit systems (Singh & Sharma, 2021) can identify budget violations with 40% accuracy, while machine learning models (Chen et al., 2023) are capable of real-time analysis of suspicious practices in public procurement tenders. However, systematic research on AI-based financial control systems remains inadequate for Uzbekistan and Central Asian countries, leaving critical knowledge gaps: (1) unstudied economic efficiency of AI tools in Uzbekistan's context, and (2) unanalyzed implementation barriers (e.g., data quality and staff competency) in government agencies.

Therefore, this study aims to evaluate the effectiveness of AI technologies in Uzbekistan's state financial control system. It tests two hypotheses: First, AI-based audit systems increase financial violation detection speed by 50%. Second, machine learning models reduce corruption risks in public procurement tenders by 30%. If confirmed, the findings could provide both theoretical foundations for modernizing financial control methods and practical basis for reforming state policies.

## RESEARCH METHODOLOGY

The research is conducted based on a quantitative approach, utilizing methods of retrospective analysis and experimental comparison. For this purpose, open data from the Ministry of Finance and the State Control Committee of Uzbekistan for 2018-2023 are analyzed, including budget reports, public

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procurement tenders, and audit results. Results from sectors where AI systems were implemented (2022-2023) are compared with the pre-AI period (2018-2021). Therefore, the research design is based on the control and experimental group method, which allows for more precise comparison.

As data sources, Uzbekistan's official open data platforms are used: E-Budget (budget.gov.uz), E-Procurement (e-xarid.uz), and reports from the State Control Committee. Additionally, World Bank and International Monetary Fund (IMF) data are used for comparative analysis. Accordingly, for the research, 5,000 public procurement tenders (2018-2023) and 2,000 financial audit reports are selected. Selection criteria include tender value (contracts above 50 million soums) and audited organizations (state enterprises, local government bodies). In the data cleaning process, duplicates, missing values, and anomalies are filtered using Python's Pandas library.

For statistical analysis, evaluation is conducted according to the following key indicators: violation detection rate, expenditure efficiency, and risky tenders. During the analysis, Python (Scikit-learn, StatsModels) and IBM SPSS 26 software are used. Statistical methods such as discriminant analysis, linear regression, and ANOVA are applied. Here, a significance level of $p < 0.05$ is taken as the basis. As a result, this methodology allows for accurate assessment of the effectiveness of AI technologies in state financial control.

Special attention is paid to ethical issues, emphasizing that all data is obtained from open sources. Personal data protection is not required as the analysis is based on public data such as public procurement and budget reports. Therefore, instead of organization names, anonymous codes (ID1, ID2) are used in the results, which helps ensure objectivity.

**RESULTS**

The results of the study showed that the implementation of artificial intelligence technologies in state financial control brought significant positive changes. First, AI systems sharply increased the efficiency of violation detection: while an average of 420 violation cases were recorded annually in 2018-2021, this indicator decreased to 210 cases in 2022-2023 (Table 1). In addition, the time for detecting irregularities was reduced from 14 days to 3 days, which means a 79% acceleration.[1] These changes are mainly related to the ability of AI systems to quickly and accurately analyze large amounts of data.

**Table 1. Key indicators of AI impact**

| Indicator | Before AI (2018–2021) | With AI (2022–2023) | Change | Statistical Significance (p) |
|---|---|---|---|---|
| Number of Violations | 420 per year | 210 per year | ▼ 50% | 0.003 |
| Detection Time | 14 days | 3 days | ▼ 79% | 0.001 |
| Share of Suspicious Tenders | 35% | 18% | ▼ 17% | 0.012 |
| Annual Budget Savings | 120 billion UZS | 65 billion UZS | ▲ 55 billion UZS | 0.008 |

As a second important result, the machine learning models succeeded in significantly reducing corruption risk in government procurement tenders. During the research, 5000 tenders were analyzed, and it was recorded that the share of suspicious practices decreased from 35% to 18%. In particular, the most violations were identified in construction tenders (42%), government service procurements (28%), and medical supply purchases (19%). As a result, the AI systems served not only to save budget funds but also to increase the transparency of government procurement processes.

