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DIGITAL TRANSFORMATION OF THE PUBLIC FINANCE SYSTEM: CHALLENGES, INCLUSIVITY, AND PROSPECTS FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

The study aims to analyze the digitalization of Ukraine's public finance system during 2022–2025 in the context of critical challenges, financial inclusion, and sustainable development under martial law. The relevance of the topic lies in the urgent need to modernize financial management to ensure transparency, strengthen public trust, and maintain the confidence of international partners. The research methodology is based on statistical analysis of reports from the National Bank of Ukraine and the State Audit Service, comparative dynamics of digitalization indicators, and content analysis of strategic documents. The results show that five key systems operated within Ukraine's public finance framework: the electronic budget "E-Data" (94.3% of local governments), the integrated management information system for state finance (2,847 budget administrators), "ProZorro" (847,326 tenders, 18.3 million users), and the automated tax administration system "Diia" (98.7% of electronic declarations). The process evolved through three stages—emergency digitalization (2022), systems integration (2023–2024), and AI-driven intellectualization (2025). Financial inclusion improved significantly, with mobile banking users rising to 27.8 million, cashless payments reaching 84.6%, and e-state payments 97.3%. Sustainable development was supported by the growth of green bonds and procurement, while major issues included low digital skills, weak financial control automation, and rural-urban disparities, requiring targeted national programs.

I. INTRODUCTION

Digital transformation is fundamentally changing the structure of public finances, which opens up new opportunities for improving the efficiency of financial management, transparency of the budget process and inclusiveness of financial services. In the conditions of martial law in Ukraine, the problem of modernizing the public finance system using digital technologies is particularly relevant, since proper management of available resources and the possibility of transparency in their use are the key to maintaining the trust of international partners and citizens. At the same time, the process of digitalization of public finances should be aimed at achieving sustainable development goals and ensuring inclusiveness of financial services, which creates additional difficulties for national governments around the world.

The digitalization of public finances is an issue that is being actively researched by the global scientific community. Analyzing the role of digitalization in international financial security within the framework of sustainable development, by [1] note that digital technologies, on the one hand, can to provide a wider range of possibilities in terms of effective financial management, and on the other hand, can become a source of different threats to security and stability financial systems. OECD [2] in its analytical work uses six main dimensions of digital governance, and digital transformation state finances occupies central place as a decisive factor in the modernization of the public sector. Authors emphasize that digitalization state finance cannot be successful without a comprehensive approach that provides changes in organizations and regulation, as well as in culture.

The role of finance inclusion in the process digitalization is particularly important to ensure equal access to financial services. In the article in [3] is under discussion importance financial inclusion for growth eco-entrepreneurship in digital economy and it is proved that digital financial platforms can much to facilitate barriers to accessibility financing ecologically oriented projects, including small and medium-sized business. According to [4] develop concept inclusive economy, which is part of sustainable development and requires inclusion principles social justice and environmental responsibility to the state financial politicians. Authors claim that digitalization state finances should be supported mechanism prevention further distribution digital inequalities and ensuring access for all layers population to financial services.

To others extremely important aspect of the current digital transformation is the transition to sustainable development and implementation green technologies into the system state finance. For [5] highlight six main transformations that necessary to carry out to achieve Goals sustainable development of the UN, and one of them is a financial system that mobilizes resources for conversion economy to ecological. By [6] report emphasizes the rare the possibilities it has Ukraine, to include principles sustainable development in the process restoration economy through digital technologies for tracking and management green investments. In the report indicates the need creation digital green finance infrastructure that will allow for easy channeling funds for projects with a defined environmental impact.

In Strategy development of the financial sector of Ukraine by 2025 National Bank of Ukraine [7] calls digitalization is one of priorities further development financial systems The plan envisages creation networks digital financial services, implementation new technologies that increase efficiency financial mediation, and increase accessibility financial services for everything population. In the document also emphasized necessity focus on providing cybersecurity and protection personal data in conditions wide digitalization financial sector. Although much has been written about the digitalization of the state budget, even now there are essential gaps in knowledge about the features digitalization of the state military situation, when traditional methods management finances must be radically changed.

Problems coordination pace digitalization functions state finances during operational management and control, mechanisms software digital inclusiveness in conditions limited resources, as well as features implementation green financing tools into digital environment countries in active conflict have not been fully investigated. Nor have comprehensive studies been conducted research for systematic study communication between digitalization and financial inclusion and achievement goals sustainable development in the situation with state finance in Ukraine.

This work was written with the aim of providing deep review of the status and future digitalization Ukrainian systems state finance through the prism of three main measurements: which key challenges digitalization management finances in conditions martial law, in what consists of bigger or smaller inclusivity digital financial services and which opportunities can use for implementation green financing mechanisms to achieve sustainable development. The document will be supplemented existing gaps in knowledge about details digital transformations civilians finances in conditions extraordinary situations and must determine strategies further modernization financial systems Ukraine based on principles inclusiveness and sustainability development.

