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Digital Public Governance as a Sustainability and Resilience Mechanism under Crisis Conditions: Evidence from Ukraine and Implications for the European Union

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Abstract:

Purpose: *This paper analyses the role of digital public governance and selected e-government platforms in sustaining the functioning of the Ukrainian state and economy under wartime conditions and assesses the adaptive potential of this experience for European Union member states as a mechanism supporting institutional sustainability and resilience.*
Design/Methodology/Approach: *The study adopts a qualitative-quantitative descriptive approach based on secondary data analysis, comparative analysis, and triangulation of sources, including reports of Ukraine's Ministry of Digital Transformation, the OECD, the World Bank, the European Commission, and the UNDP. A comparative analysis is conducted with Estonia, Poland, and Denmark, selected as three distinct models of digital governance in Europe.*
Findings: *The results show that platforms such as Diia, Diia. Business, eRobota, and Air Alert played a decisive role in ensuring the continuity of public services, supporting businesses, and enabling crisis communication throughout the war. Their integration into the public management system allowed Ukraine to maintain core state functions despite the ongoing armed conflict. The comparative analysis indicates that, while not directly transferable, the Ukrainian model can inform EU digitalization strategies, particularly regarding mobile administrative services and the integration of digital tools with crisis management systems.*
Practical implications: *The findings support concrete policy recommendations for EU institutions and member states, including the development of a European Digital Resilience*

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Platform, harmonized cybersecurity regulation, cross-border e-government services, an EU-wide early warning system, and targeted digital education and SME-support programmes for the 2025-2035 period.
Originality/value: *The article contributes an original three-dimensional framework of digital resilience - technological, institutional, and user-based - and applies it to an unprecedented wartime case, offering a theory-informed account of how digital governance mechanisms can support institutional and economic resilience and long-term sustainability under conditions of systemic crisis.*

Keywords: *Digital public governance, sustainability, digital resilience, crisis management, strategic management in the public sector, economic resilience, digital services, digital technologies, European Union.*

JEL classification: *H11, H83, D73, O33, F55.*

Paper type: *Research paper.*

1. Introduction

In the 21st century, digitization has become one of the key factors in socio-economic transformation, determining changes in public administration, the private sector, and relations between the state and its citizens. As indicated by research conducted by the OECD (OECD, 2021) and the World Bank (World Bank, 2024), the development of information and communication technologies not only enables the streamlining of administrative processes but also increases the institutional and economic resilience of countries in crisis situations.

International literature emphasizes that digital public services increase the accessibility and transparency of administration, and in conditions of sudden disruption—such as the COVID-19 pandemic or natural disasters—they can become the foundation for maintaining the basic functions of the state (United Nations, 2022).

However, Ukraine is a unique case on a global scale. The full-scale war that has been ongoing since February 2022 has led to an unprecedented situation in which the state has been forced to maintain the continuity of public services, the economy, and communication with citizens in wartime conditions. According to reports from Ukraine's Ministry of Digital Transformation (Ministry of Digital Transformation of Ukraine, 2023), during this period, digital platforms such as Diia, Diia.Business, eRobota, and Air Alert played a key role in providing access to documents, identity, social benefits, support for entrepreneurs, and information about military threats.

Ukraine's digital transformation is the result of many years of investment in e-government, but it was only the conditions of war that revealed its potential in terms

of economic and institutional resilience and its broader contribution to sustainable development and long-term socio-economic stability. While the COVID-19 pandemic highlighted the need for digitization of services in European Union countries (European Commission, 2022), Ukraine has become an example of a country that, under extreme conditions, has managed to transform its digital infrastructure into a pillar of state functioning supporting sustainable governance and community well-being.

However, the literature still lacks a structured assessment of the adaptability of Ukraine's digital governance experience to other national contexts, particularly within the European Union, which this article addresses through a three-dimensional conceptualization of digital resilience encompassing technological, institutional, and user dimensions.

Against this backdrop, the article contributes to the literature on digital economy transformation by examining digital public governance as a mechanism of resilience under conditions of systemic crisis. By situating the Ukrainian case within the broader context of European Union governance frameworks and policy priorities, the study offers a theory-informed perspective on the transferability of digital resilience solutions beyond their original national setting.

These considerations led to the development of an article, the objectives of which are formulated as follows:

1. Identifying the role of selected digital services in maintaining the continuity of Ukraine's economy in wartime conditions.
2. To examine the mechanisms of integrating digital services into the public management system and their impact on socio-economic resilience.
3. To assess the possibility of adapting and scaling Ukrainian experiences in European Union countries.

Based on these objectives, the following research hypotheses were formulated:

H1: Digital services such as Diia have significantly contributed to maintaining Ukraine's administrative and economic functions in conditions of armed crisis.
H2: The integration of digital tools into the public management system has strengthened the state's ability to respond to emergencies and improved the resilience of the economic system.
H3: The Ukrainian model of digital transformation of public administration has adaptive potential and can inspire strategies for digitization and economic resilience in selected European Union countries.

The article makes a significant theoretical contribution to the discipline of management and quality science through an innovative combination of the perspectives of e-government, institutional resilience, and digital transformation. It

also provides practical recommendations for policymakers in EU countries. The structure of the article includes a literature review, a description of the methodology, a presentation of the results, a discussion, and conclusions and recommendations.

2. Literature Review

2.1 Resilience as a Category in Management and Quality Sciences, Economics, and Finance

In the 21st century, the concept of resilience has become one of the key analytical categories in management sciences, economics, finance, and public policy. In international literature, this term has gained particular significance in the context of crisis management, organizational adaptation, and building sustainable development in conditions of extraordinary threats (Holling, 1973; Tyagi *et al.,* 2023).

Resilience and sustainability are increasingly treated as complementary concepts. While resilience focuses on the ability of systems to absorb shocks and adapt to changing environments, sustainability emphasizes maintaining this adaptive capacity over time through balanced economic, social, and environmental development. Integrating these perspectives allows for a more comprehensive understanding of how institutions and economies can achieve both short-term recovery and long-term sustainable growth.

In economics, the concept of resilience refers to the ability of an economic system to survive and adapt in crisis situations, such as recessions, supply shocks, financial crises, or armed conflicts. In finance, it mainly refers to the stability of the financial system (Rose, 2007). In management sciences, the term is increasingly used to analyze the ability of organizations, institutions, and countries to respond to dynamic and unpredictable changes in the environment (Comfort *et al.,* 2010).

In the context of the war in Ukraine, the concept of resilience takes on special significance—not only as a theoretical category, but also as a practical tool for examining the ability of institutions, economies, and societies to survive in extreme conditions.

There are many definitions of resilience in world literature, emphasizing different aspects of this category. Among the most frequently mentioned are:

1. Resilience in general terms, understood as the ability of a system (organizational, social, economic) to survive, adapt, and develop in conditions of disruption (Walker *et al.,* 2004).
2. Organizational resilience interpreted as the ability of an organization to prepare, respond, and learn in the face of crises, as well as to transform crisis experiences into new sources of competitive advantage (Lengnick-Hall *et al.,* 2011).

3. Institutional resilience refers to the stability and flexibility of public institutions in times of crisis, as well as their ability to ensure the continuity of public functions (Alexander, 2013).

