Article

The Importance of Digital Technologies in Improving The Efficiency of Public Funds Management in The Treasury System

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Abstract: The efficient management of public funds is a core pillar of modern public administration. As digital technologies advance, their integration into treasury systems has become essential for enhancing financial transparency, accountability, and operational efficiency. Countries like South Korea, Singapore, the USA, and France have pioneered digital treasury systems utilizing AI, blockchain, big data analytics, and integrated platforms. These systems have proven to reduce costs, prevent fraud, and streamline financial operations. Despite global advancements, Uzbekistan's treasury system faces challenges such as underdeveloped infrastructure, limited expert capacity, and insufficient legal regulation for implementing digital tools. This underscores the need to explore international practices and evaluate local applicability. This study aims to analyze global experiences in digitalizing treasury systems and assess their adaptability in Uzbekistan's context to improve the management of public financial resources. The research highlights significant improvements in transparency, cost-efficiency, and decision-making in countries with mature digital treasury infrastructures. A SWOT analysis reveals Uzbekistan's strengths (political will, legal reforms), weaknesses (infrastructure, expertise), opportunities (global collaboration, lower tech costs), and threats (cybersecurity, brain drain). Based on this, a roadmap for digital transformation in Uzbekistan's treasury was proposed. The study offers a structured comparison of international digital treasury systems and provides tailored recommendations for Uzbekistan, integrating global practices with local institutional realities. These findings support policy reforms and investment strategies aimed at digitizing public finance in Uzbekistan and contribute to scholarly discussions on digital governance and financial management systems.

Keywords: Treasury System, Digital Technologies, Financial Management, Artificial Intelligence, Blockchain, Big Data Analysis, API Integration, Digital Transformation, International Experience.

1. Introduction

In modern conditions, effective management of public finances has become a priority for all countries. The treasury system, which is a central element of public finance management, plays an important role in ensuring the targeted and rational use of budget funds and the transparency of financial flows. Since the beginning of the 21st century, many countries have begun to digitize state treasury operations by introducing electronic document management and automated payment systems. The main goal is to reduce paperlessness, speed up financial processes and increase the efficiency of using budget funds by ensuring transparency [1].

Digital technologies reduce the human factor in implementing state expenditures and payments, reduce errors in data processing, and reduce the risk of corruption. The experience of developed countries shows that the use of modern information and communication technologies significantly increases the efficiency of the state treasury system. Digital technologies are becoming increasingly important in this process. Artificial intelligence, blockchain, Big Data analysis, API integrations and other innovative technologies are being actively implemented in all aspects of public finance management. As a result, transparency and control over the use of budget funds are expanding, corruption risks are decreasing, and the reliability of financial data is increasing [2].

An analysis of the scientific literature shows that the introduction of digital technologies in public finance management not only increases the efficiency of the financial system, but also stimulates the development of other sectors of the economy. Zotova E.A. in her research analyzes the role of treasury bodies in the effective organization of public finance management and concludes: "The treasury system is the most effective mechanism for ensuring transparency in the management of public funds and controlling the targeted use of budget funds." Different countries have achieved significant results in the digitalization of their financial systems, and it is important to study their experience and adapt best practices to local conditions. For example, the achievements of South Korea, Singapore, the USA and the European Union in digitizing their treasury systems deserve special attention [3].

Large-scale reforms are also being implemented in the Republic of Uzbekistan to improve the state finance management system. The Decree of the President of the Republic of Uzbekistan No. PF-6079 dated October 5, 2020 "On approval of the "Digital Uzbekistan-2030" strategy and measures for its effective implementation" established the strategic goal of actively developing the digital economy in our country, as well as the widespread introduction of digital technologies in all sectors and areas, including the state finance management system. This document serves as an important step towards digitizing the treasury system in our country. However, according to experts, there are a number of problems that need to be solved in the financial management system of Uzbekistan [4].