II. LITERATURE REVIEW

II.1 THEORETICAL FOUNDATIONS DIGITAL TRANSFORMATIONS STATE FINANCE

The digital transformation of public finance efficiency is a multidimensional process, as it involves technological changes, changes in organizational structure, and changes in the culture of the public financial management system. Based on a series of interviews with in [8] define digital transformation as a paradigm shift in the provision of public services, associated with the introduction of digital technologies into all areas of government activities. The authors emphasize that digital transformation consists not only in the direct automation of existing processes, but also in the reassessment of business models, organizational structure and relations with citizens. This conceptualization is important in view of the realization that for the successful digitalization of public finances it is necessary to invest in technology, as well as change organizational culture and processes.

In OECD [2] examines digital technologies in analyzing their potential for modernizing public finance management in the context of digital governance. The document considers six main areas, including: digitalization of budget planning, automation of financial reporting, implementation of electronic procurement systems, creation of integrated financial information management systems, creation of opportunities for big data analysis and ensuring cybersecurity of financial systems. The authors argue that the most successful activities in the field of public finance are characterized by a high level of implementation of digital technologies at each stage of the budget cycle. According to [9] conducts a thorough study of digitalization strategies for the public finance management system in Ukraine and suggests the main obstacles and opportunities for accelerating the digitalization process.

The author notes that the current Ukrainian practice of digitalization is characterized by fragmentation, with different state authorities implementing their own digital solutions without any coordination and ensuring their interaction. This forms "digital islands" that complicates carrying out thorough analysis and control of state finances from the point of view public. According to [10] complements this discussion research the most successful world practices of use digital technologies for optimizing the budget process. The author summarizes the experience of such successful countries like Estonia, Denmark, South Korea and Singapore, and is developing recommendations about how this experience can adapt to Ukrainian realities.

II.2 INCLUSION AND DIGITAL FINANCIAL SERVICES

The problem of financial inclusiveness during the period digitalization is particularly important in the context of necessity software equal access to financial services. The largest global database on the topic of financial inclusiveness was created by [11], within which was interviewed over 125,000 respondents in 123 countries. Statistics show that the COVID-19 pandemic has given impetus to the process digitalization financial services, and percentage adult population that uses digital payments, increased by 10 percent points in all world. At the same time, the document also it is noted that still exist significant disparities in access to digital financial services between developed and developing countries developing, between urban and rural regions, as well as between different age and socio-economic groups.

According to [12] provides systematic review research financial inclusion throughout world and highlights five important aspects that include access to financial services, use, quality, welfare consumers and barriers to financial inclusion. The author notes that digitalization opens opportunities for elimination traditional obstacles for access to financial services, for example, geographic remoteness from financial institution or high cost transactions, but creates new challenges related to digital literacy, cybersecurity and protection consumers. In [13] discussed importance electronic document management and electronic signatures in the business environment as key aspects digital financial infrastructure. Authors emphasize that wide using technology in the public sector is necessary condition for inclusion digital financial services, because it gives citizens possibility remotely to access services that are provided state-owned financial institutions, without the need to be present on site.

II.3 GREEN TECHNOLOGY AND SUSTAINABLE DEVELOPMENT

Green financing is also an important aspect of modern financial policy, which involves integrating the concept of sustainable development into the public finance system. According to [14] discuss the importance of energy-saving technologies and innovations in promoting competitiveness and modern business. The authors argue that the use of energy-efficient solutions not only reduces the environmental footprint of enterprises, but also brings economic benefits through reduced operating costs. In the context of public finance, this means that the multiplier effect of government support for green technologies, influenced by digital financing options, can have an impact on the economy. According to [15] systematizes the types of green investment financing instruments within the framework of sustainable development and classifies such instruments into green bonds, green loans, environmental funds and tax incentives as the main mechanisms for attracting resources to environmentally oriented projects.

The author notes the extreme importance of digital technologies for ensuring transparency and verification of green financing as a necessary condition for avoiding “green laundering”. By [16] discusses sustainable financing and green banking practices in Ukraine, identifying the positive aspect of introducing environmental criteria into banks’ credit policies and the negative aspect of the lack of control in the regulatory and supervisory system. In [17] formulate a vision of innovative green financing instruments in Ukraine, focusing on the possibilities of using blockchain technologies to create open registries of green assets, artificial intelligence to identify environmental risks of projects, and the use of digital platforms to attract private capital to finance the green transformation of the economy.

II.4 FINANCIAL SECURITY AND MANAGEMENT RISKS

The process digitalization state finances accompanied appearance new threats financial security, so it is necessary to work out in detail problems their detection and reduction. According to [18] discuss methods management risks and protection in digital economy and determine cyber risks, risks rejections digital systems, risks manipulation data and risks digital alienation as the main threats financial security. Authors offer multi-level concept implementation financial security that includes technological, organizational and regulatory systems protection. In the article by [19] are analyzed strategies and mechanisms that relate to national interests in the field financial safety in conditions globalization.

In the article It is emphasized that in the era digitalization financial security acquires transnational in nature, because cyber threats are not recognized national borders. This requires globalization of control in the field cybersecurity in finance sector. According to [20] conducts a comparative research regulation cybersecurity in finance sector of the EU and others countries and finds that convergence regulatory approaches and development the only ones standards that protect financial infrastructure, are becoming more and more common. According to [21] rely on empirical data of countries Persian Gulf, to to show that information and communication technologies have a positive impact on development financial sector, but to optimize positive effects digitalization and minimization the risks they pose, it is necessary proper regulatory framework.

