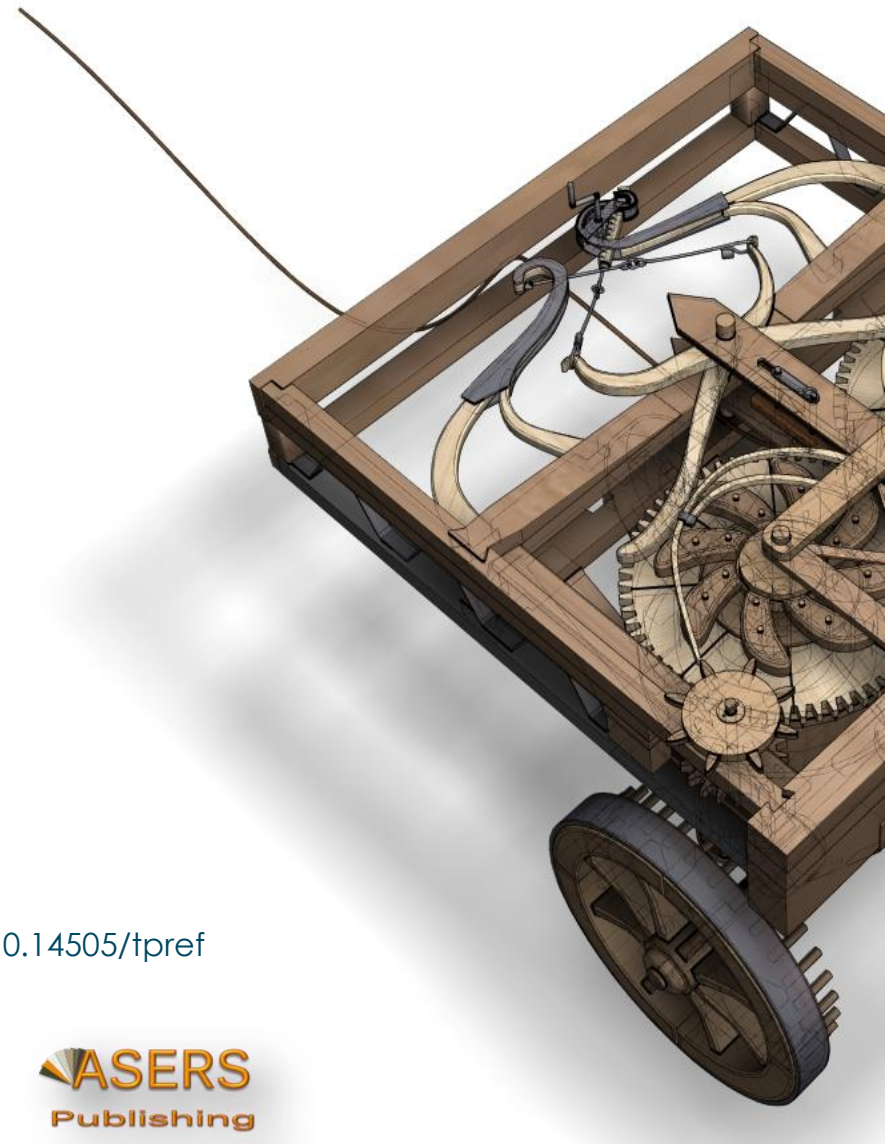
Theoretical and Practical Research in Economic Fields



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Theoretical and Practical Research in Economic Fields

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The Impact of Digitalization of Social Services on the Economic Efficiency of Public Expenditure

Vita CHERBA
University of Customs and Finance, Ukraine
ORCID: 0000-0002-1357-8827
vitaeconscn18@gmail.com

Tetiana KORIAHINA
University of Customs and Finance, Ukraine
ORCID: 0000-0002-6756-2484
kori1ahinatetiana@gmail.com

Olena RIABOSHAPKA
Interregional Academy of Personnel Management, Ukraine
ORCID: 0009-0008-4819-4517
riaboshapk0olena@gmail.com

Arsen PETROSYAN
Armenian State University of Economics, Armenia
ORCID: 0000-0002-9588-1140
arsen40petrosyian@gmail.com

Andrey SKRYLNIK
Research Institute of Finance, Economics, Management and Law
National University "Yuri Kondratyuk Poltava Polytechnic", Ukraine
ORCID: 0000-0001-9622-4217
skrylnika7@gmail.com