Polish literature on the subject points out that resilience is an interdisciplinary category, combining organizational and systemic perspectives. As Zaplata (2025) emphasizes, resilience in management sciences should be understood as the ability to adapt and reconfigure resources in the face of disruptions, while maintaining strategic coherence.

In global literature, resilience is linked to adaptive systems theory, which emphasizes the role of flexibility, learning, and innovative capabilities in responding to change (Folke, 2006; Velinov *et al.,* 2023).

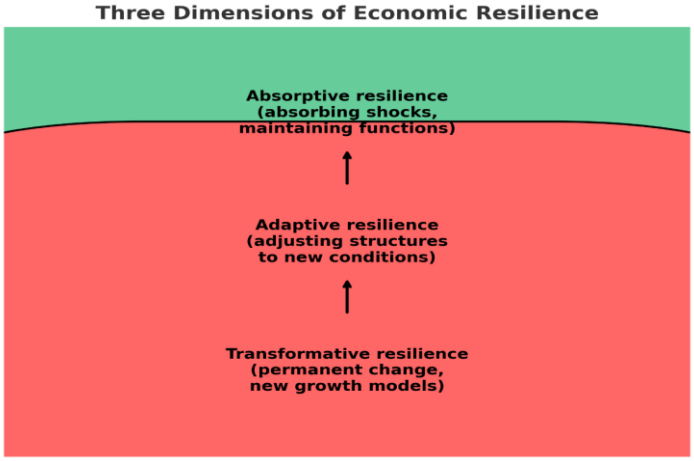
Ukrainian researchers point out that resilience should be considered at multiple levels – at the state, economy, and local community levels. According to Yakovenko *et al.* (2025), the resilience of Ukraine's economy during the war stems from a combination of the digitization of public services, support for businesses, and the mobilization of civil society.

The interpretation of economic resilience refers to the ability of the economic system to absorb shocks, minimize losses, and quickly return to equilibrium. Literature distinguishes three basic dimensions of economic resilience (Martin, 2012):

1. Absorption resilience, understood as the ability to assimilate the negative effects of shocks (e.g., financial crises, natural disasters, armed conflicts) while maintaining basic functions. An example is the maintenance of public service continuity and macroeconomic stability despite disruptions (Rose, 2007).
2. Adaptive resilience, interpreted as the ability to adapt institutional structures, processes, and public policies to changing conditions. Regulatory flexibility and organizational innovation play a key role here (Lengnick-Hall *et al.,* 2011).
3. Transformational resilience, understood as the ability to change permanently and create new models of development. This refers to both structural changes in the economy and the modernization of public institutions. Research shows that this dimension of resilience promotes long-term competitiveness and sustainable development (Martin, 2012) (Figure 1).

A three-dimensional approach to economic resilience allows for a better understanding of the dynamics of countries' adaptation in times of extraordinary threats. From the perspective of management and quality sciences, as well as economics and finance, it is important that effective public policy integrates all three dimensions of resilience within a coherent development strategy (Zaplata, 2025).

Figure 1. *Three dimensions of economic resilience*



Source: *Own work.*

In management and quality sciences, resilience is analyzed from several perspectives:

- Strategic, considering the ability of public organizations and institutions to anticipate threats and prepare alternative plans,
- Operational, referring to the ability to continuously adapt processes and structures to disruptions,
- Social, meaning the mobilization of social resources, trust, and social capital in crisis conditions.

Research by Lengnick-Hall and Beck (2005) indicates that organizational resilience is linked to an organizational culture based on flexibility, cooperation, and learning ability. In the case of public administration, these elements translate into better preparedness for systemic crises, such as the COVID-19 pandemic or the war in Ukraine.

In economics, the concept of resilience is analyzed in the context of economic crises, global supply shocks, and structural changes. As Martin and Sunley (2020) emphasize, regional and economic resilience is a dynamic process in which the ability to recover depends on the quality of institutions, public policy, and the level of innovation in the economy.

Simmie and Martin (2010), on the other hand, believe that resilience is particularly important in a regional context. They interpret it as the ability of economic systems to restore growth after crises and the ability to use crises as an impetus for innovation and restructuring.

In finance, resilience is analyzed primarily in the context of the stability of the financial system and the ability of financial institutions to absorb external shocks. Financial resilience is also understood as the ability of the banking system, capital markets, and regulatory institutions to maintain liquidity and solvency in times of crisis, as well as the ability to mitigate systemic risk (Allen *et al.,* 2014).

As Houben *et al.* (2004) emphasize, the resilience of the financial system is a prerequisite for macroeconomic stability, as it allows for the uninterrupted functioning of capital allocation, risk management, and investment support mechanisms. Ukrainian research also indicates that in wartime, financial resilience is linked to ensuring the continuity of banking and settlement services and maintaining confidence in financial institutions (Standard-Rating, 2024).

In this context, resilience in finance is closely linked to the concept of regulatory stability and the ability of central banks and supervisory institutions to take anti-crisis measures.

In summary, it should be noted that the concept of resilience, both in management and quality sciences as well as in economics and finance, is a multidimensional category encompassing institutional and organizational capabilities as well as economic mechanisms. In the context of research on digitalization and building a resilient economy, it is particularly important to combine three perspectives: institutional, social, and economic resilience.

The approaches discussed in international, Polish, and Ukrainian literature indicate that resilience should be treated not only as a capacity for survival, but also as a strategic category enabling long-term development and transformation in conditions of extraordinary threats.

Digital resilience, as used in this study, is defined as the capacity of public institutions and governance systems to maintain, adapt, and transform their core functions through digital infrastructures under conditions of systemic shock. Unlike traditional concepts of *institutional resilience*, which emphasize organizational stability and regulatory continuity, digital resilience explicitly incorporates the role of digital platforms, data interoperability, and user-level adoption as operational enablers of resilience.

Furthermore, digital resilience goes beyond *e-governance maturity models*, which primarily assess the technological advancement and service availability of digital administration. While e-governance maturity focuses on the degree of digitalization in stable conditions, digital resilience captures the performance of digital systems under extreme disruption, such as armed conflict, large-scale infrastructure damage, or mass displacement. In this sense, digital resilience constitutes a distinct analytical dimension, integrating technological capacity, institutional integration, and societal usage into a unified framework of crisis governance.

It should be emphasized that digital resilience, as conceptualized in this study, does not constitute a formal theory or a predictive model, but rather an analytical framework designed to support interpretation and comparison of governance responses under conditions of systemic disruption. The key dimensions of resilience in public management are presented in Table 1.

Table 1. *Core dimensions of digital resilience in public governance*

Dimension	Analytical focus	Illustrative indicators (conceptual)	Examples from the Ukrainian case
Technological	Capacity of digital infrastructure to ensure continuity under disruption	Platform availability, interoperability, cybersecurity, cloud backup	Diia platform, cloud-based data storage, Air Alert system
Institutional	Integration of digital tools into public administration and crisis management	Legal frameworks, inter-agency coordination, integration with emergency governance	Integration of Diia with social benefits, business support, and crisis response mechanisms
Societal (User)	Adoption and effective use of digital services by citizens and businesses	User penetration rate, service accessibility, inclusiveness	Over 20 million Diia users; widespread use of mobile administrative services during wartime

Source: *Authors' own conceptualization.*

The three dimensions of digital resilience outlined in Table 1 also provide the analytical basis for the conceptual clustering of European digital governance models applied later in the comparative analysis.