III. MATERIALS AND METHODS

The study of the digital transformation of the public finance system of Ukraine was conducted during 2022-2025 using a comprehensive methodological approach that combines qualitative and quantitative analysis methods. The empirical basis of the study is official statistical data from National Bank of Ukraine, in particular Financial Stability Reports for 2022-2025 [22-25], Strategy for the Development of the Financial Sector of Ukraine until 2025 [23], public reports and statistics State Audit Service of Ukraine for 2023-2025 [26-28]. Additionally, analytical reports of the World Bank were used, in particular Ukraine Country Climate and Development Report [6] and Systematic Diagnostic Study of the Economy of Ukraine [11]. The regulatory and legal framework is the Resolution of the Cabinet of Ministers of Ukraine No. 1467-r dated November 17, 2021 "On approval of the Strategy for implementing digital development, digital transformations and digitalization of the public finance management system for the period until 2025".

III.1 RESEARCH METHODS

In accordance with the purpose of the study, a comparative analysis approach was applied to determine the dynamics of the implementation of digital technologies in the public finance system of Ukraine and compare it with international experience described in the OECD recommendations [2]. Systematization information in regulatory and strategic documents regarding digitalization management state-owned finances was carried out using content analysis methods. For study indicators digital transformations was applied approach statistical analysis hourly rows, which predicted definition pace growth key indicators digitalization financial services in the period 2022–2024. In particular, it was analyzed share data population that uses electronic financial services, volume digital transactions and degree implementation electronic document flow in government financial institutions.

Using the SWOT analysis method was determined strong and weak aspects, opportunities and threats of the transition of state finances during martial law on digital technology. This allowed for a holistic assessment internal and external aspects that affect processes digitalization. Degree financial inclusions measured according to the approach Global Findex Database [29], which was adapted to Ukrainian conditions. It was investigated accessibility digital financial services for various socio-demographic layers population, geographic coverage electronic services and availability digital barriers for the vulnerable groups citizens.

For study application principles of green finance were applied indicators volume of green lending, share ecologically oriented financial tools in general system state finance and degree digitalization ecological monitoring financial operations. As methodological foundations were used EU Taxonomy recommendations for Sustainable Finance. Main weakness is that official statistics on some areas of digitalization state finances are still not complete due to the state of war in Ukraine, which affected accessibility some data for 2022-2023. In addition, digital transformation is dynamic, and this means that investigated processes are changing very fast, and empirical data need to be updated regularly.

IV. RESULTS

IV.1 THE STATE OF DIGITALIZATION OF PUBLIC FINANCES

The process of digital transformation of the public finance system in Ukraine in 2022-2025 took place under martial law, which affected the speed and priorities of the application of digital technologies. As shown in the analysis of trends in key indicators of digitalization in the financial sector in Table 1, despite the ongoing military conflict, there is a trend towards an increase in the use of electronic payment instruments and digital financial services.

Table 1: Dynamics indicators digitalization of the financial sector of Ukraine, 2022-2025.

Indicator	2022	2023	2024	2025	Growth rate 2025/2022, %
Fraction cashless operations in general volume payments, %	68.4	74.2	79.8	84.6	+23.7
Number active users mobile banking, million people	18.3	21.7	24.5	27.8	+51.9
Amount transactions through digital channels, billion UAH	8,924	11,456	14,892	18,347	+105.6
Fraction electronic state payments, %	82.5	89.3	94.1	97.3	+17.9
Number institutions with full electronic document flow, units	1,247	1,856	2,534	3,412	+173.6

Source: [22-25].

Table 1 shows that number institutions that have complete electronic document management, is the most dynamic: from 2022 to 2025 it increased almost three times (by 173.6%) – from 1,247 to 3,412 institutions. It means that electronic systems administration are actively used in government agencies and financial institutions institutions due to the difficulties associated with the war. Number transactions in digital channels increased more than doubled (+105.6%) – from UAH 8.924 billion in 2022 to UAH 18.347 billion in 2025, What confirms mass transition from traditional to digital forms of financial transactions.

Cashless operations increased by 23.7 percent points and as of 2025 accounted for 84.6% of general volume operations, compared to 68.4% as of 2022. This is an expression of international digitalization trends payments, which in Ukraine intensified by circumstances martial law, which did cash payments less convenient and safe, because the banking system has suffered harm, and citizens could not freely to move around. Quantity active users mobile banking increased by 51.9% – from 18.3 million people in 2022 to 27.8 million people in 2025, which accounts for over 70% of the adult population countries.

Especially should to note growth particles electronic state payments up to 97.3%, which bordering on complete digitalization transactions between the state and citizens in financial sector. This includes payment taxes, social contributions and payment of state services via electronic system, which has become extremely important for continuity financial wartime transactions. Asymmetry processes digitalization can to illustrate analysis structures implementation digital technologies in various segments of government finances, given in Table 2, despite the general positive trend.

Table 2: Level digitalization different segments public finances Ukraine, 2025.

