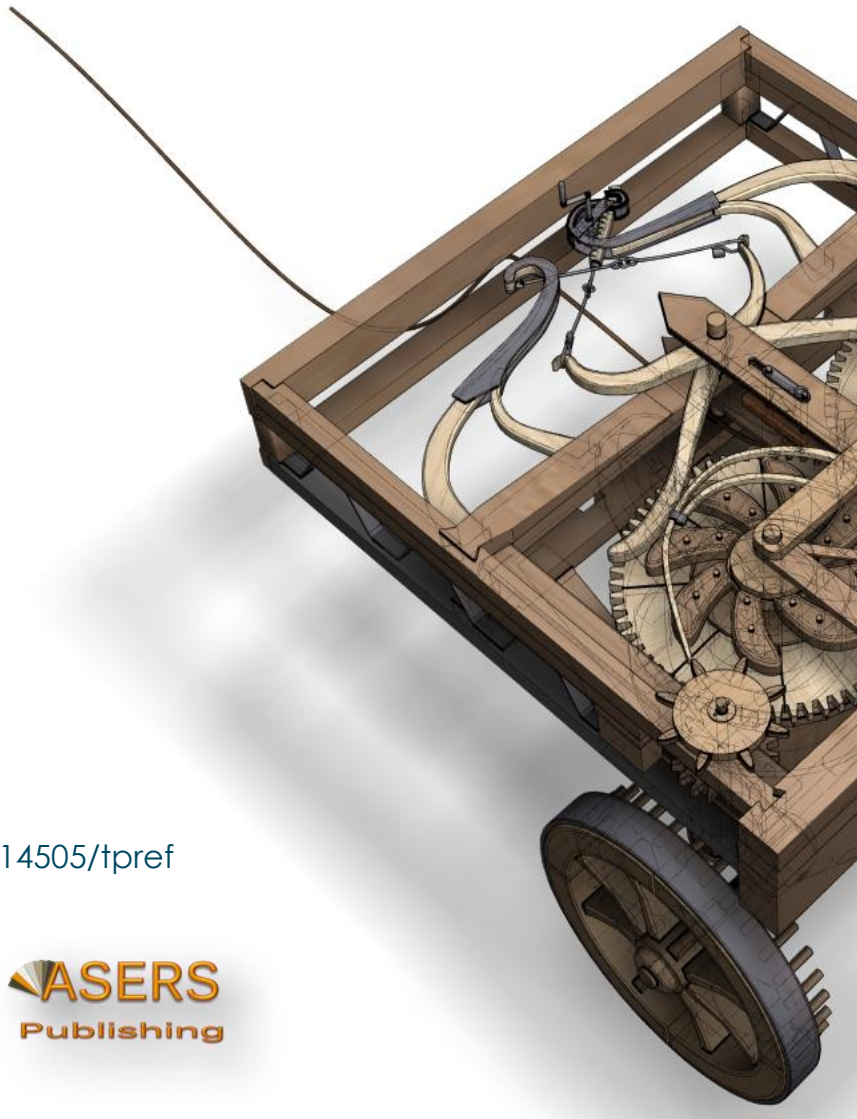
Theoretical and Practical Research in Economic Fields

Special Issue



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Theoretical and Practical Research in Economic Fields

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All the papers will be first considered by the Editors for general relevance, originality, and significance. If accepted for review, papers will then be subject to double blind peer review.

This Special Issue was created at the request of a group of researchers from Ukraine. It is a response to the challenging situation of Ukrainian scholars due to the Russian invasion as well as the growing demand for knowledge on Ukrainian issues.

We would like to express our endless thank to our colleagues, scholars from Ukraine who are working amid the war on topics that are important for all. Also, we thank all our international authors for their valuable contributions to this Issue.