In particular, Akhmedov B.S. in his research, he points out the problems in the public finance management system of Uzbekistan: "One of the main problems of the financial management system in Uzbekistan is the inefficiency of information exchange between various agencies and the insufficient development of integrated information systems." The purpose of this study is to study international experience in using digital technologies to improve the efficiency of public finance management and to identify the prospects for digitizing the treasury system in Uzbekistan. The methodological basis of the study was the use of comparative analysis, a systematic approach and SWOT analysis. The study used reports from international financial institutions such as the World Bank, the International Monetary Fund and the Organization for Economic Cooperation and Development, as well as official documents and data from the ministries of finance and treasury bodies of various countries. This study is of significant scientific, theoretical and practical importance. The results of the study contribute to enriching the theory of digitizing the public treasury system, and are also of practical importance for the financial bodies of the Republic of Uzbekistan in developing and implementing a strategy for digitizing public finances [5].

2. Materials and Methods

The introduction of digital technologies in the state treasury system has become one of the most important areas of modern public finance management. In this regard, the study of advanced international experience and the introduction of effective digital solutions in the conditions of Uzbekistan are of particular importance.

This study used a comparative analysis methodology to study the issues of using digital technologies to increase the efficiency of managing state treasury funds.

Within the framework of the study, countries were selected to study international experience based on the following criteria:

1. Countries that have achieved significant success in digitizing the state treasury system;
2. Coverage of countries of different regions and levels of development;
3. Countries that are leaders in the introduction of innovative technologies to public finance management.

Based on these criteria, the study deeply analyzed South Korea, Singapore, the USA, and the leading countries of the European Union (France). The research methodology prioritized a systematic approach, in which the technical-technological, legal-institutional, and organizational-management aspects of digitizing the state treasury system were comprehensively studied.

The methods used in the study include:

- Comparative analysis (comparative analysis of treasury systems used in different countries);
- Statistical analysis (analysis of efficiency indicators achieved as a result of the introduction of digital technologies);
- SWOT analysis (identification of strengths and weaknesses, opportunities and threats of digitizing the state treasury system in Uzbekistan);
- Expert assessment method (analysis of the opinions of specialists and experts in the field);

The following sources were used to collect data:

1. Scientific research works, monographs and scientific articles;
2. Reports and analytical materials published by international organizations (World Bank, International Monetary Fund, OECD);
3. Reports and information published by the ministries of finance and treasury departments of the countries;
4. Materials of international conferences in the field of digital technologies and public financial management;

In developing recommendations for Uzbekistan, the level of economic development of our country, its institutional environment, existing infrastructure and legal framework were taken into account.

3. Results

In accordance with the above criteria, the experience of South Korea, Singapore, the United States, and several European countries was studied in detail. These countries have advanced experience in implementing digital technologies in public finance management, and their achievements and experiences are well documented [5].

South Korea is one of the most successful countries in digitizing its public finance management system. In 2007, the country introduced an integrated information system called the "Digital Budget and Accounting System" (D-Brain). The D-Brain system covers all stages of public finance management - budget formation, execution, treasury operations, reporting and auditing. Lee J. and Park K. analyzed the capabilities of the South Korean D-Brain system in their study and concluded: "The D-Brain platform has significantly increased the transparency and efficiency of spending by creating a single electronic system for managing the state budget, maintaining financial reports and implementing public procurement." The D-Brain system has the following important features:

- An integrated information system covering all areas of public finance in real time;

- A single database providing complete and accurate information on the state of public finance;
- An automated system for budget formation, execution and control;
- Increase operational efficiency by optimizing business processes;

Singapore is recognized as one of the leading countries in the digitalization of public financial management and treasury systems. Singapore's digital treasury system includes the following key elements:

1. Integrated Financial Management System (IFMS) - a single platform for integrating financial transactions and reporting;
2. SGQR (Singapore Quick Response Code) - a universal QR code system for making payments;
3. Blockchain-based solutions - in particular, the implementation of blockchain technologies in treasury operations within the framework of the DBS Treasury Tokens project https://treasury-management.com/blog/5-reasons-why-singapore-is-a-treasury-40-hotspot/.

