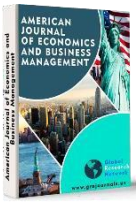

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Article

Financial and Digital Technologies in the Treasury System

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Abstract: Digitalization has become a decisive factor in transforming public financial systems, where efficiency, transparency, and security are increasingly demanded. In Uzbekistan, the treasury system is undergoing modernization through technologies such as blockchain, artificial intelligence, big data, cloud computing, and FinTech, which not only automate processes but also enhance public trust and financial inclusion. While global studies highlight the potential of these technologies, little is known about their systemic integration, challenges of cybersecurity, legal adaptation, and human capital readiness in the Uzbek treasury context. This study analyzes the application of digital technologies in Uzbekistan's treasury system, evaluates their impact on public financial management, and proposes recommendations for further development. The findings demonstrate that blockchain strengthens transparency and accountability, big data improves budget forecasting, AI enhances fraud detection and automation, and FinTech simplifies citizen–government financial interactions, though cybersecurity and legislative flexibility remain pressing concerns. The research provides a context-specific evaluation of digital treasury reforms in Uzbekistan, linking global best practices with national priorities such as economic competitiveness, fiscal stability, and integration with international standards. Strengthening cybersecurity, developing skilled personnel, accelerating digital infrastructure, and aligning with global regulations will be crucial for Uzbekistan to fully realize the potential of digitalization in treasury management, ensuring sustainable economic development in the digital era.

Keywords: Digitalization, treasury system, blockchain, artificial intelligence, big data, cybersecurity.

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1. Introduction

In recent decades, digitalization has become an integral part of the transformation of public financial systems. In the context of rapid development of information technologies, as well as growing demands for efficiency, transparency and security of financial processes, treasuries are faced with the need to implement innovative financial and digital technologies. These technologies allow not only to automate routine processes, but also to significantly improve control over public expenditure, as well as to increase the level of trust in public financial institutions [1].

Digitalization of treasury systems includes the implementation of technologies such as electronic document management, real-time financial flow management systems, blockchain, artificial intelligence (AI), and big data analysis technologies, which ensure more efficient distribution and monitoring of public funds. This allows for significantly faster settlement processes, increased accuracy in accounting and budget management, and minimization of the risks of errors and fraud [2].

However, the implementation of these technologies in the treasury system is associated with a number of challenges, including cybersecurity, legal regulation and adaptation of human resources. Despite these difficulties, the efficiency and scalability of new solutions attracts the attention of not only government agencies, but also the private sector, which makes the topic of digital and financial technologies in the treasury particularly relevant for study and practical application [3].

The purpose of this study is to analyze modern financial and digital technologies used in the treasury system, as well as to identify their impact on improving the manageability and transparency of public finances. The study will assess current technologies, as well as consider possible prospects for their further implementation and development [4].

Literature review

In recent years, the topic of introducing financial and digital technologies into public financial systems has attracted the attention of the scientific community, as such technologies can radically change approaches to budget management, increasing the transparency and security of financial transactions.

One of the first significant studies in this area is the work of Dimitriou, D. and Papageorgiou, A who examine the use of blockchain technologies in the public sector. The authors emphasize that blockchain can increase the transparency of public finances, improve transaction security and reduce administrative costs, offering examples of successful implementations in the European Union [5].

Koch, S. and Schmitt, C. focus on the role of big data in the digitalization of public finances. They argue that big data analytics allows for budget forecasting, improves expenditure management, and increases transparency in the treasury system. The introduction of such technologies contributes to improved monitoring and informed decision-making in the face of financial uncertainty [6].

Zhang, H. and Li, W. explore the use of artificial intelligence (AI) in public sector financial systems. The authors show how AI and machine learning can be used to automate budget management processes, prevent fraud, and improve the efficiency of financial operations. However, the implementation of such technologies requires major changes in human resources policies and the legal framework [7].

McKinsey & Company noted in their report that digitalization of public financial systems helps improve planning and reporting processes. The introduction of digital platforms improves interaction with citizens, reduces operating costs and increases the availability of public financial services. The experience of a number of developed countries confirms the effectiveness of using digital solutions in the management of public funds [8].