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The Impact of Digital Ecosystems on the Financial Management Efficiency in State Institutions

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Abstract: Purpose: Digital ecosystems are a key driver of development at the current stage, in particular, in state institutions. Increasing efficiency of financial management through digitalization in the public sector is one of the key directions. The aim of the study is to determine the impact of digital ecosystems on the results of financial management in Ukrainian and Azerbaijani public institutions.
Methodology: The research employed the methodological tools of regression and correlation analysis, as well as descriptive statistics to determine the impact of digitalization on the effectiveness of financial management of institutions. The application of the least squares method revealed a statistically significant positive effect of digital technology spending ($\beta 1 = 0.0528$, $p = 0.010$) on management efficiency, while other variables showed insignificant or negative effects. The model explains 43.6% of the variation in the dependent variable, with R-squared = 0.436 and Adjusted R-squared = 0.285.
Findings: Correlation analysis confirmed a strong positive relationship ($r=0.58$) between digitization costs and management efficiency. The article provides practical recommendations for optimizing the implementation of digital technologies in the management of public finances, including the development of electronic services and increasing the level of digital literacy.
Originality: Further research in the chosen direction will be focused on the formation and implementation of a system of key indicators of the effectiveness of digital ecosystems from the perspective of the efficiency of financial management in public institutions of Ukraine and Azerbaijan.
Keywords: financial management; digital strategies; digital ecosystems; investment in digitization; state institutions.
JEL Classification: G20; G28; G30.

Introduction

The speed of technological development is constantly increasing in the modern world require state institutions to adapt to new challenges. One of the main directions of such adaptation is the digitalization of financial management of state institutions, which includes the integration of digital ecosystems. These systems have the potential to significantly increase the efficiency of the management processes of institutions by optimizing the work with data, increasing transparency, and simplifying the interaction between different departments and institutions. The government's digital services are central to the fulfilment of its mission. For example, the US government (The White House, 2023) recorded 2 billion visits to federal websites every month, representing about 80 million hours of interaction with the public. Meanwhile, 45% of federal websites are not mobile-friendly, and 60% of federal websites have potential accessibility issues. Given the importance of these aspects, the relevance of researching the impact of digital ecosystems on financial management is becoming increasingly urgent.

Accordingly, an important task is the analysis of the effectiveness of the implementation of digital ecosystems in the financial management of state institutions, the identification of the main advantages and possible risks that may arise in this process. The existing studies are often reduced to evaluating the technical aspects of the implementation of digital systems and leave aside the important issues of organizational changes, cultural resistance, and the impact on human resource (HR) management policies. Besides, insufficient attention is paid to the analysis of the long-term impact of digitalization on the sustainability of financial management and goals in this area for public institutions. In this regard, it is important to rely on the experience of implementing digital technologies in different countries, analyse examples of successful practices and point out problematic aspects that require additional research. The main challenges arising from the integration of digital ecosystems in state institutions include complications with data standardization, information security, and compatibility of various platforms. At the same time, digital ecosystems offer ample opportunities to automate many processes of public institutions that traditionally require significant time and resources. Accordingly, research should focus on assessing the impact of the implementation of digital technologies not only on increasing the efficiency of financial operations, but also on ensuring greater responsibility and transparency of state institutions.

The aim of the article is to determine the impact of digital ecosystems on the effectiveness of financial management in state institutions in order to identify the possibilities of digitalization in Ukraine and Azerbaijan. The aim involves the fulfilment of the following research objectives:

1. Analyse modern financial management practices in state institutions under the influence of digitalization;
2. Assess the relationship between digital ecosystems and the effectiveness of financial management in state institutions of Ukraine and Azerbaijan;
3. Develop strategies for the optimal implementation of digital solutions in financial management for increasing the efficiency of state institutions.

1. Literature Review

Many studies deal with the problems of using digital systems in various organizations, including the state system, and their impact on financial efficiency. Zhuk (2022) examines how digital technologies are transforming public financial management. The work analyses new challenges and opportunities that arise in connection with the introduction of digital tools, and also indicates changes in decision-making processes and their transparency. Agyapong (2021) examines how digitization is affecting institutions in Ghana. The study determines the impact of digital innovation on efficiency and financial inclusion. It is emphasized separately that the digital economy can have both positive and negative factors of influence on the state of society. Ekĩnci (2021) analyses how digitalization affects the efficiency of financial services. The work considers digitization as a key factor that improves service and reduces the cost of providing it. Tian *et al.* (2022) examine how the development of the digital economy contributes to the efficiency of public sector investment. The results show that digitalization can significantly increase the efficiency of investment in environmental projects. Volosovych and Baraniuk (2019) examine the impact of digitization on public financial control. The researchers cover the changes in control and audit mechanisms that occur due to the introduction of digital technologies, separately focusing on increasing the efficiency and transparency of public finances. Bisht *et al.* (2022) emphasize that digitalization increases the transparency, efficiency, and adaptability of financial processes of institutions.