2.2 Digitization of Public Administration and the Resilience of the State and Economy

The digitization of public administration is one of the key elements of public sector modernization, enabling increased efficiency of decision-making processes, reduced bureaucracy, and improved quality of public services (Mergel *et al.,* 2019).

In the broader perspective, digital transformation contributes not only to operational efficiency but also to the sustainability of governance systems. It supports the achievement of the UN Sustainable Development Goals (SDGs), particularly Goal 16 — "Peace, Justice and Strong Institutions," and Goal 9 — "Industry, Innovation and Infrastructure," by ensuring inclusive access to services and transparency in public administration (United Nations, 2022).

It should be emphasized that e-government contributes not only to improving the functioning of administration, but also to increasing transparency and public trust in state institutions. The digitization of the public sector, including public

administration at various levels, and the digitization of households is identified as an important area, alongside the manufacturing, service, and agricultural sectors, as a prerequisite for innovation processes.

The fourth edition of the Oslo Manual (Oslo Manual, 2018a) identifies two groups of innovations, namely product innovations and business innovations, while pointing to the role of business models, including the important role of digital intermediary platforms, both market-based and those related to the provision of public services.

Thus, the growing importance of business models and their innovativeness in relation to the digitization of the economy, manifested, among other things, in the growing role of digital intermediary platforms, was not without significance in the development of the fourth edition of the Oslo Manual. The fourth edition of the Oslo Manual introduces definitions of digital innovation (Oslo Manual, 2018b) and the concept of innovation in business processes (Oslo Manual, 2018c).

The concept of state resilience includes the ability of institutions to maintain basic functions in times of political, economic, or military crises (Holling, 1973). In the context of digitalization, this means building systems that are resistant to disruption and can guarantee continuity of services even in emergency situations. The OECD (OECD, 2022a) and the World Bank (World Bank, 2024) point out that digital public administration tools increase the resilience of states through data integration, process automation, and the development of crisis communication channels.

Technologies that support the digitization of the economy, such as cloud technologies, mobile Internet, and blockchain, are also important for increasing the resilience of the state. Cloud technologies enable digital resources to be stored in secure locations, e.g., outside the country. In turn, Starlink satellite internet kits have proven to be an example of the importance of mobile internet, especially in crisis or war situations. Research by Tangi *et al.* (2021) suggests that the digitization of public administration promotes not only operational efficiency but also the adaptability of institutional systems in the face of unpredictable challenges.

2.3 Ukraine's Digital Ecosystem in Wartime

Ukraine's digital transformation began with the introduction of a series of legal acts into the national legal system, which created a comprehensive framework for the functioning of electronic services. The key document in this regard is the Ukrainian law of October 5, 2017, on the basic principles of ensuring Ukraine's cybersecurity, which establishes the principles of state policy in the field of cybersecurity, defines the responsible authorities, and specifies the mechanisms of cooperation between them (No. 2163-VIII) (Verkhovna Rada of Ukraine, 2017a).

At the same time, on November 7, 2018, the Act of October 5, 2017, on electronic trust services came into force, implementing the key principles of the EU eIDAS

Regulation (No. 2155-VIII) (Verkhovna Rada of Ukraine, 2017b). This Act introduced institutions such as electronic signatures, Mobile ID, electronic seals, and electronic time stamps, and regulates issues related to electronic identification and the provision of electronic trust services.

The development of digital public services in Ukraine accelerated significantly after 2019 with the launch of the Diia platform. Initially, it offered basic administrative functions such as digital identity documents and business registration, but during the war it became a key tool for maintaining communication between the state and its citizens (Ministry of Digital Transformation of Ukraine, 2023).

Beyond ensuring continuity of governance, these initiatives have also supported social sustainability by maintaining citizens' access to essential services, promoting digital inclusion, and strengthening civic trust — all of which are essential dimensions of sustainable development under crisis conditions.

At the same time, other platforms were developed, such as Diia.Business, which supports entrepreneurs in relocating and rebuilding their businesses, eRobota, which offers microloans to SMEs, and Air Alert, which provides a military threat notification system (Ministry of Digital Transformation of Ukraine, 2023).

According to a UNDP report (UNDP Ukraine, 2022), these tools have created a coherent ecosystem of digital services, integrating the activities of central government, local authorities, the private sector, and international organizations. Research by Ukrainian think tanks shows that the integration of digital services with public management processes enables rapid response to humanitarian, economic, and infrastructure crises (Council of Europe, 2022; UNHCR, 2024).

2.4 International Experiences in Digitization and Resilience

The digital transformation of public administration is a global phenomenon, and the experiences of individual countries are a valuable source of knowledge for Ukraine and the countries of the European Union. Comparative studies on Estonia, Poland, and Denmark show that countries with advanced e-government ecosystems tend to achieve higher levels of institutional sustainability. Their digital infrastructures facilitate not only resilience to crises but also the pursuit of sustainable governance models that balance innovation, inclusiveness, and social trust.

Estonia is considered a pioneer of digitization in Europe—its e-Estonia system integrates state registers, administrative services, and security systems into a single digital environment, enabling full automation of administrative processes. The X-Road platform, created by the European leader in the digitization of public administration, ensures interoperability between public and private sector databases, enabling real-time information exchange (Espinosa and Pino, 2024).

Over 99% of public services are available online, and electronic voting (e-voting) was implemented as early as 2005 (OECD, 2023a). In the context of national resilience, Estonia has created the concept of a "data embassy," which is a backup of critical databases stored outside the country. This solution ensures the continuity of administration even in the event of cyberattacks or disasters (European Commission, 2023).

In Poland, the development of public administration digitization accelerated after 2015 with the implementation of systems such as ePUAP (Electronic Public Administration Services Platform) and Profil Zaufany (Trusted Profile) (Dudarski, 2024). In recent years, the mObywatel application, which provides access to digital identity documents, e-prescriptions, and local government services, has become crucial.

An innovative element is the GovTech Polska program, which supports innovation in the public sector through cooperation with IT companies and the development of digital platforms for citizens and businesses (Wloch and Sledziewska, 2020). Despite progress, Poland faces challenges in terms of system interoperability and the integration of digital services with crisis management (Sledziewska and Wloch, 2021). European Commission reports (European Commission, 2024) point to the need for further investment in cybersecurity, uniform data standards, and digital education for citizens.

Denmark is one of the leaders in digitization in Europe, but unlike Estonia, it places greater emphasis on digital security and data privacy as part of its A Strong Digital Denmark 2030 strategy (Danish Government, 2022). This strategy envisages the full digitization of public services while ensuring high standards of security and access to services for groups at risk of digital exclusion.

Denmark has also developed the NemID system (now replaced by MitID), which is a central authentication tool in e-government and banking, increasing the consistency and security of digital services. In the context of national resilience, Denmark integrates digital systems with crisis management, including public warning and emergency response (Danish Government, 2022).

The OECD (OECD, 2022a) and the Council of Europe (Council of Europe, 2022) emphasize that the digitization of public services in EU countries should go hand in hand with the development of legal regulations concerning data security, system interoperability, and service inclusiveness.