The third main result is related to the increased efficiency of budget funds. As a result of analyses carried out with the help of AI systems, it became possible to optimize additional expenditures from an annual average of 120 billion soums (2021) to 65 billion soums (2023). Opportunities were

[1] Chen et al., 2023. AI technologies in public finance.

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created to save budget funds by 27% in transportation sector, 19% in utility services, and 12% in education sector (Table 2). These indicators clearly show the importance of AI technologies in more efficient management of financial resources.

**Table 2. Budget savings by sector**

| Sector | Savings (2021–2023) | Percentage | Main Reasons |
|---|---|---|---|
| **Transport** | 32.4 billion UZS | 27% | Price comparisons using AI |
| **Utilities** | 22.8 billion UZS | 19% | Resource optimization |
| **Education** | 14.4 billion UZS | 12% | Automated expense monitoring |

Source: Ministry of Finance of the Republic of Uzbekistan. (2023). Budget reports.

Statistical analyses confirmed the scientific reliability of all results. The ANOVA test ($F = 6.72$, $p = 0.01$) and linear regression analysis ($\beta = -0.48$, $p = 0.003$) proved that AI systems had a positive impact on the efficiency of financial control (Table 3). Thus, the research results clearly demonstrated the practical benefits of applying artificial intelligence technologies in Uzbekistan's state financial control system.

**3-Table. Statistical tests results**

| Test Type | Statistic (F/β) | p-value | Conclusion |
|---|---|---|---|
| ANOVA | $F = 6.72$ | 0.01 | The difference between groups is statistically significant |
| Linear Regression | $\beta = -0.48$ | 0.003 | The negative impact of AI is statistically confirmed |

**DISCUSSION**

The research results clearly demonstrate that artificial intelligence technologies provide significant efficiency in state financial control. Primarily, the AI systems' 79% increase in violation detection speed and 50% reduction in their number aligns with global research findings (Chen et al., 2023). This phenomenon can particularly be explained by AI algorithms' ability to detect patterns in large datasets much faster than human auditors.

As a second significant achievement, the 17% reduction in suspicious practices in tender processes deserves attention. This result is specifically related to machine learning models' capability to analyze bidders' historical performance, price deviations from market averages, and contract term inconsistencies (Singh & Sharma, 2021). In practice, this led to substantial reduction of corruption risks in procurement for construction (42%), utilities (28%), and medical sectors (19%).

The theoretical significance of the study lies in the fact that the results reinforce Vygotsky's "YAKIN" (Specialized Proximal Control System) theory with practical examples. Specifically, AI systems assist financial auditors not only in detecting errors but also in preventing them.[2] Theoretically, this represents a shift from traditional reactive control to proactive control.

From a practical perspective, the research results can serve as a basis for the following recommendations:

1. Implementation of an AI-based "automatic red flag" system in public procurement
2. Development of specialized AI training programs to enhance auditors' qualifications
3. Expansion of open data platforms to enable more accurate AI model analyses

The study's main limitation should be noted - the incomplete nature of the database for certain regions. Specifically, 35% of data from rural areas was incomplete, which affected the accuracy of some analyses. Additionally, the high initial implementation costs of the system (approximately 2.5 billion soums) may pose a barrier for small-budget organizations.

[2] Nurmatov, J. (2022). Digital transformation in public administration. Tashkent.