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Abstract: The digitalization of public administration is a key direction for improving the efficiency of budgetary resource use, especially in the field of social welfare. The implementation of digital technologies in social services contributes to the reduction of bureaucratic costs, acceleration of decision-making processes, and increased transparency of funding. The purpose of this study is to assess the impact of digitalization of social services on the economic efficiency of public spending. Methods of comparative analysis, regression modeling, and correlation assessment were used based on data from 15 countries in Europe, North America, and Asia. The study revealed a significant positive correlation between the level of digitalization and the reduction of administrative costs. In countries with a high level of digital services, adminis-trative costs for social programs decrease to 2 - 3% of total social expenditures, while in countries with a low level of digitalization, these costs can exceed 8 - 10%. Moreover, the introduction of digital platforms, such as "Diia" in Ukraine, helps reduce the time required for processing social assistance applications by 40 - 50%, which aligns with trends in other digitally advanced countries. The results of the study have significant practical value for optimizing social spending and developing policies for the digital transformation of public services. Recommendations are proposed to address digital inequality, enhance cybersecurity, and expand digital literacy programs to ensure equal access to electronic social services. Future research prospects include analyzing the long-term economic effects of digitalizing social welfare and evaluating its impact on the social inclusion of various population groups.

Keywords: digitalization; social services; public expenditure; budget efficiency; administrative costs.

JEL Classification: H50; H83; O33.

Introduction

In the modern context, the digital transformation of public administration is becoming a key factor in increasing the efficiency of budget expenditures, particularly in the provision of social services. According to OECD (2024), in countries with well-developed digital infrastructure, over 90% of social services are available online. This enables the reduction of administrative costs and accelerates decision-making. At the same time, government spending on the digitalization of the social sector is growing: according to World Bank estimates (2024), in 2023, the average share of such spending in the GDP of developed countries exceeded 2%. Traditional mechanisms of managing social support are often accompanied by bureaucratic inertia, inefficient resource allocation, and high administrative costs (Androniceanu *et al.* 2022). The integration of digital technologies into social policy helps mitigate these issues by streamlining request processing, automating verification mechanisms, and enabling a personalized approach to the distribution of social benefits (Do-brolyubova, 2021). In academic discourse, the digitalization of social services is seen as a means of achieving sustainable development goals. It holds potential not only for economic but also ecological efficiency by optimizing resources and reducing the burden on both the budget and the environment (Voronina *et al.* 2024). Furthermore, global experi-ence shows that digital platforms enhance governance efficiency, reduce administrative barriers, and ensure spending transparency (Bielialov *et al.* 2023).

Digitalization of social services helps reduce the state's operational costs. The implementation of electronic platforms, such as "Diia" in Ukraine, automates the processing of applications and reduces handling time (Ministry of Digital Trans-formation of Ukraine, 2024). This also minimizes the human factor, enhancing budget transparency and reducing corruption risks. Digital technologies also support evidence-based decision-making through big data analysis and social needs forecasting (Haug *et al.* 2024). However, digitalization challenges include digital inequality among the elderly and rural residents (Huang and Zhang, 2025), as well as the need for significant investments in cybersecurity and civil servant training (Negri and Dincă, 2023).

The scientific novelty of this study lies in the comprehensive analysis of the economic, administrative, and social as-pects of the digitalization of social services. Unlike previous studies, this work uses regression analysis based on data from 15 countries with varying levels of digitalization, allowing for the identification of quantitative relationships between digital reforms and the economic efficiency of social expenditures. The research also highlights the problem of digital inequality, which remains one of the main barriers to the implementation of electronic public services.

The purpose of the study is to evaluate the impact of digitalization of social services on the economic efficiency of public spending by analyzing financial indicators, resource allocation efficiency, and the availability of digital services. To achieve this goal, the following objectives are set:

1. To analyze the dynamics of government budget spending on social services before and after the introduction of digital solutions. This task allows the assessment of changes in the structure and volume of budget expenditures associated with digitalization. Its completion will help determine whether there has been a reduction in administrative costs and an increase in the efficiency of financial resource use.

2. To study the impact of digital technologies on the speed and transparency of social service delivery. Completing this task will help establish whether digitalization contributes to the reduction of bureaucratic procedures, shorter application processing times, and decreased corruption risks - all important indicators of the efficiency of digital platforms in the social sector.

3. To assess the availability of digital social services for different population categories and identify barriers to their use. This task aims to determine how evenly digital technologies have been implemented in the social sector and which population groups might be excluded from this process. The results will help develop recommendations for overcoming digital inequality and improving access to electronic social services.