2.5 Research Gap and Need for Further Research

Despite the growing number of publications on the digitization of public administration, few studies analyze the role of digital services in armed conflict. Most of the work to date has focused on the COVID-19 pandemic (OECD, 2021),

economic transformation (European Commission, 2022), or the development of the information society in peacetime (European Commission, 2023).

The case of Ukraine is unique because it shows how digital technologies can support the state in extreme situations, enabling it to maintain basic administrative and economic functions.

However, few studies have explored how such digital resilience contributes to the broader goals of sustainable development, such as institutional stability, social inclusion, and long-term recovery. Addressing this research gap allows for linking digital transformation not only with crisis response but also with sustainability-oriented public policy design.

There is a need for comparative research to assess the adaptability of Ukraine's experience in EU countries, considering differences in digital infrastructure, legal regulations, and administrative culture (UNDP Ukraine, 2022).

3. Methodology

Although the study employs quantitative indicators derived from secondary data sources, the analysis remains descriptive and comparative in nature and does not aim to test causal relationships between digitalization and resilience outcomes.

Due to the complexity of the phenomenon under study and the objectives formulated in the article, a qualitative-quantitative approach was used in the research. It was based on secondary data analysis, comparative analysis, and triangulation of sources. This approach allowed for a holistic view of the problem and enabled the verification of research hypotheses based on a variety of data sources (Creswell and Creswell, 2018).

The main research method was secondary data analysis. The following sources were used for the analysis:

a) Reports of the Ministry of Digital Transformation of Ukraine concerning the functioning of the Diia platform and tools such as Diia.Business, eRobota, and Air Alert (Ministry of Digital Transformation of Ukraine, 2023),
b) Reports from international organizations, including the OECD, the World Bank, the European Commission, and the UNDP, relating to the digitization of public administration and the resilience of states in crisis situations (OECD, 2021; World Bank, 2024; European Commission, 2023; UNDP Ukraine, 2022);
c) Books and articles in English, Ukrainian, and Polish focusing on the digitization of public administration, crisis management, economic resilience, and digital transformation in Central and Eastern European countries (Tangi et al., 2021; Wloch and Sledziewska, 2020);

d) Statistical data on the number of digital platform users, the range of available services, and their use in 2022-2024.

The methodological framework of the study was also guided by the principles of sustainable development. The selection and interpretation of data were carried out with reference to the United Nations Sustainable Development Goals (SDGs), particularly Goal 9 ("Industry, Innovation and Infrastructure") and Goal 16 ("Peace, Justice and Strong Institutions").

By analyzing digital services as instruments for maintaining institutional continuity, transparency, and inclusiveness during crises, the research highlights how digital transformation supports the sustainability of governance systems and contributes to building long-term socio-economic stability. The analysis of secondary data made it possible to identify the main functions and tools of digital services in Ukraine and their role in maintaining basic administrative and economic functions in wartime conditions (UNDP Ukraine, 2022).

Another element of the research procedure was a comparative analysis of solutions used in Ukraine and in selected European Union countries. The selection of countries was deliberate. Countries with different levels of digitization were selected. Among the countries analyzed were:

- Estonia, as the leader in digitization in Europe (e-Estonia system),
- Poland, where the GovTech program and the mObywatel platform are being developed,
- Denmark, where the A Strong Digital Denmark strategy is being implemented, which emphasizes data security and the inclusiveness of public services (Espinosa and Pino, 2024; Sledziewska and Wloch, 2021; Danish Government, 2022).

Estonia, Poland and Denmark were selected as comparative cases based on a purposeful sampling strategy reflecting three distinct models of digital transformation in Europe.

Estonia represents a fully integrated and highly interoperable e-government ecosystem; Poland illustrates a dynamic but still partially fragmented model of public sector digitalization; while Denmark demonstrates a mature digital governance model strongly grounded in data security, inclusiveness, and citizen trust.

This selection aligns with theoretical perspectives on digital transformation and institutional resilience, which emphasize the importance of analyzing countries with different administrative traditions, governance infrastructures, and degrees of digital maturity. Such diversity makes it possible to more accurately assess the transferability of Ukrainian digital resilience practices to EU Member States.

The selection of Estonia, Poland, and Denmark was guided by a theory-driven comparative sampling strategy, rather than an attempt to represent the full diversity of European Union governance models. The purpose of the comparison was analytical rather than statistical.

The selected countries reflect three distinct clusters of digital governance and institutional resilience observed in Europe. Estonia represents a highly integrated and interoperability-driven digital governance model, Poland illustrates a transitional and partially fragmented model, while Denmark exemplifies a security- and trust-oriented model, characterized by strong data protection and regulatory compliance. This conceptual clustering allows for meaningful comparison of governance logics and enhances the analytical transferability of the Ukrainian case to different EU institutional contexts.

Table 2. *Conceptual clustering of EU digital governance models based on the dimensions of digital resilience*

Governance cluster	Dominant digital resilience dimension	Key characteristics	Representative country
Integrated digital governance	Technological + Institutional	High interoperability, unified digital identity, strong institutional embedding of digital platforms	Estonia
Transitional digital governance	Institutional + User	Partial interoperability, coexistence of legacy systems, expanding user adoption	Poland
Security- and trust-oriented governance	Institutional + Technological	Strong data protection, regulatory compliance, cautious but stable digital infrastructure	Denmark

Source: *Authors' own conceptual clustering based on the digital resilience framework (Table 1).*

This clustering does not constitute a statistical classification but a theory-informed typology, in which countries are grouped according to the dominant configuration of digital resilience dimensions. Such an approach allows for analytically meaningful comparison despite the limited number of cases.

To increase the reliability of the results, the study used data triangulation by combining:

• quantitative data (data on users, number of services and their use),
• qualitative data (analysis of documents, reports, and scientific publications),
• comparative context (Ukraine-European Union countries).

The use of data triangulation made it possible to obtain a holistic picture of the phenomenon under study and reduced the risk of misinterpretation, which is in line

with methodological recommendations in public policy and crisis management research (Silverman, 2011; Yin, 2018). This study is based exclusively on secondary data, as the wartime conditions in Ukraine made it impossible to collect primary empirical material or conduct quantitative field research.

While the secondary sources used in this article were triangulated across international reports, governmental documents, and academic analyses, the absence of primary data limits the generalizability of the findings and restricts the possibility of empirically measuring the effectiveness of individual digital services. The results presented should therefore be interpreted as exploratory and descriptive. This approach is consistent with methodological recommendations for research conducted in crisis environments, where data accessibility is constrained and research risks are elevated.

The adopted research methodology also has certain limitations. The research is based on secondary data, which to some extent limits the possibility of direct verification of some of the information. This applies primarily to the quality of digital services from the point of view of end users. In addition, the availability and therefore the comparability of data between Ukraine and EU countries varies, which may affect the accuracy of comparative analyses (Braun and Clarke, 2024).

In the future, the authors plan to use qualitative methods in their research (e.g., interviews with representatives of public administration and digitization experts), which would enable an in-depth analysis of the processes of implementation and use of digital services.