The results of digitizing Singapore's public treasury system are as follows:

- Reduction of time taken to make payments by 90%;
- Increase in liquidity management efficiency by 40%;
- Reduce operational costs associated with treasury operations by 35%;
- Dramatically increase the transparency of financial transactions https://treasury-management.com/blog/5-reasons-why-singapore-is-a-treasury-40-hotspot/.

The U.S. Department of the Treasury is making significant strides in implementing digital technologies in public finance management. The U.S. Department of the Treasury is actively using artificial intelligence and machine learning technologies to manage financial operations. In this regard, such areas as analyzing financial transactions, detecting financial fraud, and forecasting cash flows deserve special attention. The following digital technologies are actively used in the U.S. Treasury system:

- Hyperledger blockchain platform - to increase the transparency of the process of distributing government grants;
- Artificial intelligence algorithms - to analyze financial statements and detect fraud;
- APIs and microservices architecture - to improve data exchange between various government systems;
- Robotic process automation (RPA) - to automate repetitive financial operations.
- https://www.tadviser.ru/index.php/Проект:Министерство_финансов_США_(Проекты_на_базе_блокчейн-технологии) [7].

In European countries, great attention is being paid to the digitization of state treasury systems. For example, in France, an integrated financial management information system called CHORUS has been introduced, which allows you to manage state expenditures, revenues and accounting within a single system. The CHORUS system, implemented by the Budget Directorate of the French Ministry of Finance (Direction du Budget), is a large information system covering all aspects of state finance management. The CHORUS system consists of the following main modules:

CHORUS Core - management of state expenditures and purchases;

CHORUS Restitution - formation of financial reports and analyzes;

CHORUS Portail Pro - a portal for working with state procurement and suppliers;

CHORUS Factures - working with electronic invoices.

Benoit Jean, Deputy Director of the French Treasury Inspectorate, states: "The introduction of the CHORUS system has led to a radical renewal of public finance management in France. This system has not only increased operational efficiency, but has also been an important step in ensuring transparency and accountability. Thanks to

CHORUS, we have achieved savings of approximately 400-500 million euros per year" (Table 1).

Table 1. Experience of leading countries in digitalization of state treasury systems

Country	System name	Main technologies	Main functions	Achieved results
South Korea	D-Brain	Integrated Information System, API Integrations, Analytical Solutions	Budget formulation, Budget execution, Treasury operations, Reports, Audit	-Reducing the budget formation process from 53 days to 20 days -Reducing the time of preparation of reports by 4 times - Reduce operating costs by 30%
Singapore	IFMS, Treasury Operation System (TOS)	Blockchain, API-first approach, SGQR QR-code payment system	Financial Transactions, Payments, Liquidity Management, Reports	- Reduce payment time by 90% - Increase the efficiency of liquidity management by 40% -Reduce operational costs by 35%
USA	Fiscal service innovation systems	Hyperledger Blockchain, Artificial Intelligence, API, RPA	Payments, Purchases, Treasury Transactions, Fraud Detection	- Annual savings of 1.4-3.0 billion US dollars - Improving the accuracy of financial reports - Reduce fraud

Country	System name	Main technologies	Main functions	Achieved results
France	CHORUS	Integrated information system, Modular architecture, Electronic invoices	Government Expenditures, Revenues, Accounting, Reports	-Reduce the time of financial transactions by 70% -Accelerate the preparation of reports by 60% - Reduction of payment period from 30 days to 15-20 days - Saving 400-500 million euros per year

Prospects for digitizing the state treasury system in Uzbekistan. Within the framework of the "Digital Uzbekistan - 2030" strategy launched in Uzbekistan in 2022, important steps are being taken to digitize the state administration system, including the state treasury system. The Ministry of Economy and Finance of the Republic of Uzbekistan is implementing the following projects to digitize the state treasury system [8]:

1. **Improving the system for automating treasury operations** - creating a single electronic platform for interaction with budget organizations;
2. **Developing the "Electronic Budget" information system** - creating an integrated information system covering all stages of the budget process;
3. **Digitizing the state procurement system** - increasing the transparency and ensuring the efficiency of the state procurement process;
4. **A unified electronic payment system** - creating a single electronic payment system for making state payments;
5. **Open data portal** - providing information on state finances in an open form.