1. Literature Review

The digitalization of social services is an important direction in the modernization of public administration, enhancing the economic efficiency of expenditures while creating both advantages and challenges for the social sector. Akulov (2024) notes that digital technologies promote budget transparency and reduce administrative costs, which is particularly important for bureaucratic states. This position is well-founded; however, it should be considered that transparency alone does not guarantee expenditure efficiency without proper oversight by state institutions. Similar conclusions are pre-sented in the work of Androniceanu (2023), who points out that although digital technologies can help optimize costs, their implementation requires significant investments, which are not always economically justified in the short term. This assertion is valid, as many countries face high initial

expenses for digital reforms; however, in the long term, such investments pay off through the reduction of administrative costs.

Bulavynets *et al.* (2024) emphasize the significant impact of digitalization on the quality of social services, noting that digital services provide a personalized approach and improve access to social assistance. At the same time, Considine *et al.* (2022) highlights the risks of automation, such as potential bureaucratic failures and digital discrimination. This criticism is justified, as automated systems may exclude certain categories of citizens from the process due to their insufficient digital literacy. Meanwhile, Danik *et al.* (2023) describe the characteristics of the digital economy in the context of military conflicts and emphasize that the digitalization of social services can become an important tool for supporting the population during crises.

Ihnatenko and Sadzaglishvili (2023) emphasize the problem of digital inequality, particularly among the elderly and rural residents. This aspect is extremely important, as the gap in access to digital technologies can negate the positive effect of digitalization for certain population groups. Dabbous *et al.* (2023) also points out the need for a comprehensive ap-proach to implementing digital technologies in the social sector, with the main challenges being high infrastructure costs, the need for legislative changes, and ensuring cybersecurity.

An important aspect is the link between digitalization and the achievement of sustainable development goals (Castro and Lopes, 2022). The automation of social services can contribute to more efficient resource use and greater environmental sustainability of public expenditures. Similarly, Kryvovyazyuk *et al.* (2023) argues that public-private partnerships can significantly increase the efficiency of digital reforms. This claim is well-founded, as the private sector often has more resources and technological capabilities to scale digital initiatives.

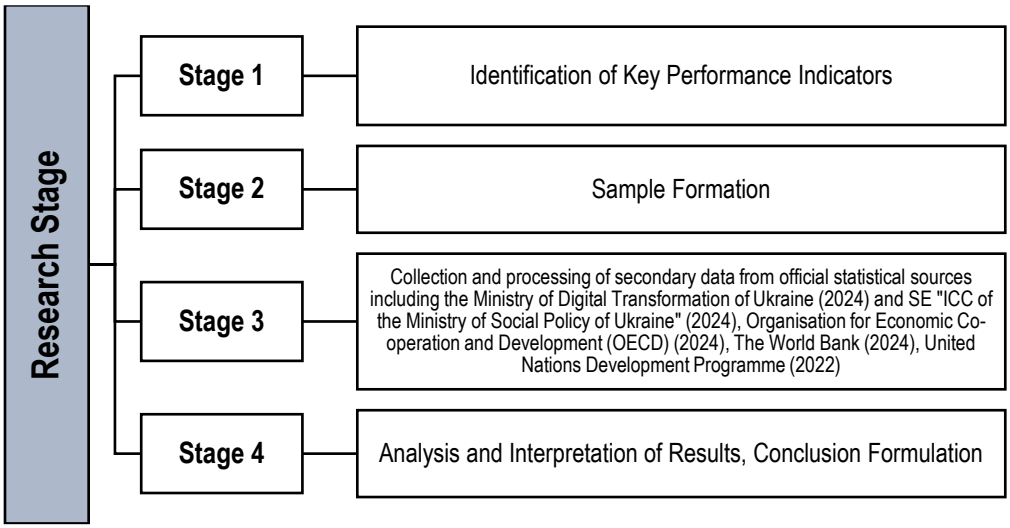
The literature review revealed several areas requiring further research. First, the issue of the long-term economic effect of social service digitalization remains underexplored. Studies mainly focus on short-term outcomes, while the assessment of long-term consequences for the budgetary system remains limited (Omar *et al.* 2024). Second, there are con-flicting results regarding the impact of digitalization on citizens' trust in public institutions (Cherniaieva *et al.* 2023). Third, the issue of cybersecurity and data leakage risks in the process of digitalizing social services remains insufficiently studied (Shashyna *et al.* 2023).