OECD in its report highlights the importance of technological maturity for effective digital transformation of public finances. It points to the role of cloud technologies and platforms for centralized accounting and distribution of financial flows. OECD also highlights key challenges, including data protection and the need to adapt legislation to support digital initiatives [9].

Bucy, J. and Lee, K. examine the impact of financial technologies (FinTech) on public financial management. They consider the introduction of digital wallets for tax payments, as well as the use of cryptocurrencies and other technologies to simplify public financial transactions. The authors emphasize the need to improve financial literacy and technical training of personnel in government agencies [10].

Pereira, R. and Martins, L. focus on the cybersecurity challenges that arise in the process of digitalization of public finances. They argue that with the development of digital technologies, the threat of cyberattacks increases and propose the implementation

of advanced cryptographic methods and data protection systems to prevent information falsification and protect against fraud [11].

Finally, the World Bank in its report analyzes the potential of digital technologies to improve the efficiency of public financial management. The World Bank focuses on the automation of budgeting, auditing and reporting processes, as well as the use of digital platforms to improve interaction with the private sector. The introduction of such technologies allows for greater openness and accountability of public finances [12].

Thus, research into digital and financial technologies in treasury systems shows that these technologies can significantly improve the efficiency, security and transparency of financial transactions in the public sector, but they require significant efforts to overcome challenges related to legal regulation, cyber threats and staff training.

Research methodology

The research employs a qualitative and analytical approach to examine the integration of financial and digital technologies in the treasury system of Uzbekistan. The study is grounded in a comparative analysis of international and domestic practices, with a focus on identifying the role of technologies such as blockchain, artificial intelligence, big data, cloud computing, and FinTech in improving public financial management. Data were collected through the review of official reports, academic literature, and case studies from countries that have implemented treasury digitalization, enabling a contextual understanding of global best practices and their applicability to Uzbekistan. A systems approach was adopted to evaluate the efficiency, transparency, and security outcomes associated with these technologies, while also considering challenges such as cybersecurity threats, legislative adaptability, and human capital development. Statistical analysis and forecasting techniques were employed to assess the potential of digital tools in enhancing budget planning, expenditure management, and financial accountability. The methodology emphasizes triangulation by combining theoretical insights with practical evidence from case examples, ensuring both conceptual depth and empirical relevance. This approach allows the study not only to assess the current state of treasury digitalization in Uzbekistan but also to provide forward-looking recommendations aligned with international standards. Ultimately, the methodology is designed to capture both the opportunities and risks of digital transformation, offering a balanced evaluation of how financial innovations can contribute to strengthening the country's economic stability, institutional efficiency, and integration into the global digital economy.

Analysis and results

Digitalization of treasury systems is an important and inevitable process in the modern economy, which opens up new opportunities for public finance management. The introduction of financial and digital technologies significantly transforms not only budgeting processes, but also the level of transparency, accessibility and security of financial transactions [13].

One of the most promising areas of digitalization of the treasury system is the introduction of blockchain technologies. Blockchain provides a high degree of transparency and data security, which is critical for public finances, where the risk of fraud and manipulation must be minimized. In some countries, blockchain is actively used to account for public assets and control the movement of funds. This helps increase the trust of citizens and businesses in the financial system, reducing administrative costs and increasing the efficiency of financial transactions.

Another important element of digital transformation is the use of big data for budget forecasting and financial planning. Big data allows for more accurate and informed forecasts, which helps government agencies effectively manage expenditure, optimize the

distribution of funds, and increase transparency in the process of executing the state budget. Big data analytics can be used to quickly respond to changes in the economy and make informed decisions in uncertain conditions.

Integrating artificial intelligence (AI) into public finance management processes helps automate routine operations and improve forecasting accuracy. AI can effectively analyze financial data, identify anomalies, and predict changes in budget revenues and expenditures. AI can also be used to combat financial fraud, automatically verify tax returns, and monitor financial transactions in real time, significantly accelerating audit and verification processes.