Wang *et al.* (2022) indicate that digitalization in finance contributes to the growth of efficiency, innovation, and competitiveness of organizations. Mavļutova *et al.* (2022) see digitization as a key element for sustainable development through improved financial inclusion and operational efficiency. Melnik and Antipova (2019) analyse how managerial aspects affect the implementation of digital technologies and indicate the need to adapt organizational structures. Taka and Bayarçelik (2023) emphasize that the sustainable implementation of digital

technologies requires not only technological changes, but also organizational, cultural, and strategic innovations. Wang *et al.* (2020) analyse how digitalization affects the efficiency of financial management. The study shows that the implementation of digital technologies helps to optimize processes, reduce costs and increase the overall efficiency of the organization. Hontar (2021) examines how fintech solutions integrate into the wider financial ecosystem. The work emphasizes the advantages provided by digital platforms for controlling and managing finances and points to the importance of smart technologies in this process. Konovalova *et al.* (2019) analyse how digitalization is changing fundamental aspects of the monetary system. In this context, they study how digital currencies and new forms of payment systems affect the traditional understanding of money, its functions, and role in society.

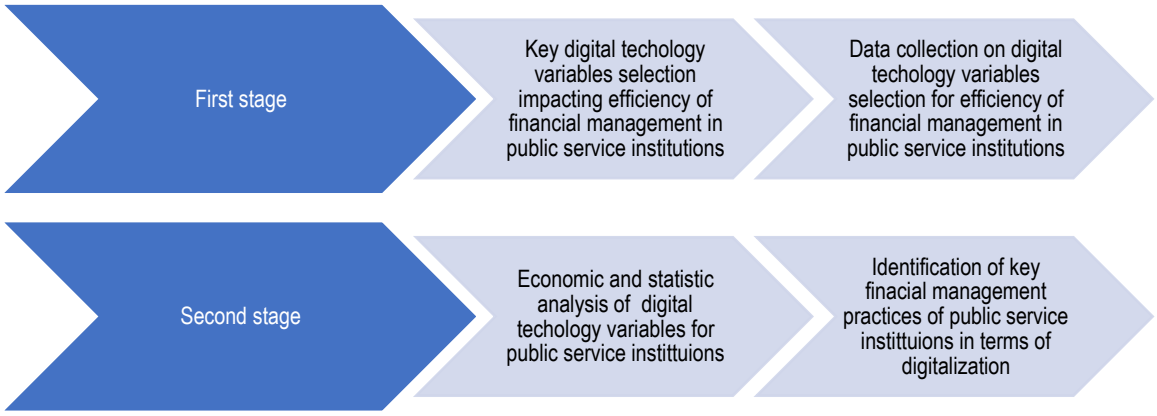
Muharsito and Muharam (2023) analyse the impact of digital financial inclusion on the performance of public banks. Digital inclusion enables state banks to optimize their resources and improve quantitative performance indicators. Moşteanu (2020) focuses on the impact of digitalization of financial services on the labour market. The author analyses how technological changes require new skills and cause changes in the employment structure. Digitization contributes to increased efficiency, but also requires retraining of employees and adaptation to new working conditions. Syrtseva *et al.* (2021) investigate the application of digital technologies in financial accounting and control over tax obligations of budget institutions. The researcher indicates an improvement in the accuracy and transparency of financial reporting using modern digital tools, which allows for more effective management of public resources. Burlacu *et al.* (2021) considers digital finance as a catalyst for development in the new economy. Researchers note that the integration of digital technologies opens new opportunities for growth and innovation, promotes sustainable development. Serah *et al.* (2024) examines the role of digital services in law enforcement from the perspective of the financial efficiency of the institution. Krasnykov *et al.* (2024) examine the impact of e-governance on the quality of public services and municipal property management. The work identifies the advantages and challenges associated with the implementation of electronic management, and also provides examples of best practices in this area. However, the issue of the influence of digital ecosystems on the effectiveness of financial management in state institutions of a number of developing countries (primarily, Ukraine and Azerbaijan) has not been sufficiently studied and requires more detailed consideration.