4. Research Results and Discussion

The analysis of secondary data and comparative data allowed for the identification of key areas in which digital services played a crucial role in maintaining the functioning of the Ukrainian state and economy during the ongoing war. The results were presented in five thematic blocks: the scale of digital service use, support for the economy and businesses, crisis communication, integration with the public management system, and adaptive potential for European Union countries.

4.1 Scale of Digital Service Usage in Ukraine

Between 2022 and 2024, there was a sharp increase in the number of users of digital services in Ukraine (Table 3). Reports from the Ministry of Digital Transformation of Ukraine show that in mid-2024, the Diia platform had over 20 million users, which represents about 60% of the country's adult population (Ministry of Digital Transformation of Ukraine, 2023). The number of services offered through the platform increased from 72 in 2021, to 96 in 2022, 115 in 2023 and 132 in 2024, including digital identity documents, business registration, social benefits, reporting war damage, and tax services (World Bank, 2024).

Table 3. *Use of digital services in Ukraine in 2021-2024*

Year	Number of Diia platform users (million)	Number of services available on Diia	Number of notifications in Air Alert
2021	9.5	72	0
2022	14.0	96	4500
2023	18.5	115	8200
2024	20.2	132	12000

Source: *The authors' study based on: Ministry of Digital Transformation of Ukraine (2023); World Bank (2024); UNDP Ukraine (2022).*

Dynamic growth was also recorded in the case of the Air Alert application, which has sent over 12,000 hazard alerts across the country since the beginning of the war (Ministry of Digital Transformation of Ukraine, 2023). The implementation of this system has enabled the rapid warning of civilians about air raids and missile attacks, which has had a direct impact on the safety of residents (UNDP Ukraine, 2022).

The increase in the number of digital platform users should not be interpreted as a direct causal indicator of improved resilience. In this study, user growth is treated as an indicative proxy for service accessibility and functional continuity under crisis conditions. This dynamic occurred alongside multiple confounding factors, including internal and external population displacement, physical infrastructure damage, and wartime centralization of public administration.

4.2 Support for the Economy and Businesses

Between 2022 and 2024, Ukraine also saw dynamic development of IT tools aimed at the economic sector (Table 4). Between 2022 and 2024, the Diia.Business platform also helped to relocate over 750 businesses from areas affected by military operations to western regions of Ukraine (World Bank, 2024) (Ministry of Digital Transformation of Ukraine, 2023).

The eRobota program awarded over 10,000 microgrants to small and medium-sized enterprises and farms. The microgrants supported the reconstruction of economic activity, job creation, and the maintenance of production in wartime conditions (Ministry of Digital Transformation of Ukraine, 2023).

Table 4. *Support for businesses*

Year	Companies relocated by Diia.Business	Microgrants under eRobota	Public tenders in Prozorro
2022	210	2500	15000
2023	480	3800	18000
2024	750	4200	20500

Source: *The authors' study based on: UNDP Ukraine (2022); Council of Europe (2022); OECD (2022b); Prozorro (2023).*

In addition, the Prozorro public procurement system has enabled companies to participate in state tenders, ensuring transparency in procurement processes even in times of crisis (Prozorro, 2023).

4.3 Crisis Communication and E-Government

The use of digital tools has significantly improved communication between public administration and citizens. The implementation of mobile applications has enabled, among other things, the submission of applications for financial assistance, the registration of war damage, and constant access to information about evacuations and shelters.

The UNDP report (UNDP Ukraine and Ministry of Digital Transformation of Ukraine, 2024) indicates that Ukraine has created an integrated e-government system based on mobile platforms, enabling the continuity of public services despite the destruction of physical infrastructure.

4.4 Integration with Crisis Management System

Digital services have been integrated into crisis management systems and administrative activities at all levels. The Ministry of Digital Transformation has cooperated with local authorities, the IT sector, and international organizations, which has enabled services to be quickly adapted to changing social and economic needs (OECD, 2022a).

The OECD (OECD, 2021) emphasizes that multisectoral cooperation was one of the key factors in the success of Ukraine's digitalization, allowing for effective coordination of activities in crisis situations.

4.5 International Comparison and Adaptation Potential

A comparative analysis shows that Ukraine has quickly achieved a level of digitization of public services similar to that of selected European Union countries (Table 5).

Table 5. *International comparisons*

Country	Number of online services	Users (% of population)	Integration with crisis management system
Ukraine	132	60	High
Estonia	140	75	Medium
Poland	110	50	Low
Denmark	125	68	Medium

Source: *The authors' study based on: European Commission (2025); International Telecommunication Union (2023); European Commission (2024); OECD (2021).*

Based on Table 5, it can be concluded that:

- Estonia maintains its leading position in terms of state system integration, but Ukraine's digitalization development in wartime conditions is characterized by greater dynamism (Espinosa and Pino, 2024);
- Poland is implementing programs such as GovTech Polska and mObywatel, but their functional scope and level of use are still lower than in the case of Diia (Sledziewska and Wloch, 2021);
- Denmark emphasizes data protection and privacy, which indicates the need to further adapt Ukrainian services to EU regulations such as the GDPR (Danish Government, 2022).

European Commission experts (European Commission, 2022) emphasize that Ukraine's experience can support the implementation of the European Digital Decade 2030, particularly in the areas of mobile administrative services and the integration of crisis management systems with digital infrastructure.

The observed differences between Ukraine and the selected EU countries should be interpreted considering the conceptual clustering of digital governance models presented in Table 2, which reflects distinct configurations of technological, institutional, and user dimensions of digital resilience.

4.6 Sustainability Dimension of Digital Resilience

The analysis of empirical data also demonstrates that the implementation of digital services in Ukraine contributes not only to the resilience of institutions and the economy but also to their sustainability. The integration of platforms such as Diia and eRobota has helped maintain inclusive access to public and business services, even for socially vulnerable groups and small enterprises affected by the war.

This inclusiveness is consistent with the principles of sustainable development, particularly in promoting equal access to opportunities, transparency of governance, and digital participation. Moreover, the continuity of public functions achieved through digital infrastructure reduces administrative inefficiencies and supports resource-efficient governance — a dimension often emphasized in sustainability-oriented policy frameworks.

These sustainability effects correspond primarily to the institutional and user dimensions of digital resilience later synthesized in Figure 2.

4.7 Long-term Sustainability Implications for the EU

The comparative results with Estonia, Poland, and Denmark indicate that integrating digital services into public management systems can enhance the long-term sustainability of governance in European Union countries. Beyond improving administrative efficiency, digital ecosystems foster social trust, innovation, and adaptability — elements essential for sustainable institutional development. The

Ukrainian case shows that resilient digital infrastructures can serve as a foundation for sustainable socio-economic recovery, reducing systemic vulnerability and supporting the implementation of the UN Sustainable Development Goals (SDGs), especially those related to strong institutions, innovation, and inclusive growth.

These observed differences can be further interpreted through the conceptual clustering of digital governance models presented in Table 2, which reflects distinct configurations of technological, institutional, and user dimensions of digital resilience.

The interpretation of these results should consider the extraordinary wartime context, including population displacement, infrastructure damage, and the temporary centralization of public governance functions.

4.8 Digital Resilience and Sustainability Nexus

From the perspective of European Union policy frameworks, including the Digital Decade agenda, the Ukrainian experience should be understood not as a directly transferable model, but as a learning case illustrating how digital governance mechanisms can enhance institutional continuity under crisis conditions.