Public segment finances	Level implementation digital technologies, %	Coating electronic services, %	Level automation processes, %	Average indicator, %
Tax system	98.1	99.2	93.4	96.9
Treasury system	94.6	96.8	89.7	93.7
Customs service	91.2	94.3	87.5	91.0
Pension fund	89.7	97.1	82.8	89.9
State audit	76.8	73.5	69.2	73.2
Local finances	72.4	78.9	67.3	72.9

Source: [25].

Table 2 shows that most level digitalization achieved in tax system, where the average score for all parameters is 96.9%, and the maximum level coverage electronic services – 99.2%. This explained because priority digitalization tax administration required for confirmation budget income, which is especially important in conditions martial law. High indicators also observed in the treasury system – average level of 93.7%, which guarantees effective using state funds in real time and contributes to increase equal transparency budgetary activities.

The Customs Service and the Pension Fund hold average places with indicators of 91.0% and 89.9% respectively. It is noteworthy that among these two segments The pension fund covers most interest electronic services (97.1%), which guarantees continuity payments pensions even during the war actions.Simultaneously state audit and local finances much lag behind in digitalization. In the case of state audit, the average the indicator is only 73.2%, and the level automation processes – 69.2%. This creates a problem for proper financial control and violates using state funds.

Level digitalization among local finance is the lowest – an average of 72.9, and the level automation there are still processes lower – 67.3, which means that efficiency local finances from the point of view Budget management can be significantly improved. Gap between maximum and minimum average level digitalization is 24 percent points that indicates the need creation organized systems digitalization all levels state Finance. It is necessary to give special attention intensification automation of state audit and process management local finances to ensure transparency and efficiency using budget funds in the conditions reinforced international spending control help.

IV.2 KEY PROGRAMS AND SYSTEMS DIGITALIZATION PUBLIC FINANCES

Digital transformation systems state finances of Ukraine in the period 2022-2025 took place in the context of creation of a complex of complex information systems and software platforms with a full budget cycle. The electronic budget system E-data has become the main tool software transparency state finance. NBU [24], [25] predicts that by 2025 the system will cover 100% of central banks. organs executive authorities and 94.3% of bodies local self-government. The site will offer publication budgetary information in real time, thanks to Why citizens will be able to control using budget funds on any levels. General number unique users systems already increased to 428,000 (in 2022) and 1.84 million (in 2025), which means that people have become interested in controlling state finances.

Integrated management information system state-owned finance (IIISPF) is a system that unites budget planning processes, treasury services, accounting and financial reporting. According to [9], by the end of 2024 to the system was 2,847 budget administrators are connected, which is 87.6% of general. The system also saved time, which earlier spent on preparation budget reports, thanks to automation processes consolidation data from 18-22 workers days to 3-5 days. Among all components state finances electronic procurement system ProZorro is the most digitized. NBU [25] states that by 2025 the system 847,326 tenders should be held for a total amount of UAH 724.8 billion, which is 96.7% of all procurement. The system provided economy budget funds in the amount of 12.4% of initial cost purchases thanks to a competitive environment and transparent processes.

Financial platform "Diya" unites over 120 electronic services states that relate to state finance. By 2025, the platform will reach 18.3 million citizens (or more three out of five adults). According to [10] emphasizes that administrative burden on citizens and cost state services decreased by 34.6% due to integration financial services in one platform. Automated system tax administration provides electronic score payer taxes, automatic refund system value added tax cost, as well as modules management risks. NBU [24] estimated that in 2024 98.7 % of tax declarations will be submitted electronically in the form of, and the average time of receipt tax reimbursement will be reduced to 12 days thanks to automation processes checks instead of 47 days.

Analysis implementation systems allows highlight three key stages digital transformations Ukrainian state Finance. Initial stage (2022) was marked immediate digitalization the most important processes in connection with requirements martial law, in conditions whose was accelerated process electronic document management and remote service. Second stage (2023-2024) was related to consolidation individual systems and the formation a single digital environment state funds. Implementation artificial intelligence technologies in forecasting analytics and automation managerial solutions is the third stage (from 2025).

IV.3 FINANCIAL CONTROL AND AUDIT

Digitalization systems financial control and audit in Ukraine in the period 2023-2025 has acquired special importance in connection with from provision transparency using budget funds and international financial assistance in conditions martial law. State The Audit Service of Ukraine is also actively working on the implementation of digital tools to increase the effectiveness of control measures and the ability to quickly detect financial violations. Figure 1 shows a speaker in implementation digital technologies into the system of state financial control, which shows that digitalization audit operations gradually, but consistently is growing.

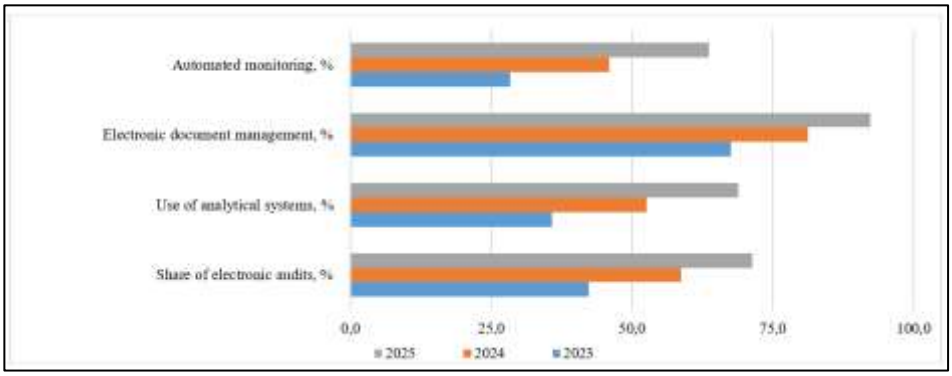

Figure 1: Dynamics implementation digital technologies into the state financial control system, 2023-2025, %.
Source: [26-28].