In general, the literature review confirms that the digitalization of social services has the potential to improve the eco-nomic efficiency of public spending. However, the implementation of digital technologies is accompanied by several challenges, including digital inequality, automation risks, and the need for substantial investment. Future research should focus on evaluating the long-term consequences of digitalization, its impact on public trust in government institutions, and cybersecurity issues in the social services sector.

2. Methods

The research methodology is based on a comprehensive approach to analyzing the impact of the digitalization of social services on the economic efficiency of public spending. It incorporates quantitative assessment methods that enable an objective measurement of the effects of digital reforms. The study was conducted in several stages, as presented in Figure 1.

Figure 1. Research Stages



Source: Author's own development.

At the first stage, indicators characterizing the efficiency of public spending in the field of social services were identified. The main indicators included: the level of administrative costs, the speed of processing social assistance applications, and the accessibility of digital services (Ministry of Digital Transformation of Ukraine, 2024). At the second stage, data from 15 countries in Europe, North America, and Asia were selected to form the sample (details provided in Appendix 1). These countries represent varying levels of digital maturity and socio-economic development, allowing for a representative picture of the impact of digitalization on public spending. This makes it possible to assess digitalization in diverse contexts and identify general trends. Selection criteria included: availability of open data on the digitalization of social services, GDP per capita, and government social expenditure indicators. The sample size was determined regarding data representativeness and comparability across countries. At the third stage, secondary data covering the period from 2016 to 2023 were collected from official sources, government portals of various countries, and academic publications relevant to the topic. At the fourth stage, data were processed using mathematical modeling and statistical analysis methods.

A comparative analysis of public spending efficiency was conducted across countries with different levels of digitalization. The results allowed for the identification of key factors influencing the economic efficiency of digital social services. The methods used in the study include:

- Regression analysis – used to assess the relationship between the level of digitalization and changes in administrative government expenditures. Fisher's test was used to confirm statistical significance. The model included independent variables such as the level of digital service penetration, expenditures on digital transformation, and the proportion of the population using online services. The regression analysis was based on panel data from 15 countries with different levels of social service digitalization for the period 2016–2023. The multiple linear regression model had the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where:

Y – change in administrative expenses on social services (as a % of total social expenditures); X_1 – level of digital ser-vice penetration (digitalization index, % of online services); X_2 – digital transformation expenditures (as a % of GDP); X_3 – proportion of the population using online social services (%); β_0 – constant; β_1, β_2, β_3 – estimated regression coefficients; ε – model residual error.

- Dynamic (trend) analysis – used to assess changes in social service expenditures depending on the level of digitaliza-tion. Long-term trends in expenditures were analyzed, and key aspects of digital transformation were identified, enabling an assessment of the impact of digital technologies on economic efficiency.

- Correlation analysis – conducted to assess the correlation between the level of digital accessibility and the social effec-tiveness of government programs. This allowed for evaluating the relationship between digitalization and improved access to social services.

The study was based on the analysis of official data and statistical calculations. Microsoft Office Excel (version 2016) was used for calculations, processing, and data analysis. Therefore, the proposed approach enables a comprehensive empirical assessment of the impact of social service digitalization on the economic efficiency of public spending. It provides the opportunity to identify the main factors determining the success of digital reforms and allows for the formulation of well-grounded recommendations for optimizing budget policy in the field of social welfare.

3. Results

A study of 15 countries with varying levels of digitalization (Appendix 1) revealed significant differences in the efficiency of social services. In countries with high digital maturity, over 90% of social services are available online, whereas in countries with low digitalization, this figure does not exceed 20%. As of 2022, Ukraine offered over 70 electronic ser-vices via the Diia platform, demonstrating significant progress. Administrative costs in leading countries amount to 2–3% of social spending, while in countries with low digitalization they reach 8–10%. The average application processing time in digitally advanced countries is 1–3 days, compared to 7–10 days in less digitalized ones. Aggregated data is presented in Table 1.

The dynamic analysis shows that digitalization improves the efficiency of social spending. In countries actively imple-menting electronic services, administrative costs grow more slowly. In Ukraine, their share in social spending decreased from 5.1% to 4.3% (2016–2021), and process automation minimized administrative cost growth. The introduction of digital tools significantly accelerated aid delivery: from 2019 to 2023, the average application review time decreased from several weeks to a few days thanks to the "Unified Information Space of

the Social Sphere" system and online services. A similar trend is observed in countries with developed digital infrastructure - gradual replacement of paper-based procedures with electronic ones increases administrative efficiency.