Interpreting the comparative findings through the lens of the digital governance clusters identified in Table 2 allows for a clearer understanding of how different configurations of digital resilience shape national responses to crisis and influence the transferability of the Ukrainian experience. The analysis of the research results shows that the digitization of public administration in Ukraine played a key role in maintaining the continuity of the functioning of the state and the economy in wartime conditions.

The results of the research confirm hypothesis H1, indicating that platforms such as Diia, Diia. Business, eRobota, and Air Alert have significantly contributed to providing citizens and businesses with access to administrative services, information about threats, and financial support instruments even in extreme situations. The digitization of public services has enabled citizens to access key documents (e.g., passports, driver's licenses), social benefits, and business registration in electronic form, despite the destruction of physical infrastructure and mobility restrictions (UNDP Ukraine and Ministry of Digital Transformation of Ukraine, 2024).

Similar conclusions are presented in a UN report (United Nations, 2022), which emphasizes that digital channels for the provision of public services are a prerequisite for the continuity of the state in crisis situations. According to research by Matveieva *et al.* (2024), digital administration in Ukraine has also become a tool for rebuilding citizens' trust in state institutions, which have been able to demonstrate their effectiveness even in wartime conditions. This confirms the thesis that the digitization of administration not only supports the operational efficiency of

the state, but also strengthens its social legitimacy, which is a key element of institutional resilience (Laegreid and Rykkja, 2019).

The results obtained are consistent with studies by the OECD (2022a) and the World Bank (2024), which emphasize that the inclusion of digital tools in the public management system allows states to increase their institutional and economic resilience. This is particularly evident in the data on the number of users of the Diia platform. Its reach in 2024 exceeded 20 million people, which corresponds to 60% of the adult population of Ukraine. A similar phenomenon was observed in Estonia during the implementation of e-Estonia, but in Ukraine this development was more dynamic due to the pressure exerted by the war situation (Espinosa and Pino, 2024).

Hypothesis H2 concerning the integration of digital services with the public management system is also confirmed. The results show that Ukraine has created an integrated ecosystem of services, covering central administration, local authorities, the private sector, and international organizations. Similar conclusions are presented in reports by the UNDP Ukraine (2022) and the European Commission (2022), indicating that effective digitization requires multisectoral cooperation and interoperability of administrative systems.

A comparative analysis with Estonia, Poland, and Denmark shows that Ukraine's experience can serve as a reference point for EU countries, confirming hypothesis H3. While Estonia remains a leader in the digitization of public services, Poland and Denmark are only just developing solutions for mobile administrative platforms and the integration of services with crisis management systems. Thanks to the rapid implementation of digital solutions in wartime conditions, Ukraine has shown that it is possible to combine administrative functions, crisis communication, and economic support in a single digital ecosystem. A summary of the hypotheses in relation to the empirical research results and the literature on the subject is presented in Table 6.

Table 6. *Comparison of research hypotheses with own research results and secondary data*

Hypothesis	Scope	Results of own research	Literature
H1	Digital services and administrative continuity	Confirmed	World Bank (2024); UNDP Ukraine (2024)
H2	Integration of digital tools into public administration	Confirmed	OECD (2021); European Commission (2021)
H3	Adaptability in EU countries	Confirmed	World Economic Forum (2023); International Telecommunication Union (2023)

Source: *The authors' study based on: OECD (2022a); World Bank (2024); UNDP Ukraine and Ministry of Digital Transformation of Ukraine (2024); European Commission (2022); World Economic Forum (2023); International Telecommunication Union (2023).*

The findings also highlight that digital resilience and sustainability are mutually reinforcing dimensions of modern governance. Resilient digital infrastructures ensure the continuity of essential state functions, while sustainable governance frameworks guarantee that these infrastructures are inclusive, transparent, and resource efficient.

In the Ukrainian case, the integration of digital tools into crisis management and economic support systems has not only enhanced institutional resilience but also promoted long-term sustainability by strengthening social trust and reducing administrative and environmental costs. This demonstrates that digital transformation, when aligned with sustainability principles, can generate systemic benefits that extend beyond emergency response toward durable socio-economic stability.

Consequently, the relationship between digital service usage and resilience should be understood as correlational rather than causal. The reliance on secondary data limits the ability to isolate the independent effect of digitalization from broader socio-demographic and infrastructural transformations induced by war.

4.9 Implications for Sustainable Governance in the EU

For European Union countries, the Ukrainian experience provides practical insights into how digital innovation can serve as both a resilience mechanism and a driver of sustainable development. The adoption of integrated digital platforms, data-sharing ecosystems, and inclusive service design contributes to the realization of several UN Sustainable Development Goals (SDGs), notably Goal 9 ("Industry, Innovation and Infrastructure"), Goal 11 ("Sustainable Cities and Communities"), and Goal 16 ("Peace, Justice and Strong Institutions").

These results underline the importance of embedding sustainability considerations into digital policy frameworks at both the national and EU levels, ensuring that the pursuit of technological resilience is aligned with long-term environmental, social, and institutional sustainability.

At the same time, the analysis reveals certain limitations and challenges. First, the development of digital services in Ukraine took place in conditions of limited data protection and lack of full compliance with EU regulations such as the GDPR. Second, the lack of uniform security standards may hinder the integration of Ukrainian platforms with the digital systems of European Union member states. The literature on data protection emphasizes that citizens' trust in digital administration depends on the effectiveness of regulations on privacy and information security (European Commission, 2024).

The results also suggest that Ukraine's experience could support the implementation of the European Digital Decade 2030, which aims to fully digitize public services in

the EU. Particularly important are solutions in the area of mobile administrative platforms, integration with crisis management systems, and support for businesses in emergency situations (European Commission, 2023).

The literature indicates that the digitization of public services can act as a catalyst for economic recovery after crises (Tangi et al., 2021). Experience shows that investments in digital technologies not only enable the maintenance of the main functions of the state, but also support the development of entrepreneurship, which is in line with the findings on digital transformation in the context of sustainable development (United Nations, 2022).

The conceptual model presented in Figure 2 is directly grounded in the three-dimensional framework of digital resilience introduced earlier in the article (Table 1). The model integrates the technological dimension (digital platforms and infrastructure), the institutional dimension (embedding of digital tools within public administration and crisis management systems), and the user dimension (societal adoption and utilization of digital services). Together, these dimensions illustrate how digital resilience operates as a multi-layered governance capability enabling institutional continuity, economic support, and crisis response under conditions of systemic disruption.

Accordingly, Figure 2 should be interpreted as a synthetic and non-testable conceptual representation, rather than as a causal or predictive analytical model.

Figure 2. *Conceptual synthesis of digital resilience dimensions and governance outcomes*

Source: *Own work.*

The analysis identifies a partial regulatory compliance gap between Ukraine and the European Union in the areas of data sovereignty, cross-border data transmission, and cybersecurity governance. While Ukrainian digital platforms operate effectively under emergency legal frameworks, full alignment with EU regulations such as GDPR and NIS2 would require stricter data minimization principles, standardized incident reporting, and enhanced cross-border data governance mechanisms. These discrepancies reflect structural differences between wartime emergency governance and peacetime regulatory regimes rather than deficiencies in digital capacity.