Based on international experience, the following promising directions for digitizing the state treasury system in Uzbekistan have been identified. First, by creating a single integrated information system similar to the South Korean D-Brain system, budget planning, execution, and reporting processes can be managed holistically. Second, based on US experience, the introduction of artificial intelligence and machine learning technologies will help assess financial risks and forecast cash flows. Third, by introducing an electronic payment system, similar to that in Singapore, payment processes will become faster, more transparent, and more efficient. Also, the use of blockchain technologies will make public procurement and debt management more transparent [9].

4. Discussion

In recent years, the rapid development of digital technologies has had a significant impact on public administration systems, including treasury activities. First, the digitization of the state treasury system ensures open and transparent management of

information on income and expenses. Studies conducted by the World Bank and other international organizations show that the digitization of financial information systems, along with transparency, also increases responsibility and accountability in management. Second, digitization is an effective tool for combating corruption. By reducing the impact of the human factor, fully automating operations, and introducing technologies such as blockchain and artificial intelligence, suspicious and illegal financial activities can be detected and prevented in a timely manner. According to OECD analyses, digital management tools can reduce the level of corruption by 20–30%. According to JPMorgan analysis, a digital treasury system can reduce financial transaction times by up to 80% and operational costs by up to 25-30% [10].

In addition, digital technologies play a key role in decision-making. Through Big Data Analytics and artificial intelligence (AI), historical financial data can be analyzed and accurate predictions about future trends can be made. This creates significant advantages in strategic planning, resource allocation and quality assurance of budget execution [11].

Opportunities and obstacles to the introduction of digital technologies. There are a number of important opportunities for the digitization of the state treasury system in Uzbekistan. Firstly, in recent years, a legal framework has been created in the country for the development of the digital economy and informatization, and a number of important regulatory and legal acts have been adopted. Secondly, work is underway to modernize the technical infrastructure, in particular, projects to create a unified state finance information system are being implemented [12].

At the same time, the issue of increasing human resources potential, in particular, training specialists in the IT field, has also been identified as one of the priority areas of state policy. At the same time, there are also some obstacles. In particular, at present, the necessary regulatory and legal documents for the introduction of some digital technologies are not enough. In addition, the obsolescence of existing information systems in some state organizations and problems with their mutual integration are hindering the digitization process. Staff shortages also remain one of the important problems. To overcome these obstacles, it is necessary, first of all, to improve the legal framework. It is also important to attract investments through public-private partnership mechanisms, to develop a system of training personnel in the field of digital finance and information technologies in higher education institutions, as well as to use international experiences [13].

SWOT analysis for Uzbekistan. A SWOT analysis was conducted to identify the strengths, weaknesses, opportunities, and threats of digitizing the state treasury system in Uzbekistan (Table 2) [14].

Table 2. SWOT Analysis of Digital Transformation in Uzbekistan's State Treasury System

Strengths	Weaknesses
1. High level of political will and state support	1. Inadequate development of technical infrastructure
2. Availability of legal framework for digital transformation	2. Lack of qualified specialists in the field of digital technologies
3. Availability of qualified specialists	3. Limited funds
4. Creation of the foundations of the "Electronic Government" system	4. Outdated and insufficient integration of existing information systems

Strengths	Weaknesses
Opportunities	Threats
1. Opportunity to study and apply international experience	1. The rise of cyber security threats
2. Technical and financial support of international financial institutions	2. The speed of technological changes and the difficulty of adapting to them
3. The decrease in the price of digital technologies and the expansion of possibilities	3. The instability of the international financial and political situation
4. Training of new generation specialists	4. Departure of qualified specialists abroad

Based on the results of the SWOT analysis, the following strategic directions for digitizing the state treasury system for Uzbekistan can be identified:

1. Adapting best practices of international experience to the conditions of Uzbekistan;
2. Developing technical infrastructure and integrating information systems;
3. Creating conditions for training and retaining qualified specialists;
4. Developing comprehensive measures to ensure cybersecurity;
5. Further strengthening cooperation with international financial institutions [15].