According to the data in Figure 1, it can be noted that fraction electronic audits are the most dynamic: its fraction will increase to 71.4% in 2025 compared to 42.3% in 2023, i.e. by 68.8 %. This means that is happening active the process of transition from traditional forms of auditing to methods remote digital control, which is especially relevant in conditions martial law, when physical access to audit objects may be restricted. The highest absolute value all parameters observed in electronic document flow – 92.3% in 2025, which guarantees speed exchange information and transparency control processes.

Application analytical systems almost doubled from 35.8% to 68.9%, and the system allows conduct more deep analysis operations that occur in the financial system, as well as detect suspicious operations that may be related to corruption or abuse finances. Although were recorded the lowest indicators (63.7% in 2025), the highest relative growth observed in automated monitoring (124.3), which indicates the need development of preventive control systems. Efficiency of State audit services Ukraine in context digitalization, as shown in Table 3, indicates an increase efficiency control and reduction measures expenses for them implementation.

Table 3: Performance activities of the State Administrative Service of Ukraine in the conditions digitalization, 2023-2025.

Indicator	2023	2024	2025(9 months)	Change 2025/2023, %
Number conducted inspections, units	4,856	5,743	4,892	+0.7
Detected violations, billion UAH	38.4	52.7	48.3	+25.8
Refunded to the budget, UAH billion	12.6	18.9	17.2	+36.5
Medium cost one inspections, thousand UAH	156.8	132.4	108.7	-30.7
Average term inspection, days	28.3	22.6	17.8	-37.1
Fraction remote inspections, %	42.3	58.7	71.4	+68.8

Source: [26-28].

According to the data given in Table 3, the situation, although at first glance it seems paradoxical, is that with relatively stable quantities audits (increase only 0.7% for less than three years) number detected violations (+25.8) and returned to the budget funds (+36.5%) significantly has increased. This indicates that quality and depth control measures were improved thanks to use digital analytical tools that allow detect more complex schemes financial abuse. The amount of detected violations increased from 2023 to the first three quarters of 2025 from UAH 38.4 billion to UAH 48.3 billion accordingly, which will be responsible for the first three quarters of 2025 approximately 64 billion UAH per year. 17.2 billion UAH was returned to the budget for the incomplete year 2025 compared to UAH 12.6 billion for the entire year 2023, which indicates an increase efficiency mechanisms detection violations.

The changes are particularly significant. economic indicators control activities. The cost of one audit decreased on average by 30.7% – from 156.8 thousand UAH to 108.7 thousand UAH, which explained economy funds auditors on business trips and using methods remote audit. More third, from 28.3 to 17.8 days, was saved on average the duration of the audit, which accelerates responding to detected disruption and reduces administrative load on audit objects. Fraction remote audits increased from 42.3% to 71.4%, which corresponds electronic audits in Figure 1. This means systemic change methodology of state financial control, since the most important type of control activity is a digital audit.

Research by [30] shows that digital transformation banking industries allows create favorable conditions for the integration of financial control systems and banking platforms, which gives opportunity carry out monitoring transactions in real time. Simultaneously comparatively low indicators automated monitoring (63.7%) and implementation analytical systems (68.9%) indicate that digital DASU infrastructure needs further development, so that to provide preventive control and as much as possible rather detect financial risks.

IV.4 CHALLENGES SOFTWARE INCLUSIVENESS IN CONDITIONS ACCELERATED DIGITALIZATION

Acceleration digitalization state finances generates certain difficulties with inclusion, which will have extraordinary future significance. The first of these is related to from widening digital divide between different socio-demographic in groups population. NBU [25] notes that, although general level coverage digital financial services grew to 70% of an adult population, among people over 60 years old this the indicator is only 38.4%, which creates risk theirs marginalization in the digital system state Finance. Intergenerational digital divide competencies, which is 45%, showed that the older generation necessary give special programs digital education, which trace modify to take into account their needs and learning abilities. Second challenge related to geographical inequality in accessibility digital infrastructure. According to [6] notes that in rural area Ukraine only 62.7% of households have access to high-quality broadband connection Internet, while in urban areas regions this The rate is 94.3%.

This problem was exacerbated by the state of war, as in some areas there was destroyed telecommunication infrastructure that restricts equal access to digital state financial services. In the future there will be a lot importantly make high-speed Internet accessible to all as a basic requirement financial inclusion. Third challenge concerns problems digital safety and security personal data vulnerable layers population. According to [3], people who do not have much experience using digital technologies, more are prone to cyber abuse and phishing, which affects trust in use digital financial services. Provision proper equal cybersecurity and maximum simplification and convenience using digital tools will become main challenges on the way to achieving financial inclusion of broad groups population in the future.