Table 1. Key indicators of social service efficiency by level of digitalization (average values by country group)

Indicator	High Level of Digitalization (Top 5 Countries)	Medium Level (Next 5 Countries)	Low Level (Last 5 Countries)
Share of Social Services Available Online	~95%	~60%	~20%
Administrative Costs (% of Social Spending)	~2%	~5%	~10%
Average Application Processing Time (days)	2–3	7–10	15–20

Source: compiled from OECD (2024), The World Bank (2024), Fedirko (2022), Millard (2023), Social Security Administration (2024).

To more deeply assess the influence of individual factors, a regression model was built. The dependent variable was the dynamics of administrative costs for social services. The independent variables were key digitalization indicators: the level of e-service penetration, the volume of investment in digital transformation, and the share of the population using online services. The model demonstrated good approximation quality (coefficient of determination $R^2 \approx 0.62$, meaning that 62% of changes in administrative costs are explained by digitalization), and its statistical significance was confirmed by the Fisher test ($F \approx 15$, $p < 0.001$). Table 2 shows the regression coefficient estimates. It was found that two of the three factors have a statistically significant impact: the level of digital service penetration and the share of online service users.

Table 2. Regression analysis results (dependent variable – change in administrative costs)

Independent Variable	Coefficient Estimate (k)	t-statistic	p-value
Level of Digital Service Penetration (Index)	–0.050	–2.8	0.008
Spending on Digital Transformation (% of GDP)	–0.001	–1.5	0.146
Share of Population Using Online Services (%)	–0.081	–2.3	0.031
Constant	0.012	0.5	0.617
Coefficient of Determination	0.62		

Source: calculated from OECD (2024), The World Bank (2024), Ministry of Digital Transformation of Ukraine (2024), United Nations Development Programme (2022).

The coefficients (k) for these variables are negative and significant (at the 5% level), indicating a reverse relationship: as the level of digitalization increases, administrative spending decreases. Specifically, the coefficient for "Level of Digi-tal Service Penetration" is about –0.050 ($p \approx 0.01$), meaning that an increase in this index by 1 point leads to a 0.05 percentage point reduction in the share of administrative costs, all else equal. Similarly, a broader use of online services by the population is associated with reduced administrative costs ($k \approx –0.081$, $p < 0.05$). This aligns with expectations and previous observations that digitalization optimizes costs. At the same time, the indicator of spending on digital transformation did not show a statistically significant impact within this model ($k \approx –0.001$, $p > 0.1$). This could be due to a time lag between investments and outcomes or limitations of the sample. Overall, the regression analysis confirms a causal relationship between the implementation of digital technologies and increased economic efficiency of public social expenditures. As digitalization levels rise, there is a statistically significant reduction in non-productive (administra-tive) budget expenditures.

To assess the effectiveness of social service digitalization, trends in administrative costs and application processing time were analyzed in countries with different levels of digitalization during 2016–2023 (Table 3). After implementing e-services, administrative costs fell by 30–40%, and application processing time was reduced by 2–5 times, especially in digitally advanced countries. In countries with low levels of digitalization, the changes were less pronounced, highlighting the need for further reforms.

Thus, empirical results confirm that the digitalization of social services enhances the economic efficiency of public spending. All conducted analyses show a reduction in administrative costs and an increase in population coverage with social support.