5. Conclusion

The results of the study show that digital technologies play an important role in increasing the efficiency of state budget management. An analysis of international experience shows that the digitalization of the state treasury system allows achieving the following results:

1. Increasing the transparency of state financial management;
2. Reducing the level of corruption;
3. Increasing operational efficiency;
4. Improving the quality of decision-making.

The following proposals and recommendations have been developed for Uzbekistan:

1. **Creation of an integrated financial information system** - using the experience of the South Korean D-Brain system, to create a single integrated financial information system that ensures data exchange between all government agencies;
2. **Introduction of artificial intelligence and machine learning technologies** - introduction of artificial intelligence and machine learning technologies to increase the efficiency of financial forecasting and risk management;
3. **Introduction of blockchain technologies** - introduction of blockchain technologies to increase the transparency of government procurement and payments;
4. **Application of big data analysis technologies** - application of big data analysis technologies to assess the effectiveness of budget expenditures and improve the quality of decision-making.

It is advisable to conduct future research in areas such as assessing the economic efficiency of digitizing the state treasury system, determining the volume of investments required to introduce digital technologies, and assessing operational efficiency after the introduction of digital technologies.

REFERENCES

[1] B. S. Akhmedov, "Problems and prospects of digitizing the financial system of Uzbekistan," Economy and Innovative Technologies, no. 1, pp. 45–57, 2024. [Online]. Available: http://www.iqtisodiyot.uz/journals/2024/1/article5

[2] A. Damodaran, "Methodology for comparing financial management systems," International Journal of Finance and Management, no. 3, pp. 78–92, 2022.

[3] World Bank, "Report on the assessment of financial management reforms in Uzbekistan," 2024. [Online]. Available: https://www.worldbank.org/uz/reports/financial-management-reforms-uzbekistan-2024

[4] E. A. Zotova, "The role of the treasury system in public finance management," Finance and Credit, no. 8, pp. 112–125, 2021.

[5] J. Lee and K. Park, "Evaluating the effectiveness of the South Korean D-Brain system," Journal of Digital Government Studies, no. 2, pp. 67–84, 2023.

[6] President of the Republic of Uzbekistan, "On approval of the Digital Uzbekistan-2030 strategy and measures for its effective implementation," Decree No. PF-6079, Oct. 5, 2020. [Online]. Available: https://lex.uz/uz/docs/5030957

[7] World Bank, "D-Brain in South Korea." [Online]. Available: https://www.worldbank.org/en/topic/governance/brief/d-brain-in-south-korea

[8] U.S. Department of the Treasury, "Digital is Here for the Federal Government." [Online]. Available: https://fiscal.treasury.gov/fit/deee/

[9] J.P. Morgan, "Digital Transformation of Treasury." [Online]. Available: https://www.jpmorgan.com/content/dam/jpm/treasury-services/documents/Digital-Transformation-of-Treasury_FINAL.pdf

[10] myDiapason, "The Digitalization of Treasuries." [Online]. Available: https://www.mydiapason.com/en/ressources/the-digitalization-of-treasuries/

[11] Highradius, "Treasury Management Digital Transformation." [Online]. Available: https://www.highradius.com/resources/Blog/treasury-digital-transformation/

[12] Treasury Management, "5 Reasons Why Singapore is a Treasury 4.0 Hotspot." [Online]. Available: https://treasury-management.com/blog/5-reasons-why-singapore-is-a-treasury-40-hotspot/

[13] O. Abiola-Adams, C. Azubuike, A. K. Sule, and R. Okon, "Treasury innovation: The role of technology in enhancing strategic treasury operations and financial performance," Gulf Journal of Advanced Business Research, vol. 3, no. 1, pp. 157–171, 2025.

[14] E. V. Gavrilina and A. E. Gavrilinb, "The role and place of the property of the treasury of the Russian Federation and the state treasury of the subjects in the management of the public sector of the economy both in the regions and in the country as a whole," Management Sciences, vol. 13, no. 2, p. 46, 2023.

[15] M. V. Gruzd, "Directions of modernization of the information and technical support of the treasury system," Management Sciences, 2024.