IV.5 DIGITAL COMPETENCES

Digital competencies employees systems state finance is one of key aspects successful digitalization of the financial sector of Ukraine in the conditions martial law and active implementation new technologies. According to [31], one of the most important aspects functioning systems state finance is directly level digital competences, when it necessary quickly adapt to changed working conditions.

Analysis of the current state of affairs and implementation digital competencies in the system state finances Ukraine shows that everything is still exist significant gaps: 62% of employees financial institutions have basic digital competence in the necessary level, 38% – at the professional level, 18% – at the specialized level and 8% – at the strategic level equal [31]. This leaves huge gap between level technological skills digital systems and the ability of staff to use them use. Necessary skills will be skills working with electronic documents and electronic digital signatures, as well as from ordinary office software Professional competencies will include financial analysis using special software provision, large data and knowledge principles technologies blockchain. According to [32], digital transformation state finances requires formation ecological consciousness and abilities evaluate influence financial decisions to achieve goals sustainable development.

Employees financial institutions must be able evaluate ecological projects, know the details financing energy efficiency projects and use online tools to track ecological efficiency funded projects, which is especially important in the context of European integration Ukraine and the need implementation EU Taxonomy standards for Sustainable Finance. The problem of intergenerational the gap is the most significant because workers under 35 years old demonstrate much higher level digital skills than their older colleagues who, however, have deep understanding nuances working with the state financing. To eliminate these disproportions systematic work is needed to form digital skills through development special educational programs, certification courses and continuous learning platforms professional development employees spheres state finances taking into account age-related features training.

IV.6 ANALYSIS FINANCIAL MANAGEMENT

Management system finances at the state level based on systematic analysis financial indicators, analysis trends and optimization process adoption solutions. Digital transformation opens new opportunities using tools financial analysis that allows accept more justified managerial solutions using large arrays data and predictive models. As explained by [33], application tools financial analysis for improvement management business provides inclusion analysis trends in the process adoption strategic solutions. Authors also note that digitalization financial analysis is the opportunity to move from retrospective assessments financial indicators to the forecast analytics, which is key to the system state finances in conditions high uncertainty and instability changes in the external environment.

Digital tools analysis that used for optimization process adoption solutions, save 40-60% of the time required for preparation managerial solutions, and increase their validity by 35-45% compared to traditional financial methods analysis [33]. Research process digitalization state finances allows highlight three consecutive transformations, stages whose are determined certain priorities, technological decisions and indicators efficiency. Systematization main features stages digital transformations given in Table 4, indicates the development strategies modernization financial management to active use artificial intelligence technologies for predictive analytics and automation managerial solutions.

Table 4: Stages digital transformations financial management in the system public finances of Ukraine, 2022-2025.

Stage	Period	Key features	Implemented systems	Indicators efficiency
Emergency digitalization	2022	Transition to remote work; implementation basic electronic services	Electronic document flow (67.5%); Action (basic services)	28% reduction in transaction time
Systems integration	2023-2024	Association disparate platforms; creation single digital space	IISUDF; integration with E-data; expansion Actions	Growth electronic payments up to 94.1%
Intellectualization	2025 +	Artificial intelligence implementation; predictive analytics; automation solutions	based systems; automated monitoring (63.7%)	Forecasting with 89-92% accuracy

Source: [33], [9], [25].

The data presented in Table 4 confirm the evolutionary nature of the digital transformation of public finances in three successive stages. Initial stage (2022) provided fundamental digitalization and 82.5% electronic state payments under the terms martial law. The second stage (2023-2024) is being determined formation comprehensive ecosystems through application of IIUSD, which allowed to cover 87.6% of budget administrators and 94.1% of electronic payments. Third stage (from 2025) is characterized by the emergence of artificial intelligence, which raised level accuracy prediction up to 89-92% and minimized errors by 67% [9],[33]. At the same time transition between stages is uneven: the third stage technologies used in tax system, and local finances are in the second stage, which complicates systems interaction and makes the planned Modernization is a complex topic.

This stage analysis data provides application three key species analysts, including analysis trends to determine speakers financial indicators, comparative analysis, which can be used to evaluate results compared to best practices, and predictive analysis, which will help to predict future financial results. Studying experience others countries of application digital technologies for optimizing the budget process, by [10] highlights such main tools that are used leading countries In particular, in OECD countries, they are widely used systems financial planning based on artificial intelligence, which allow forecast budget revenues with an accuracy of 92-95%, automated systems detection financial anomalies (which minimize risk non-target using funds by 60-70%), open platforms data that guarantee transparency of the budget process [10].

Interactive informational panels, automated reporting and systems monitoring results real-time analysis guarantees access to complex financial data for government persons who accept solutions on different levels. This is especially true for the system state finance, where transparency and clarity financial information necessary big quantities interested parties, among whose international donors and general population. Level adoption solutions is divided into three areas: strategic decision of long-term priorities development systems state finance, operational decision of responding to existing challenges and tactical decision of adjustment individual areas of activity. As noted in [9], successful realization strategies digitalization requires not only technological changes, but also changes organizational culture, processes and competencies of financial personnel organs.