FinTech technologies play an important role in improving interactions between government agencies and citizens. The introduction of mobile applications and electronic platforms for paying taxes, fines and other financial obligations significantly improves the convenience of citizens, reduces the time for financial transactions and helps increase tax collection. The use of digital wallets and online payment systems also increases the level of financial inclusion, enabling people in any region of the country to make payments and receive government services [14].

However, with the introduction of digital technologies into the treasury, a new set of risks associated with cyber threats and data protection also appears. One of the most important challenges for public financial systems is the need to protect against cyber attacks and ensure data security. In the context of rapidly developing technologies, continuous improvement of security systems is required, including the use of cryptographic methods, multi-level security systems and the creation of platforms protected from counterfeiting. This requires not only technological efforts, but also a change in approaches to organizing security within the civil service (Table 1).

Table 1. Financial and digital technologies in the treasury system

Technology	Description	Example of application
Blockchain	A decentralized accounting system that ensures security, transparency and immutability of data.	Used for accounting of government assets, debt and tax management in Estonia and the UK.
Big Data	Analytics and processing of big data for budget forecasting, monitoring and analysis of financial transactions.	Used in the US and Canada for budget expenditure analysis and revenue forecasting.
Artificial intelligence (AI)	Machine learning and data analytics to automate processes, predict and prevent fraud.	Applying AI in Singapore for Automatic Auditing and Control of Financial Transactions.
Cloud Computing	Using remote servers to store, process and access data, which reduces infrastructure costs.	Cloud solutions in Finland for public finance management and reporting.
FinTech solutions	Innovative financial technologies, including mobile wallets, online payments and other digital tools to simplify financial transactions.	Implementation of electronic wallets for tax payments in Denmark, Sweden and India.
Electronic payments	Digital platforms for paying taxes, fines and other financial obligations by citizens and businesses.	Implementation of online payment systems for citizens and businesses in Europe and Asia
Robotization of processes (RPA)	Automation of routine processes using software robots, which speeds up the execution of tasks and minimizes the human factor.	Using RPA in South Korea to automate tax filing and reporting.

Digital identifiers Using digital IDs to verify citizens' identities when conducting financial transactions, increasing security and convenience. Use of digital IDs in India for paying taxes and receiving government services.

Cybersecurity Methods of protecting data and financial transactions from cyber attacks and counterfeiting, including cryptographic systems, multi-level protection and monitoring.Application of data protection systems in Israel and China for the security of financial transactions.

Digital government Creation of a single digital platform for the provision of public financial services, management of public expenditure and reporting. Digital budgeting and reporting platforms in the UK and Canada.

Table 1 provides an overview of the main financial and digital technologies that are being actively implemented in treasury systems around the world. These technologies help transform public financial management processes, providing a higher level of efficiency, security and transparency. Let us consider the main points and conclusions that can be drawn based on the presented technologies.

1. Digitalization for increased transparency and control. One of the most significant effects of digitalization of the treasury system is increased transparency. For example, technologies such as blockchain ensure immutability and transparency of data, which significantly reduces the risks of corruption and manipulation of financial flows. In countries that actively use blockchain, citizens can confidently monitor how public funds are spent. This also helps increase trust in financial systems.

2. Efficiency and reduced operating costs. Technologies such as cloud computing, robotic process automation (RPA), and artificial intelligence (AI) allow you to automate many routine operations, which significantly reduces the cost of time and resources. Using RPA in the reporting process or AI for automated auditing and forecasting can significantly reduce the workload of employees and speed up financial decision-making. This increases the overall efficiency of the treasury and allows you to allocate resources for more strategic planning and analysis.

3. Simplifying interactions with citizens and businesses. The introduction of FinTech solutions such as e-wallets, mobile applications and e-payment platforms actively improves the interaction of citizens and businesses with government financial authorities. The use of such technologies facilitates the process of paying taxes, fines and other obligations. This reduces the burden on physical infrastructure, simplifies access to government services and contributes to increasing the level of financial inclusion, allowing citizens to easily make payments and use services without having to visit government agencies.