The conceptual model presented is based on the assumptions of organizational resilience theory and strategic management in the public sector. The diagram shows

that digital services (e.g., Diia, Diia.Business, eRobota) are key resources which, when integrated with public and crisis management systems, enable effective response to emergency situations. The model takes into account three dimensions of resilience:

1. Institutional resilience, understood as the ability to maintain continuity of operations and public service delivery in a crisis.
2. Social resilience, interpreted as ensuring public safety, crisis communication, and access to social services.
3. Economic resilience, understood as maintaining the main functions of the economy, supporting businesses, and creating conditions for economic recovery.

In this approach, digitalization acts as a resource and management lever that enables the state to respond effectively to emergencies and maintain its main economic functions. This approach is consistent with the concept of digital resilience, emphasized in the literature of the OECD (2023a), UNDP (2022), and the World Bank (2024), and is in line with theories of strategic management in the public sector.

It is worth adding that digitization in crisis conditions is not only a technological innovation but also serves as a strategic resource that changes the way states and society's function. The experience of Ukraine shows that in a situation of existential threat, the state can use digital tools to maintain basic administrative functions, provide the public with access to documents and services, and mobilize society in areas such as defense financing or humanitarian aid.

This dimension of transformation confirms the hypothesis that digitization is becoming a prerequisite for institutional and economic resilience, rather than merely a tool for streamlining bureaucratic processes. At the same time, it should be noted that digital resilience is not a homogeneous category. It encompasses technological issues (ICT infrastructure, cybersecurity), social issues (digital skills, trust in institutions), and economic issues (support for businesses, creation of new business models). In this sense, Ukraine is a unique laboratory case that shows how the multidimensional nature of digitization can be activated in conditions of extreme crisis.

The conclusions drawn from the research are also relevant for European Union countries, which, although operating in a more stable political environment, face challenges related to global technological competition, the risk of cyberattacks, and the need to ensure the continuity of public services in the face of climate, health, and energy crises. The literature emphasizes that building digital resilience in Europe requires, on the one hand, harmonization of regulations and security standards and, on the other hand, investment in the development of the digital skills of society and inclusive access to services.

An important conclusion from the analysis of the Ukrainian case is also the importance of the speed of implementation of solutions. The Diia platform was introduced in a short period of time, and its functionalities were gradually expanded in response to new needs. This kind of flexibility and adaptability can be a valuable lesson for European institutions, which are often characterized by complex procedures and lengthy legislative processes.

When interpreting the transferability of Ukraine's digital resilience practices to EU Member States, it is essential to acknowledge the significant institutional and contextual differences. Ukraine's digital transformation has been accelerated under wartime conditions, which resulted in unprecedented centralization of decision-making, shortened implementation cycles, and a higher tolerance for operational risk.

In contrast, EU Member States operate in peacetime institutional frameworks characterized by stronger regulatory constraints (e.g., GDPR), longer policy cycles, and extensive stakeholder consultation processes. These differences reduce the direct comparability of digital governance models but do not prevent selected Ukrainian solutions — such as mobile administrative services or crisis-integrated digital systems — from being adapted in a structured, regulated EU environment.

Digitization as a foundation for resilience also entails certain risks and challenges that should be further explored. These include, among others, the risks associated with dependence on global technology providers, inequalities in access to digital services, and issues of personal data protection in the context of mass digitization.

For EU countries, including Poland, Estonia, and Denmark, it will be important to find a balance between the effectiveness of digital solutions and ensuring their security, transparency, and inclusiveness (Deloitte, 2023). Thus, the results of this study contribute to the broader scientific debate on the role of digitization in shaping the resilience of economies and societies, emphasizing that this is not only a technological process, but also a political, social, and cultural one.

4.10 Limitations

The study is subject to limitations related to the reliance on secondary data and the constrained availability of primary empirical evidence due to ongoing wartime conditions.

5. Conclusions, Proposals, Recommendations

5.1 Summary of Key Findings

The research conducted allowed for a comprehensive analysis of the impact of the digitization of public administration and the Ukrainian economy on building the

country's resilience in crisis conditions. The results clearly confirm the importance of digital technologies in ensuring the continuity of public administration, maintaining basic economic functions, and supporting citizens and businesses in emergency situations. To enhance policy relevance and feasibility, the proposed recommendations should be interpreted within an implementation sequencing and marginal benefit framework.

Short-term measures, such as the integration of mobile administrative platforms with crisis communication systems, generate high marginal benefits at relatively low implementation costs, whereas long-term initiatives—such as cross-border interoperability infrastructures—require substantial investment but offer systemic resilience gains over time.

The literature on the subject emphasizes the growing role of digital technologies in the transformation of the public sector and its adaptation to changing conditions (Van der Voet *et al.,* 2021; McKinsey and Company, 2021; United Nations, 2022).

Hypothesis H1, which assumes that digital services contributed to maintaining administrative and economic functions in wartime conditions, has been confirmed both by empirical data (the number of Diia users, the development of Diia.Business and eRobot) and by a comparative analysis with other countries.

In particular, the dynamic growth in the number of services available online in Ukraine in 2021-2024 and their integration with crisis services such as Air Alert indicate that digitization has made it possible to maintain the basic functions of the state in conditions of significant damage to the socio-economic infrastructure (World Bank, 2023).

5.2 Integration of Digital Tools and Governance Resilience

Hypothesis H2, concerning the integration of digital tools into the public management system, has also been confirmed. Research shows that Ukraine has managed to quickly create a digital ecosystem encompassing central administration, local authorities, the private sector, and international organizations. This integration has covered not only administrative services, but also public warning systems, business support programs, and social communication tools (UNDP, 2022).

Hypothesis H3, concerning the potential for adapting Ukrainian experiences in European Union countries, was confirmed by a comparative analysis with Estonia, Poland, and Denmark. The results show that although Estonia remains the leader in the digitization of public services, Ukraine's experience in integrating digital tools with crisis systems can serve as a model for EU countries in the context of building economic and institutional resilience (OECD, 2022a).

5.3 Contribution to the Understanding of Digital and Institutional Resilience

A comparison of the results of our own research with the literature indicates that Ukraine has brought a new perspective to research on state resilience, showing that digital transformation can be an effective tool for responding to systemic crises (European Union, 2024; World Economic Forum, 2023; International Telecommunication Union, 2023).

Based on the obtained results, several recommendations for Ukraine can be formulated aimed at further developing digitalization and strengthening the country's resilience. The most important recommendations are:

1. Development of integrated digital infrastructure. Ukraine should continue developing integrated digital platforms that combine the functions of public administration, crisis management, and economic support. Reports from the UNDP (2022) and the World Bank (2024) indicate that data interoperability is a key factor enabling an effective response to emergency situations.
2. Growing importance of cybersecurity and data protection. As digitalization develops, the importance of data security increases. Ukraine should implement solutions compliant with EU regulations, such as GDPR and NIS2, and develop national cyber threat monitoring systems (ENISA, 2024).
3. Further support for businesses and economic recovery. Programs such as Diia.Business and eRobota should be expanded with new functionalities, including those related to financing innovation, exports, and the digital transformation of small and medium-sized enterprises. OECD research (OECD, 2023a) indicates that the digitalization of small and medium-sized enterprises is a key factor in economic development during crisis times.
4. Continued digital education and the inclusiveness of educational programs in the use of e-government and data security (Bada and Nurse, 2019). Developing digital competences among citizens and officials is a prerequisite for the effective implementation of new services.