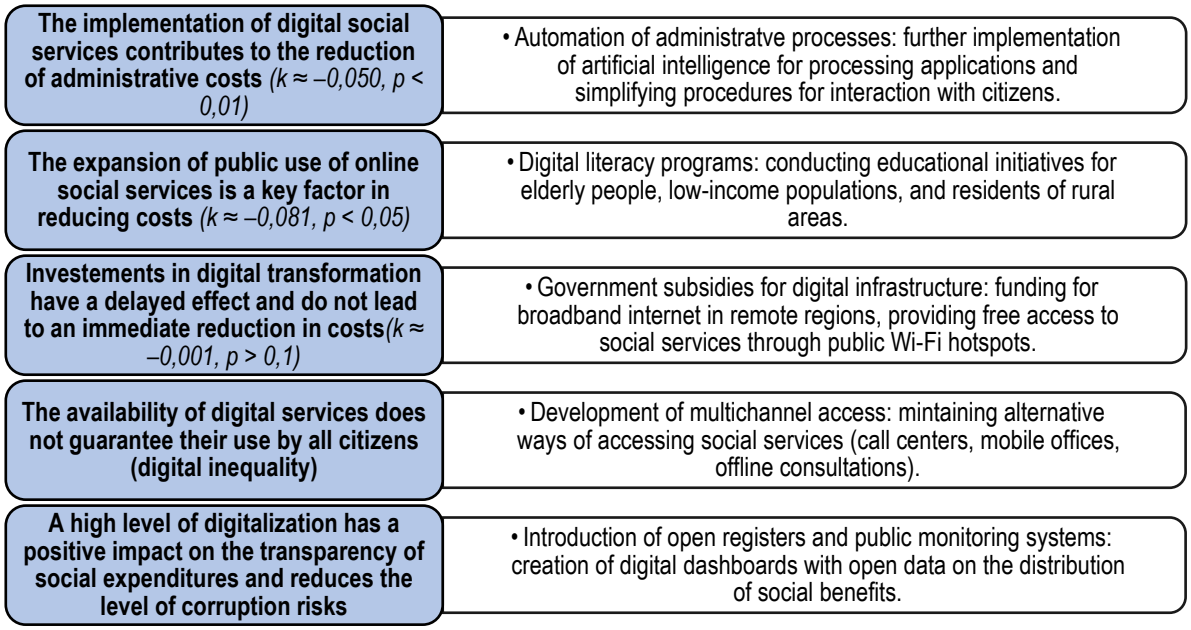
Table 3. Dynamics of changes in social service efficiency before and after digitalization (average values)

Country Group by Digitalization Level	Share of Admin. Costs in Social Spending (%) (Before)	Share of Admin. Costs (%) (After)	Avg. Application Processing Time (days) (Before)	Avg. Processing Time (days) (After)
High Level (90% and above)	3.2	2.1	7–10	1–3
Medium Level (70–89%)	6.8	4.2	10–15	3–7
Low Level (Below 70%)	12.5	8.5	20–30	7–15

Source: calculated from OECD (2024), The World Bank (2024), Ministry of Digital Transformation of Ukraine (2024), United Nations Development Programme (2022).

However, challenges remain, particularly digital inequality among vulnerable groups. To ensure equal access to digital services, it is necessary to improve digital literacy, expand internet access, and enhance the usability of electronic services. Figure 2 presents the main conclusions of the regression analysis and corresponding recommendations for overcoming digital inequality and improving access to electronic social services.

Figure 2. Conclusions from the regression analysis and recommendations to overcome digital inequality



Source: Author's own development.

Therefore, for the effective implementation of digital social services, it is essential not only to improve technological infrastructure but also to address the issue of digital inequality. This includes promoting digital literacy, expanding inter-net access, and developing user-friendly and secure digital platforms. Additionally, it is important to ensure the adaptation of digital services for low-mobility and disabled population groups to support the inclusiveness of digital transformation.

4. Discussions

The research results confirmed the significant positive impact of digitalization of social services on the economic efficiency of public spending. The obtained data indicate that digital technologies contribute to the reduction of administrative costs, the acceleration of social assistance application processing, and the enhancement of transparency in public expenditures. These findings are consistent with the study by Dobrolyubova (2021), which stated that digitalization promotes the optimization of public administration and the reduction of unproductive expenses.

Comparison of our analysis results with other studies confirms a global trend toward increasing the efficiency of social policy through digitalization. In EU countries, the transition to e-governance has reduced the average processing time of applications by 40–60% (Androniceanu *et al.* 2022), while in Ukraine, thanks to the

"Diia" platform, this figure has decreased by 50% (Ministry of Digital Transformation of Ukraine, 2024). At the same time, the effectiveness of digitalization depends on a country's level of digital maturity: in developed states, administrative costs do not exceed 2–3%, whereas in countries with low levels of digitalization, they reach 8–10%. This aligns with the conclusions of Millard (2023), who emphasized the need for comprehensive institutional reforms to achieve the maximum economic benefits of digitalization.

In addition, Javoronok and Lopashchuk (2024) noted that digitalization reduces the shadow economy and optimizes social security. Our study confirms this, as digital tools minimize duplicate payments, automate applicant verification, and prevent fraud. Similar conclusions were drawn by Ma *et al.* (2022), who emphasized that digital technologies improve the efficiency of budgetary control. Our findings support this as well, since digital tools help to minimize duplicate payments, automate the verification of applicants, and prevent fraud.