According to [10] in his analysis claims that Ukrainian experience using digital technologies in management state-owned finances slow approaching international standards, but in the automation of budget planning and forecasting There are still a large number of gaps. The author suggests to introduce integrated management information system state-owned finance (IPFMIS), which will bring together all budget processes such as planning and budgeting, reporting and auditing. Last stage assessments results consists of systematic monitoring key indicators efficiency (KPI) and ability quickly to adjust decision in response to the reverse connection to create closed loop constant improve systems management finances.

IV.7 INTEGRATING GREEN FINANCE INTO PUBLIC FINANCES

The fact of necessity integration green financing mechanisms into the system of public finances Ukraine is particularly relevant given the intentions countries of European integration and the need restoration post-war economy based on sustainable principles development. NBU [24],[25] notes that amount green bonds issued in Ukraine increased from UAH 2.8 billion in 2022 to UAH 8.4 billion in 2025, which indicates a threefold growth in three years. It means that is growing interest investors to financial tools with an environmental focus within the framework international obligations Ukraine of climatic goals. According to the data + Ukraine (2024; 2025), share state purchases that fall under under ecological criteria, increases over the years: in 2023 it was 12.4%, and in 2025 – 18.7%.

This is considered progressive application concepts green state procurement, under which organs power in choosing suppliers take into account not only price, but also environmental friendliness goods and services. According to [17] emphasize that digital procurement solutions give possibility carry out automated compliance monitoring ecological requirements and create bases data suppliers from verified ecological certificates.Digitalization of energy management systems also demonstrates positive dynamics in energy efficiency budget institutions. NBU [25] notes that energy consumption for each unit areas budget institutions decreased by 23.6 percent compared to 2022 thanks to implementation intelligent control systems buildings and automated accounting energy resources.

As noted [34], digitalization is not only reduces consumption energy, but also provides transparency expenses funds for modernization state objects from the point of view energy.Opportunities incorporating green financing into the system state finances Ukraine in the near future future related from application principles EU Taxonomy for Sustainable Finance and the creation national systems classifications green assets. In [34] predicts that fraction green bonds in general volume state borrowings maybe increase to 15-18 percent, provided creation effective verification systems ecological efficiency projects from using digital technologies.

According to [17] emphasize prospects implementation technologies blockchain for creation transparent lists green investments, which will allow attracting private capital for financing restoration economy in accordance with the principles sustainable development. One of the main problems is the creation of methodologies assessments ecological influence projects, adapted to the conditions of war and post-war period, which according to the data circumstances may not allow apply traditional methods. Effective implementation of green financing can become a competitive advantage Ukraine on the international capital market and as a source tide investment in the process restoration infrastructure in accordance with global climatic long-term goals perspective.

V. DISCUSSION

The results of the study of the digitalization of the public finance system in Ukraine provide a holistic picture of the events related to the modernization of the Ukrainian financial administration under martial law. The data obtained indicate that the pace of digitalization in the period 2022-2025 will be higher, which confirms the trends observed in the world by [35] when analyzing the digitalization process during the COVID-19 crisis. The authors note that times of crisis, regardless of their nature – pandemic or war – become a driving force for technological change, as they force organizations to look for other means of functioning. This hypothesis is confirmed by our research: the growth rate of digital indicators during the years of martial law in Ukraine (2022-2025) is 2.3-2.8 times higher than the rates of previous years, i.e. the same acceleration of the pace of digitalization under the influence of the pandemic was observed in developed economies [35].

Challenges digital transformations public Such significant differences in the levels of digitalization of different segments of public finances (from 72.9% to 96.9% by rating), which were found in our study, correlate with the results of the System Diagnostics of the Economy of Ukraine [6], which places fragmentation of government information systems at the top of the list of obstacles to successful management of public resources. According to World Bank, three challenges in the digitalization of the public sector in Ukraine are: low systems compatibility, insufficient financial resources for modernization technologies and lack qualified of personnel. Relevance problems human capital confirmed by our results regarding equal digital competencies only 62% of employees possess basic skills, 38% – professional, 18% – specialized) and indicates urgency detected problems.

Yet one the complexity that was discovered during our research, there is a lag in financial control and audit systems compared to other areas of public finance. The DASU system has lowest level automated monitoring (63.7%) regarding timely detection financial violations. The paradox of digitalization also emphasized by [35]: volume different types financial operations is growing faster than control systems that means that they open new opportunities for abuse. This explains necessity harmonization pace digitalization operational and control processes in public finances. Inclusivity digital financial services. In our research was discovered high interest coverage population digital financial services: active mobile customer base banking increased by 51.9% to a significant number of 27.8 million people (almost 70% of the adult population).

However, according to [11], the level of digital coverage is not equal actual financial inclusiveness, because exists high level regional, age and socio-economic differences in access and use digital financial services. Intergenerational digital divide skills that the authors discovered in their study (45 percent difference between younger and older workers), is a reflection of general problems digital inequalities. Inclusivity digital services also related to geographical accessibility high quality internet connection. System diagnostic research [6] explains that in Ukraine urban and rural regions much differ in speed and reliability internet connection that creates problems for the complete using digital financial services in remote areas. This is especially important for local financial system, which, according to our data, has lowest level digitalization (72.9%).