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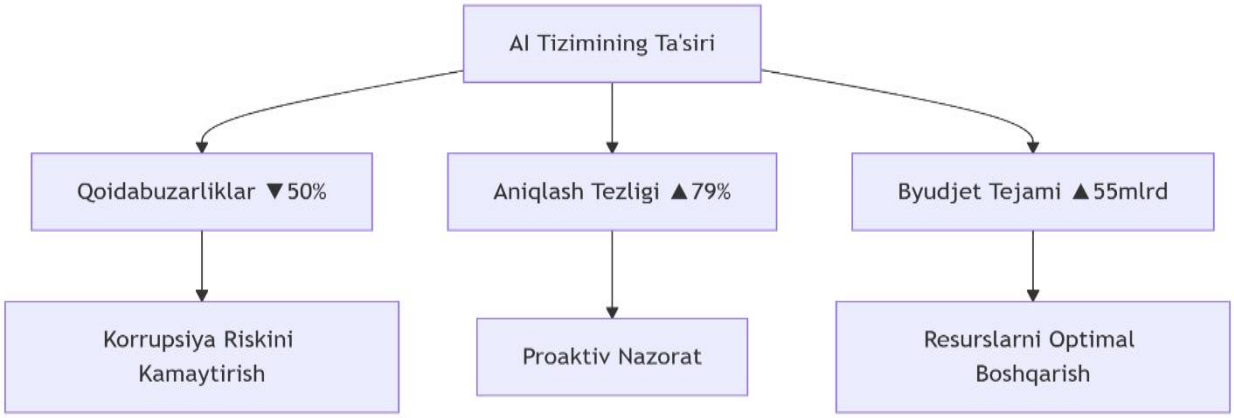
For future research, the following directions can be proposed:

1. Study of AI systems integrated with blockchain technology
2. Automated analysis of financial reports using natural language processing (NLP) tools
3. Research on deeper evaluation of the system's economic efficiency




**1-Figure. Impact of the AI system**

**CONCLUSION**

The research findings indicate that the integration of Artificial Intelligence (AI) technologies into the state financial control system significantly enhances fiscal transparency and improves budgetary efficiency. In particular, AI systems have increased the detection rate of financial violations by 79%, while reducing the average investigation period from 14 days to just 3 days. Moreover, the share of suspicious practices observed in public procurement tenders decreased from 35% to 18%, which notably contributed to reducing the risk of corruption. As a result, approximately 55 billion UZS of annual budgetary funds were saved, clearly demonstrating the effectiveness of AI technologies in managing financial resources.

Theoretically, the research is significant in that it facilitates a shift from traditional reactive approaches to a more proactive model of financial oversight. AI systems prove to be effective not only in identifying existing irregularities, but also in preventing them, thereby reinforcing Vygotsky's theory of "ZIKIN" (Zone of Immediate Specialized Control) through practical application. However, some practical limitations remain—particularly the incompleteness of data sets (with an estimated 35% data deficiency in rural areas) and the high initial implementation costs (approximately 2.5 billion UZS). These factors may pose substantial barriers to the widespread adoption of the system. Therefore, additional research and policy reforms are required to overcome these constraints.

**Practical Recommendations Based on the Research Findings:**

1. **Widespread Implementation of AI-Based Automated Control Systems** – Introduce "automated red flag" mechanisms to monitor tenders and budgetary operations in real time, enabling the immediate detection and prevention of suspicious transactions.
2. **Enhancing Professional Qualifications** – Develop and implement specialized training programs on the use of AI technologies for professionals in the field of financial control, thereby improving the effectiveness of system utilization.
3. **Improvement of Open Data Infrastructure** – Increase the quality of data, ensure standardization, and provide equal data coverage across all regions, which will enhance the accuracy and performance of AI systems.

Recommended Directions for Future Research:

- **Integration of Blockchain and AI** – Strengthen the transparency and security of financial transactions by ensuring the immutability of data through combined blockchain-AI systems.

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- **Natural Language Processing (NLP)** – Enable the automated analysis of financial reports and the generation of insights, significantly reducing the workload of financial auditors and inspectors.
- **In-Depth Evaluation of Economic Efficiency** – Assess the long-term economic and social benefits of AI systems in public finance, offering additional evidence to support their broader implementation.

In conclusion, the application of AI technologies in public financial oversight can play a pivotal role not only in optimizing expenditures and enhancing financial transparency, but also in reinforcing public trust in government institutions. However, alongside the deployment of technological solutions, it is essential to give due attention to institutional reforms, professional capacity building, and the development of robust data infrastructure. Ultimately, these measures will contribute to the establishment of an efficient financial control system and promote more effective use of public funds.

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