2. Methods

2.1. Research Design

The first stage of this study is the collection of data on digital ecosystems in public institutions and key factors influencing the state of financial management for their further analysis within the framework of the study. The next stage of the research is the study of the impact of selected factors on the effectiveness of financial management of state institutions in the context of digital ecosystems.

Figure 1. Research Scheme



Source: developed by the author

The methods of economic and statistical analysis (regression analysis, correlation analysis, analysis of descriptive statistics) were used to investigate the relationship between digital ecosystems and the efficiency of financial management of state institutions. As a result, the influence of the key digitalization factors on the effectiveness of financial management in the public sector was determined. The final stage of the research involved providing recommendations on the practical application of the obtained results. Research conclusions were drawn, and research prospects were outlined (Figure 1).

2.2. Sample

The studied sample includes 20 state institutions in Ukraine and Azerbaijan. The studied state institutions belong to the central authorities and are located in Kyiv and Baku, respectively. The research period covers 2020-2024. The indicators of the efficiency of financial management in state institutions (the level of budget utilization efficiency, the level of financial discipline), the intensity of the use of digital technologies in state institutions (spending on digital initiatives, the number of electronic services), the level technology availability (access to the Internet and other infrastructure resources), the level of digital literacy of managers and employees of public institutions. This methodological approach to sampling was chosen on the basis of a number of the above-mentioned earlier professional studies, namely Wang *et al.* (2020), Agyapong (2021), Ekĩnci (2021), Kwilinski *et al.* (2022), Zhuk (2022), McKinsey and Co (2022), Taka and Bayarçelik (2023), OECD (2023), European Commission (2023), UN (2023), PwC (2023), World Bank (2020), US Department of State (2023), Government Transformation Magazine (2023), President of the Republic of Azerbaijan (2021), Verkhovna Rada of Ukraine (2021).

2.3. Methods

The proposed methodological approach implies:

Regression analysis to find out how different management strategies affect the efficiency of financial management in public institutions. The regression analysis identified the strength and direction of the influence of the digital ecosystem on the effectiveness of financial management in state institutions. This gives grounds for recommendations for improving digital ecosystems in the financial management in the public sector;

Correlational analysis that enables the identification of how digital ecosystems affect the efficiency of financial management in the public sector. Accordingly, this contributes to the development of more effective digital ecosystems for better financial management in public institutions.

The variables for the model are presented in Table 1. The studied variables are selected on the basis of earlier studies Wang *et al.* (2020), Agyapong (2021), Ekĩnci (2021), Zhuk (2022), McKinsey and Co (2022), Taka and Bayarçelik (2023), OECD (2023), European Commission (2023), UN (2023), PwC (2023), World Bank (2020), US Department of State (2023), Government Transformation Magazine (2023), President of the Republic of Azerbaijan (2021), Verkhovna Rada of Ukraine (2021).

Table 1. Regression Model Variables

Variable	Calculation	Comment
Efficiency of financial management (Y)	Measured as % for Budget Utilization as the ratio of actual spending to the allocated budget	This variable measures how effectively public institutions manage their finances in the context of digital technology adoption.
Spending on digital technologies (X1)	Quantifiable measure in USD of total spending on digital initiatives and investments in digital infrastructure of public service institutions	This variable helps to determine how actively public institutions invest in digital technologies.
Number of digital services available in the state institution (X2)	Quantity of digital services, including electronic filing platforms, electronic voting, public engagement services, etc	This variable measures the number of electronic services available in each institution
Level of availability of digital technologies (X3)	Score from 1 to 10, 1 being the lowest and 10 being the highest, for availability of technology enabled by digital for public service institution	This variable measures availability of technologies based on digital platforms
Level of digital literacy of employees (X4)	Score from 1 to 10, 1 being the lowest and 10 being the highest, for Internet proficiency and software specialization skills of public service institution's employees	This variable measures the employees' competence in the use of digital technologies

Source: developed by the author

This study used software tools namely Google Sheets, Excel, and R to analyse the collected sample information. The research identified limitations related to the possibility of the model not taking into account certain factors affecting the efficiency of financial management of state institutions in the context of digitalization. These limitations were overcome by regularly checking and updating the data, which provides a reflection of the current state of financial management practices.