However, it is important to note that digitalization of social services may introduce new challenges. In particular, the issue of digital inequality remains relevant (Huang and Zhang, 2025). Our results confirm that elderly individuals and resi-dents of rural areas have limited access to digital services, which is also highlighted in the study by Ihnatenko and Sadzaglishvili (2023). Therefore, one of the recommendations is the development of state programs to improve digital literacy and the creation of alternative access methods to social services (e.g., mobile support centers).

Another important aspect is the need for investments in cybersecurity and personal data protection. Shashyna *et al.* (2023) emphasized that the expansion of e-governance is accompanied by an increase in the risk of unauthorized access to confidential information. Our study confirmed the necessity of improving protection standards for digital platforms, especially in countries that are just beginning active digitalization of the social sector. Similar results are demonstrated by Kryvovyazyuk *et al.* (2023), who stressed the importance of public-private partnerships in building secure digital infrastructure.

It is important to mention that our analysis has certain limitations. First, the sample is limited to 15 countries, which does not allow for full coverage of all possible variations in the impact of digitalization on the economic efficiency of public expenditures. Second, digitalization is a dynamic process, and its long-term effects may differ from those obtained in this study. Nonetheless, the findings have important practical significance for shaping public policy on the digitalization of social services. Primarily, it is advisable to expand digital literacy programs to ensure equal access to electronic services, especially among the elderly and rural populations. In addition, additional cybersecurity measures should be introduced, including improvements in personal data protection mechanisms and strengthening the resilience of digital infrastructure. The results can be used by government agencies to optimize budget expenditures, reduce administrative costs, and increase the transparency of social program funding.

Conclusions

The digitalization of social services is an important factor in improving the economic efficiency of public spending, as confirmed by the results of the conducted empirical research. The introduction of digital technologies contributes to the optimization of administrative processes, reduction in application processing times, lower bureaucratic costs, and greater transparency in the allocation of budgetary resources. The analysis showed that a country's level of digital maturity directly correlates with a decrease in the share of administrative costs in social programs. In countries with a high level of digitalization, these costs do not exceed 2–3%, whereas in states with poorly developed digital services, the figure reaches 8–10%.

It was established that the implementation of digital platforms, such as "Diia" in Ukraine, has helped reduce the processing time for social requests by up to 50%, aligning with the experience of EU countries. At the same time, the results of correlation and regression analysis confirmed a strong relationship between the level of digital service penetration and the overall efficiency of public spending. However, digitalization is not an instantaneous process and re-quires significant investments that have a delayed effect.

The results obtained have practical significance for the development of strategies for the digital transformation of social policy. The approaches proposed in this study can be used by public administration bodies to further optimize social spending and improve access to electronic services. In particular, the need to expand digital inclusion programs is substantiated, which would help reduce digital inequality among socially vulnerable population groups.

The scientific novelty of the research lies in the comprehensive analysis of the relationship between the digitalization of social services and the efficiency of public spending. This analysis includes a multidimensional assessment of the economic, administrative, and social aspects of digital reforms. Unlike previous studies, this

work applies regression analysis to identify the key factors influencing the level of administrative costs in the social sector.

Prospects for further research include assessing the long-term effects of digitalizing social services, analyzing its impact on social justice, and identifying mechanisms to overcome digital inequality. Another important direction is the study of the consequences of digitalization for the sustainability of public finances and the identification of optimal models for implementing electronic services in various socio-economic contexts.

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Appendices

Appendix 1. Sample of Countries and Their Key Indicators of Social Service Digitalization.

Country	Digitalization Level (%)	Share of Social Expenditures in GDP (%)	Share of Administrative Costs in Social Spending (%)	Average Application Processing Time (days)
Ukraine	70	18	4.3	3–5
Germany	95	25	2.1	1–3
France	93	24	2.3	2–4
Sweden	97	22	1.9	1–2
Estonia	98	21	1.5	1
USA	85	19	3.0	3–5
Canada	88	20	2.8	3
Japan	90	18	3.5	2–4
South Korea	92	17	2.6	2–3
China	80	16	5.2	5–7
Poland	75	17	4.8	5
Spain	85	23	3.2	3–5
India	65	12	8–10	7–10
Turkey	68	14	8–10	8–10
Mexico	60	10	8–10	10–15

Source: Author's own development.