4. Increased security and data protection. As the volume of digital transactions increases, so does the importance of cybersecurity. The use of modern data protection methods, such as cryptographic technologies and multi-layered security, is becoming key to preventing information leaks and cyberattacks. The implementation of such technologies helps countries guarantee the security of financial transactions, which is critical for trust in the financial system. Countries with highly developed digital systems are actively developing new data protection standards and enhanced cyber defenses to counter growing threats.

5. Analytics and forecasting. The use of big data and analytical platforms in the treasury system helps to more accurately forecast budget revenues and expenditures. Big data-based systems allow analyzing and processing huge amounts of information, which enables government agencies to accurately plan budget expenditures, predict possible financial crises and quickly respond to changes in the economy.

Digitalization of treasury systems using various financial and digital technologies is an important step towards more efficient and secure management of public funds. The introduction of technologies such as blockchain, artificial intelligence, cloud computing, big data and others helps to increase transparency, reduce operating costs and improve interaction with citizens. However, the success of digital transformation depends on the effective implementation of technologies, data protection and staff development. It is also important to take into account the challenges associated with the adaptation of legislation, as well as the need to ensure an adequate level of cybersecurity [15].

Thus, these technologies not only help improve the efficiency of public financial management, but also play a key role in the development of a modern, sustainable and open financial system.

2. Conclusion

Digitalization of the treasury system is a key element in the process of modernization of public administration and the financial system. The introduction of advanced financial and digital technologies, such as blockchain, artificial intelligence, big data, cloud computing and others, opens up new opportunities to increase the efficiency and transparency of public finance management, improve interaction with citizens and businesses, and strengthen the security of financial transactions.

For Uzbekistan, the process of digitalization of the treasury is an important step towards improving the country's economic stability and competitiveness. In recent years, Uzbekistan has been actively implementing various digital initiatives aimed at improving public administration and creating favorable conditions for businesses and citizens. However, in order for the country to make the most of the potential of digital technologies in the field of treasury, a number of factors must be taken into account.

Suggestions for Uzbekistan:

First, Uzbekistan should accelerate the implementation of blockchain technologies to ensure transparency and protection of public finances. The development of blockchain infrastructure will also improve control over public funds and increase citizens' trust in the financial system. In addition, it is necessary to develop electronic payment systems and mobile applications, which will simplify the process of paying taxes, fees and other obligations, improving financial inclusion and accessibility of public services.

Secondly, Uzbekistan should integrate artificial intelligence (AI) and big data analytics technologies to more accurately forecast budget expenditures, manage public assets, and prevent financial risks. The use of these technologies will help improve planning accuracy, reduce financial losses, and improve budget execution control, which in turn will improve the efficiency of public administration and financial operations.

Third, cybersecurity needs to be strengthened to protect government and financial data in the face of growing threats from cybercriminals. Uzbekistan should develop cybersecurity infrastructure, including the use of modern cryptographic methods and multi-level data protection systems, which will enhance the security of financial platforms and provide protection from external attacks.

Fourth, an important aspect of digitalization is the training of qualified personnel for the effective use of new technologies. Uzbekistan needs to invest in the training of civil servants and specialists in finance and information technology to ensure a high level of competence in working with modern digital solutions. This will not only improve the efficiency of processes, but also minimize the risk of errors.

Fifth, Uzbekistan should actively work on integrating national digital solutions with international standards. This will ensure harmonization with global practices, improve interaction with other countries, increase confidence in the national financial system, and accelerate the development of foreign trade. Such steps will also help increase the country's competitiveness in the international arena

Sixth, it is important to ensure the flexibility of legislation to quickly adapt to new digital challenges and opportunities. This includes creating a regulatory framework that supports the introduction of innovations such as blockchain, cryptocurrencies, digital financial

instruments and other advanced technologies. Flexible legislation will help to quickly respond to changes in global practice and stimulate the development of new financial technologies.

These proposals represent key areas for the effective use of digital technologies in the treasury system of Uzbekistan, which will increase the transparency, efficiency and security of public finance management, improve interaction with citizens and businesses, and create a sustainable basis for economic development in the context of the digital economy.

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