3. Results

We present the results of regression analysis by coefficients (Table 2). According to the constant, β0 is -1.0738 (p = 0.929). According to the variable Spending on Digital Technologies (X1), the β1 coefficient is 0.0528 (p = 0.010), which indicates a positive relationship between spending on digital initiatives and the efficiency of financial management of a public institution. In terms of the number of electronic services (X2), β2 was 0.1249 (p = 0.155), which indicates a positive effect of the number of electronic services on the efficiency of the financial management of the state institution. As for the technology availability (X3), the β3 coefficient is -0.0054 (p = 0.960), which identifies a slight negative effect of technology availability based on the network of digital ecosystems. In conclusion, the results of the regression analysis on the level of digital literacy (X4) of β4 at the level of -0.0283 (p = 0.570) indicate a weak negative effect of the digital literacy of employees on the effectiveness of financial management of a public institution.

Table 2. Regression Analysis Results

Variable	Coefficient	p-value	Effect Description
Constant (β0)	-1.0738	0.929	Insignificant, baseline level of efficiency
X1: Spending on digital technologies	0.0528	0.010	Positive relationship, significant
X2: Number of digital services available in the state institution	0.1249	0.155	Positive relationship, but not significant
X3: Level of availability of digital technologies	-0.0054	0.960	Insignificant negative impact
X4: Level of digital literacy of employees	-0.0283	0.570	Weak negative impact, not significant

Source: calculated by the author

The obtained results are interpreted below. Spending on digital initiatives has a statistically significant positive effect on the efficiency of financial management. The number of electronic services also shows a positive trend, but the effect is not statistically significant. The availability of technology and the level of digital literacy do not have a statistically significant effect on the efficiency of management according to the results of this model. These results provide a basis for understanding the key factors that influence the effectiveness of financial management in the context of the use of digital technologies.

The obtained results were confirmed through a statistical analysis of the developed model. The R-squared indicator is 0.436 - accordingly, the model explains about 43.6% of the variation of the dependent variable. The Adjusted R-squared indicator is 0.285. The F-test is 2.896 with a p-value of 0.0584, indicating that the model is statistically significant.

The results of the correlation analysis presented in the correlation matrix are shown in Table 3.

Spending on digital initiatives has a strong positive correlation (r = 0.58) with the effectiveness of financial management, confirming the regression results about the important impact of these investments. The number of digital services has a weak positive correlation (r=0.20) with efficiency indicating a potential, but not very strong effect on the efficiency of financial management in public institutions. Negative correlations of technology availability and digital literacy level with efficiency (r=-0.18 and r=-0.15, respectively) may indicate possible indirect relationships or the influence of other variables outside the scope of the studied model.

The analysis of the results of descriptive statistics by variables determined that spending on digital initiatives shows a significant level of investment in digital technologies among the studied state institutions (Average at the level of 191.44 units). A standard deviation of 48.00 shows high variability in spending levels, which may indicate different strategies or levels of involvement in digitization. The minimum and maximum show a spread of 104.34 to 278.96 units, confirming the large range of costs that occurs between the least and most invested institutions. In terms of the number of digital solutions, the Average of 4.34 shows that the average public institution has about 4 digital solutions. The standard deviation of 9.68 indicates moderate variability in the number of services, which may be related to the specifics or size of the state institution. In terms of technology availability, the Average of 79.73% shows a high overall level of technology availability. A standard deviation of 8.21% indicates a relatively homogeneous availability of technology among institutions. In terms of Minimum and Maximum, 62.37% to 90.57% shows that although most public institutions have high technology availability, some still need more technology availability.