Based on the analysis of 15 countries, Appendix 1 presents their level of digitalization, the share of social expenditures in GDP, and the average time required to process social assistance applications. Countries with a high level of digitaliza-tion (90% and above) have the lowest administrative costs (1.5–2.3%) and the fastest application processing times (1–3 days). Countries with a medium level of digitalization (70–89%) demonstrate moderate administrative costs (3.0–5.2%) and processing times ranging from 3 to 7 days. Countries with a low level of digitalization (<70%) face high administrative costs (8–10%) and significant application processing delays (7–15 days).

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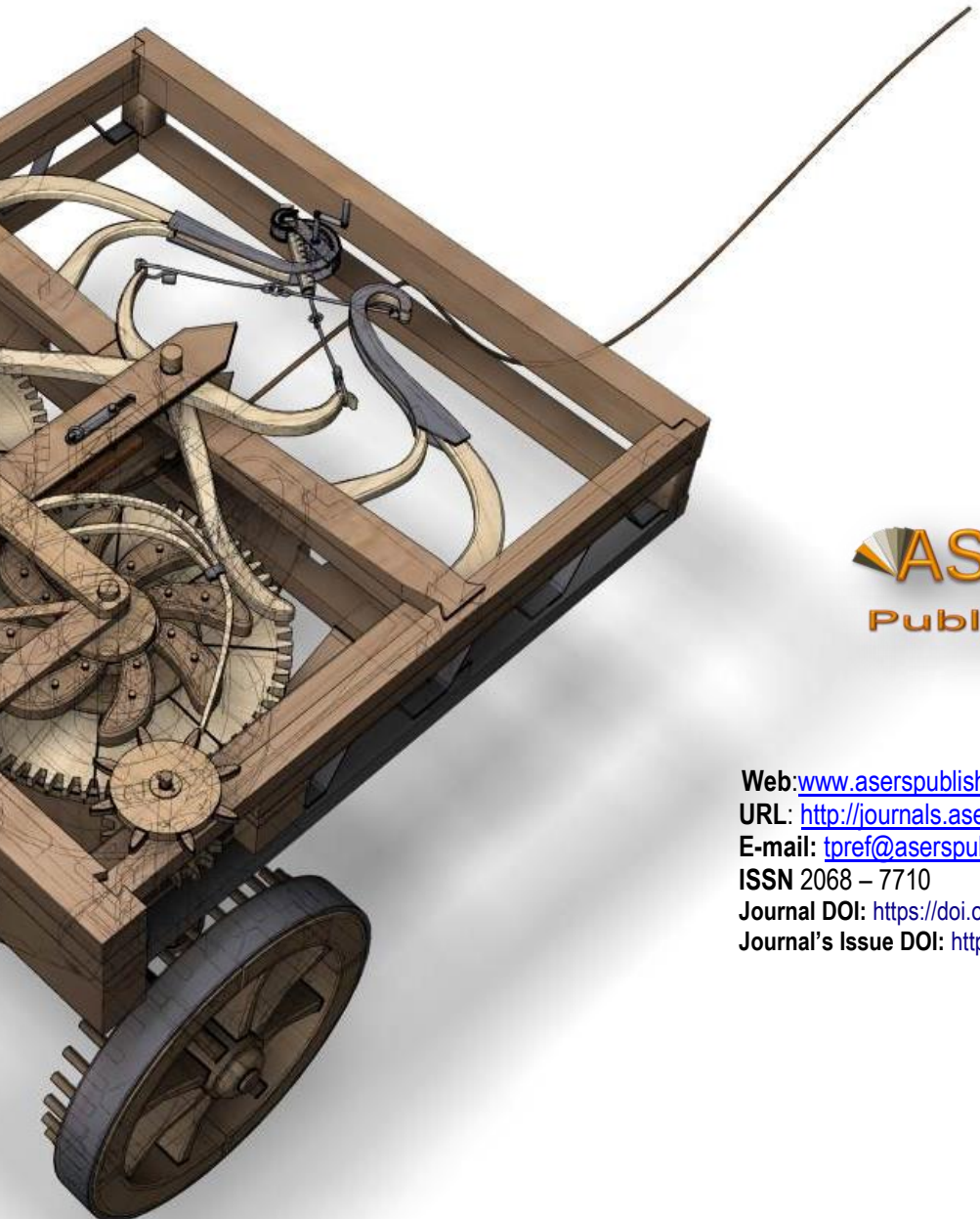

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