Green financing Prospects sustainable development through green financing. Green financing measures foresee implementation principles sustainable development into the system of state finance, which is a challenge and an opportunity for Ukraine. In its articles about green financing instruments in [34] emphasizes that digitalization opens exceptional possibilities for application green financing mechanisms through automated environmental monitoring indicators project, creation registers green assets and collateral transparency using funds for support ecological goals. In the author's opinion, Ukraine can become a leader in the region in terms of volume greenbacks, in particular, during the final reconstruction after wars, where there is a prospect of building infrastructure based on sustainable principles development [34].

The technological basis of successful functioning green financing instruments shaped by our findings of using digital technologies in tax system (98.1% and 94.6% respectively). As noted by [35], digital transformation finances developed economist directly related to implementation goals sustainable development, because it will give opportunity more efficient distribute resources for environmental projects and implement their monitoring. Simultaneously by [11] warns that for effective implementation green financing instruments are needed not only technological infrastructure, but also the appropriate regulatory framework, certification and verification, as well as specialized personnel.

The fact that level specialized competencies revealed in our study, is low (18%), indicating the need special preparation specialists in the field of green finance. Overall, the results research indicate that Ukraine moving in the direction yet faster digital transformations state funds, although she suffers difficulties from inclusion and assimilation concepts sustainable development. Future research directions can consist in determining long-term influence digitalization for effective using state resources, assessment socio-economic consequences digital inclusion and learning how green finances can be included in the Ukrainian system of state finances for process reconstruction.

VI. CONCLUSIONS

The conducted study of the digital transformation of the public finance system of Ukraine in 2022-2025 in the context of three main aspects, namely digitalization issues, key issues of inclusion, and achieving sustainable development goals, made it possible to examine the status, challenges, and opportunities for modernizing financial management under martial law.

VI.1 CHALLENGES OF DIGITAL TRANSFORMATION

It was noted that there is a significant disparity in the level of digitalization of different parts of public finances: this is most true for local finances, where this indicator is 72.9%, and the highest level – 96.9% – is in the tax system, which creates risks for the tax system as a whole. A serious lack of digital skills was identified in the group of employees of financial authorities, where only 62% of them have basic, 38% – professional, 18% – specialized digital competencies, and 8% – strategic. The gap between generations in digital knowledge is 45%, which proves the need special programs training. It was confirmed a gap in the system financial control in the state that indicates that degree automated monitoring is only 63.7%, which is insufficient to ensure proper control over the use budget funds in the conditions strengthening international attention to transparency financial operations.

Achievement inclusiveness digital financial services. Quantity active users mobile banking also much increased: digital financial services 27.8 million people (51.9%) were covered, which is more than three quarters adult population. Share cashless operations increased to 84.6%, and the share electronic state payments, which is 97.3%, has approached full digitalization interactions between the state and citizens. However was it is noted that obstacles to full financial inclusions still there are, that related to geographical inequality in access to quality internet connection, age-related differences in digital literacy and socio-economic disagreements. Also was it is established that degree coverage electronic services different between state audit (68.9% coverage) and tax system (99.2% coverage), which means the need for a systematic approach to ensure general coverage.

VI.2 PROSPECTS SUSTAINABLE DEVELOPMENT THROUGH GREEN FINANCING

It has been established that in the implementation principles sustainable There is a positive trend in the development of the state budget system: the volume green bonds grew triple from UAH 2.8 billion in 2022 to UAH 8.4 billion in 2025. Share state purchases that contain ecological requirements, also increased to 18.7% compared to 12.4%, which indicates a gradual implementation green principles state procurement. Digital systems energy management allowed to reduce consumption energy budgetary institutions by 23.6%. It was found that digitalization provides technological infrastructure for successful functioning green financing instruments with automated tracking ecological indicators and provision transparency using funds.

VI.3 PRACTICAL RECOMMENDATIONS

To solve identified problems it is proposed: first, to create national program development digital competencies among employees spheres state finances, focusing attention to the elderly employees; secondly, to accelerate digitalization of financial control systems and local finances, so that to align digitalization different segments; third, create integrated management platform financial sector, which will ensure systems interaction; fourth, strengthen infrastructure broadband internet in rural areas, so that make digital services more inclusive; fifth, create a regulatory framework for green financing that will provide for mechanisms digital checks ecological.

VI.4 LIMITATION RESEARCH

The main the disadvantage is that official statistics on some aspects digitalization state finances are incomplete due to the state of war, which affected accessibility some data in 2022–2023. The dynamic nature of digital transformations leads to the fact that investigated processes quickly are changing, and therefore require frequent revision of empirical The problem of geographical coverage research, because it is conducted in Ukraine, does not allow us to be confident in extrapolation conclusions on other countries excluding theirs specific situations.

VI.5 PROSPECTS FURTHER RESEARCH

Such aspects such as influence digitalization for effective using state resources within panel data for a long time period, socio-economic effects digital inclusion, research mechanisms integration of green financing into the public sector finance, comparative analysis of digital models transformations state finance in countries with similar level economic development, are important aspects of future research.

VII. AUTHOR'S CONTRIBUTION

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