Table 3. Correlation Matrix Results

Variables	Spending on digital technologies	Number of digital services available in the state institution	Level of availability of digital technologies	Level of digital literacy of employees	Efficiency of financial management
Spending on digital technologies	1.00	-0.16	-0.36	-0.03	0.58
Number of digital services available in the state institution	-0.16	1.00	0.11	-0.06	0.20
Level of availability of digital technologies	-0.36	0.11	1.00	-0.18	-0.18
Level of digital literacy of employees	-0.03	-0.06	-0.18	1.00	-0.15
Efficiency of financial management	0.58	0.20	-0.18	-0.15	1.00

Source: calculated by the author

Based on the results of the regression and correlation analysis, several recommendations can be made for improving financial management in public institutions through the implementation of digital ecosystems. The recommended directions for improving the digital ecosystems of state institutions are provided below on the basis of the previously performed analysis taking into account the goals of increasing the efficiency of financial management:

1. Investments in digital technologies: the results of the regression analysis showed that investments in digital technologies have a statistically significant positive effect on the efficiency of financial management. Digitization can increase the transparency of financial transactions, reduce costs through automation, and improve control over the use of budget funds. It is recommended to set clear targets for investments and define key performance indicators to regularly measure the impact of digitization.

2. Development and integration of electronic services: a positive correlation between the quality and quantity of electronic services and the efficiency of management indicates the potential for the development of these services. Wider implementation of electronic services can contribute to more efficient and convenient access of citizens to public services, which, in turn, can reduce the administrative burden on institutions. It is important to implement universal security and privacy standards to ensure trust and protect data.

3. Ensuring the availability of digital technologies: the negative correlation between the availability of technologies and efficiency may be caused by inefficient use of available resources. It is necessary to focus on the effective integration of available technologies into management processes, as well as on optimizing the use of resources to achieve the maximum return on investment in technology.

4. Increasing digital literacy: Increasing the level of digital literacy among government employees is critical. Considering the negative impact on short-term efficiency, long-term investment in education and training will contribute to increasing the employee competence and the effective use of digital tools. Developing specialized training programmes and regularly updating courses according to the latest trends in technology can significantly improve management outcomes.

Successful implementation of these initiatives requires a coordinated approach at all levels of governance, including stakeholder engagement, regular review of strategies, and adaptation of approaches to changing circumstances. It is also necessary to create an effective monitoring system to track progress and identify potential problems in the early stages of their development.

The development of digital ecosystems can significantly increase the efficiency of financial management in public institutions, promote their transparency and accountability. The basis of such development is the standardization of data and processes, which will ensure easy integration of new technologies and promote unity between different departments. Central to this is the integration of advanced technologies such as artificial intelligence and blockchain, which will automate the collection and analysis of financial data and ensure its security.

Increasing the level of digital literacy of employees through specialized training will be the key to the effective use of these innovations. At the same time, it is important to ensure a high level of data protection and privacy through the implementation of the most modern cyber security standards. Cooperation with the private sector will allow implementing best practices and technological solutions, thus increasing the overall efficiency and reliability of digital financial systems. The creation of open platforms for the integration of various digital services and tools plays a strategic role in this process. In particular, it promotes the exchange of experience and best practices between institutions, which ensures sustainable growth and adaptation to changing conditions of public finance management.

4. Discussion

This study determined the influence of digital ecosystems on the efficiency of financial management of state institutions in Ukraine and Azerbaijan. The leading role of an integrated approach to the development of digital ecosystems, taking into account the needs of effective financial management of state institutions, is emphasized. Emphasis is placed on the importance of supporting these efforts by increasing the digital literacy of the employees of state institutions (Paryzkyi *et al.* 2023). A separate focus is the need to make regular investment in digitization to achieve the appropriate result in terms of management efficiency in the public sector. These theses are supported by the earlier work of Zhuk (2022), which indicates the possibilities of transformation of public financial management with the help of digital technologies. In this regard, Zhuk (2022) separately emphasizes the factor of transparency of decision-making processes in state institutions due to digitalization. These findings are supported by earlier study of Agyapong (2021), which examines the impact of digitalization on institutions in Ghana with a focus on the impact of digital innovation on financial performance and inclusion. Additional confirmation of these results is provided by Ekĭnci (2021), which studies the impact of digitalization on the efficiency of financial services. In this regard, Ekĭnci (2021) points to the key importance of digitalization in improving service and reducing the cost of services. The proposed theses are supported by Tian *et al.* (2022) in terms of the development of the digital economy as a factor of increasing the efficiency of public investments.

Additional confirmation of the results is an earlier study by Volosovych and Baraniuk (2019) on the changes in the mechanisms of state financial control due to digitalization. In this regard, Volosovych and Baraniuk (2019) separately focus on increasing efficiency and transparency. In addition, these results are supported by the earlier work of Bisht *et al.* (2022) in terms of the fact that digitalization contributes to increasing the transparency and adaptability of financial processes in institutions. An earlier study by Wang *et al.* (2022) deals with the role of digitalization in increasing the efficiency of organizations. The work by Taka and Bayarçelik (2023) emphasizes the importance of sustainable adoption of digital technologies, which requires changes in technological, organizational, cultural, and strategic areas. Wang *et al.* (2020) demonstrate that digitalization contributes to process optimization and cost reduction, increasing organizational efficiency. These theses are confirmed in the earlier work of Syrtseva *et al.* (2021) regarding the use of digital technologies in the financial accounting of state institutions in the area of improving the accuracy and transparency of financial reporting. These results are supported by Serah *et al.* (2024) in terms of the impact of digital services on the financial efficiency of law enforcement agencies.

This thesis is confirmed by a previous study by Krasnykov *et al.* (2024) in terms of increasing the quality of financial management of municipal property due to digitalization. However, the proposed study, in contrast to the existing generality of already existing works, focuses on the importance of a systemic approach to the introduction of digitalization in public institutions. This approach should include consideration not only of the convenience of the digital service and cyber security, but also the task of internal management of the institution, namely the efficiency of financial management. This is reflected in a set of potential directions for the development of digital ecosystems, covering their integration and accessibility, as well as the critical importance of efforts to strengthen the digital literacy of the staff of public institutions.

Conclusions

The study revealed the importance of the integration of digital technologies into the financial management processes of state institutions in Ukraine and Azerbaijan. Investment in digital initiatives (X1) with a mean value of 191.44 units (standard deviation 48.00) provides a statistically significant positive effect on management performance, with a coefficient of $\beta 1 = 0.0528$ ($p = 0.010$) and a correlation of $r = 0.58$. This shows the importance of further investment in digitization to increase transparency and efficiency of operations. The number of e-services (X2), which averages 4.34 with a standard deviation of 9.68, shows a trending positive effect on financial management efficiency with a coefficient of $\beta 2 = 0.1249$ ($p = 0.155$) and a correlation of $r = 0.20$. This indicates the potential for development and optimization of digital services in state institutions.

Technology availability (X3) with a mean of 79.73% and a relatively homogeneous standard deviation of 8.21% shows a slight negative effect on efficiency, with a coefficient of β3 = -0.0054 (p = 0.960) and a correlation of r = -0.18. This may indicate the need for more effective integration and use of existing technologies. Digital literacy (X4) with minimum and maximum values of 62.37% and 90.57%, respectively, shows a weak negative effect on performance with coefficient β4 = -0.0283 (p = 0.570) and correlation r = -0.15. This emphasizes the importance of increasing the level of education and training in digital skills. The model's R-squared is 0.436, indicating that the model explains approximately 43.6% of the variation in financial management performance. The Adjusted R-squared is 0.285 and the F-test is 2.896 with a p-value of 0.0584, indicating the statistical significance of the model as a whole. The directions for the development of digital ecosystems of state institutions were outlined based on the results of the study. First, it is an increase in investments in digital technologies, with the aim of ensuring high transparency and management efficiency. Second, it is optimization of the quantity and quality of electronic services to increase their impact on efficiency. Third, it is the effective integration and use of technology, ensuring its accessibility, and increasing the employees' digital literacy. The approach to implementation should include coordinated work at all levels of management, regular monitoring of implemented changes, and flexible adaptation of digital strategies in accordance with changing conditions and requirements.

The novelty of the research concerns the formulation of a concept that summarizes approaches to the implementation of digitalization in state institutions, combining the task of ensuring the convenience and security of digital systems with increasing the efficiency of financial management. This was realized by formulating a unique set of indicators and applying analysis methods that allowed us to cover all key aspects of the investigated problem, namely, the effectiveness of financial management, spending on digital technologies, the number of available digital services, the availability of digital technologies and the level of digital literacy of workers. As a result, the influence of the main factors of digitalization on the effectiveness of financial management in the public sector was revealed, which is the basis for optimizing the implementation of digital technologies. An important conclusion of the work is the confirmation of the connection between investments in digitalization and the efficiency of financial services, as well as the quantity and quality of digital services, which allows considering investments and expanding the range of services as the main determinants of optimization.

Credit Authorship Contribution Statement

The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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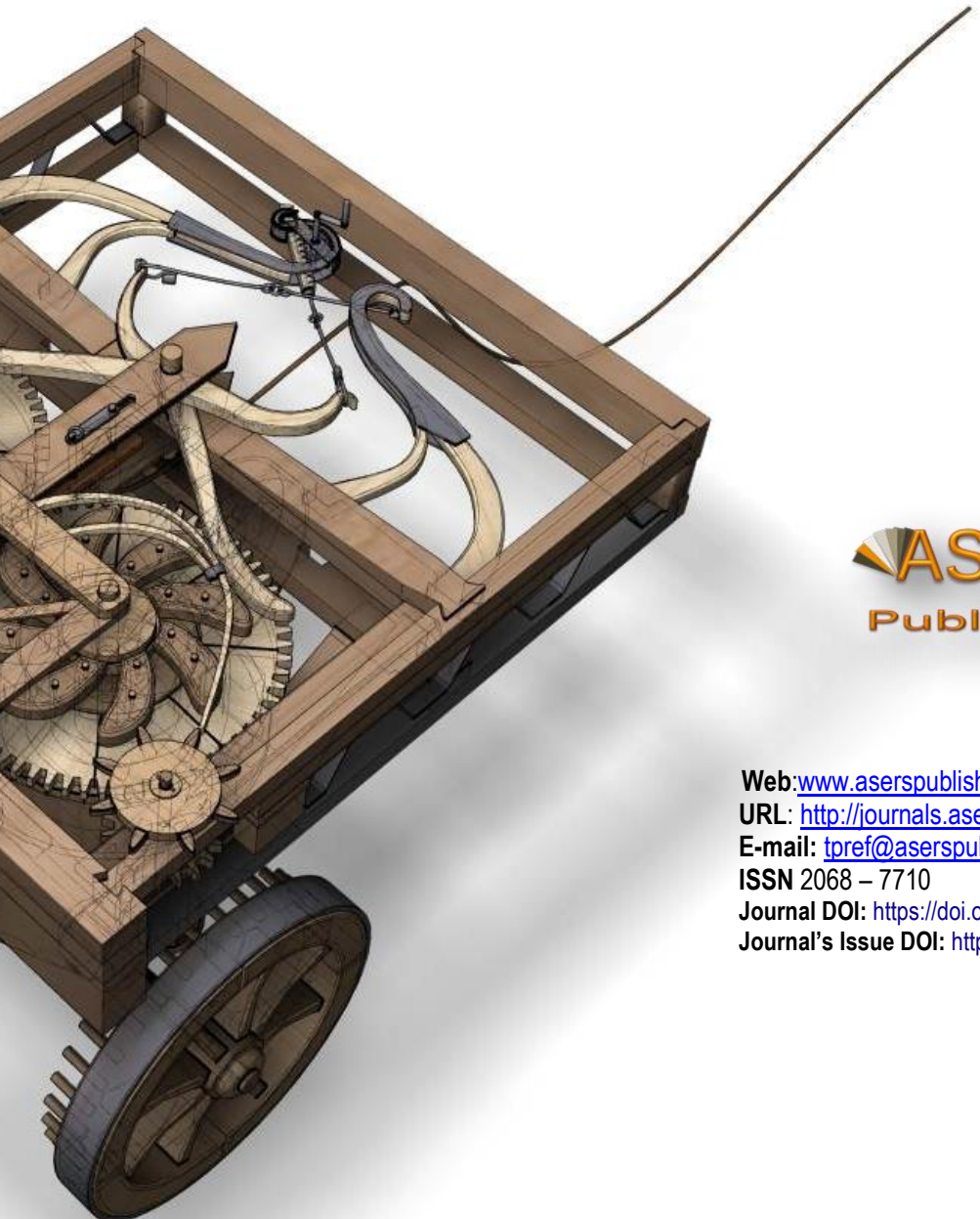

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