Ukraine's experience is significant for EU countries striving to achieve the goals of the European Digital Decade 2030. Based on the analysis, recommendations for individual countries can be formulated (Table 7).

Key recommendations for Poland (Wloch and Sledziewska, 2020; Dudarski, 2024):

1. Integration of the mObywatel platform with crisis management systems.
2. Implementation of a central database enabling the coordination of central and local government activities.
3. Development of digital education as part of the National Recovery Plan.

Recommendations for Estonia (Espinosa and Pino, 2024):

1. Strengthen cybersecurity and data protection in the context of growing hybrid threats.
2. Develop international partnerships for the digitalization of public services.
3. Participate in the creation of European emergency data centers.

Recommendations for Denmark (UNDP, 2022):

1. Integrate digital platforms with early warning and crisis response systems.
2. Develop services for businesses in emergency situations.
3. Implement European data interoperability standards.

Table 7. *Comparison of recommendations for Poland, Estonia and Denmark in 2025-2030*

Country	Priorities
Poland	Integration of mObywatel with crisis management systems; digital education
Estonia	Data security; international partnerships
Denmark	Service inclusiveness; integration with warning systems

Source: *Own work.*

An analysis of Ukraine's experience integrating digital services with public and economic governance systems allows for the formulation of a set of common recommendations for EU countries. These recommendations were developed for the 2025-2035 timeframe:

1. Establishment of a European Digital Resilience Platform (2025-2028) (European Commission, 2023; OECD, 2023a):
- An integrated system for data exchange between EU Member States, encompassing administration, warning systems, and economic support.
- The platform should build on the experiences of Ukraine and Estonia in the interoperability and mobility of digital services.
2. Harmonization of cybersecurity regulations (2025-2030) (ENISA, 2023; Bada and Nurse, 2019):
- Introducing common data security standards for all EU countries, covering critical infrastructure, public administration, and the private sector.
- Developing a European cyber threat monitoring center that would coordinate the exchange of information on incidents in real time.
- The experiences of Estonia and Denmark, which have implemented advanced cyber defense systems, could serve as a model for other countries.
3. Development of cross-border e-government services (2026-2030) (United Nations, 2022; Mergel *et al.,* 2019):
- Creating a uniform electronic identification and digital signature system valid throughout the EU, enabling citizens and businesses to use public services in any Member State.
- The Estonian e-residency system, expanded to a European scale, could be an inspiration.

- Integration should also include mobile administration platforms and cloud computing services.

4. Implementation of the European Early Warning and Crisis Response System (2025-2030) (ITU, 2022; Comfort *et al.,* 2010):

- This system should be integrated with public administration digital platforms and enable rapid warning of cross-border threats, such as natural disasters, cyberattacks, and health crises, to the public.
- Ukraine's experience with the Air Alert application can serve as an example of implementing mobile and multi-channel solutions.

5. European Support Programme for SMEs in Crisis Situations (2026-2035) (EBRD, 2024; IFC, 2025):

- Establishment of a fund to support the digitalization and recovery of enterprises after economic and military crises.
- Development of common platforms for digitally managing grants, loans, and training for SMEs.
- The programme could be implemented in stages, beginning in 2026-2028 in border regions and expanding to the entire EU by 2035.

6. European Digital Education and Skills Development Programme (2025-2035) (UNESCO, 2023; European Commission, 2023):

- The aim is to improve the digital skills of officials, entrepreneurs, and citizens across the EU.
- The programme should include training in cybersecurity, data analytics, and the use of e-public services.

Modular implementation could include:

- Basic training (2025-2027).
- Specialized programs for administration and business (2028-2030).
- Digital education in higher education systems (2031-2035).

The most important strategic goals for the EU are presented in Table 8.

Table 8. *Strategic priorities for the EU*

Priority	Significance	Leading countries
Service integration	High	Estonia, Poland
Data security	Very high	Denmark, Estonia
Digital education	Medium	Poland
International partnerships	High	Estonia, Denmark

Source: *The authors' study based on: OECD (2025); European Commission (2023); ENISA (2024).*

This topic requires continued research. Future analyses could include:

1. Quantitative analyses of the impact of digitalization on economic indicators such as GDP, employment, and investment in the ICT sector (Jutting and de Laiglesia, 2009) (Brynjolfsson and McAfee, 2014).

2. Qualitative research, e.g., interviews with public administration representatives, entrepreneurs, and citizens to assess the quality of digital services (Yin, 2018; Silverman, 2011).
3. Comparative analyses, including a comparison of government digitalization models in various countries and an assessment of their effectiveness in building resilience (OECD, 2023b).
4. Foresight studies, including forecasting the development directions of digitalization and its impact on public policies until 2030 (Kuusi *et al.,* 2015; European Commission, 2022).

In summary, the research results presented in this article indicate that digitalization is one of the pillars of the resilience of the economy, public administration, and society in the 21st century. The Ukrainian case study demonstrated that digital platforms—especially Diia—not only enable the continuity of state functioning in crisis conditions but also contribute to strengthening public trust, increasing institutional efficiency, and providing channels of interaction between citizens and the administration.

This demonstrates that digital services are becoming not so much a technological tool as a social and economic infrastructure of strategic importance (Mergel *et al.,* 2019). The importance of this topic should also be seen in the context of the challenges facing the European Union. Health, climate, energy, and geopolitical crises demonstrate that traditional response mechanisms are insufficient, and systemic resilience requires a new quality: flexibility, adaptability, and innovation.

Digitalization creates opportunities to shorten institutional response times, minimize the costs of state operation in times of destabilization, and maintain the continuity of essential public services (European Commission, 2021). Ukraine's experience demonstrates that it is possible to quickly implement digital solutions that prove effective in extreme crisis conditions. This observation is crucial for the EU, where institutional complexity and regulatory diversity can pose a barrier to similar dynamics of change.

5.4 Sustainability Implications of Digital Transformation

The conducted research also demonstrates that digital transformation contributes directly to the sustainability of governance and socio-economic systems. By ensuring the continuity, transparency, and inclusiveness of public services, digital platforms strengthen not only the resilience of institutions but also their capacity to operate in line with the principles of sustainable development.

The Ukrainian case illustrates that digital ecosystems can serve as long-term instruments for achieving sustainability goals by supporting innovation-driven growth, enhancing institutional accountability, and fostering social cohesion. These

findings suggest that building digital resilience should be viewed as an integral part of strategies for sustainable development at both national and European levels.

5.5 Theoretical and Practical Significance

The significance of this article should also be seen from a theoretical perspective. The study introduces the concept of digital resilience as an interdisciplinary element, combining public management, economics, security studies, and information technologies. This approach is consistent with recent trends in global literature, which indicate that resilience is not solely an economic concept but also a systemic one. It requires the integration of social capital, technological infrastructure, and regulatory institutions (Comfort *et al.,* 2010).

In this context, the case study of Ukraine brings a new dimension to resilience research, demonstrating how digital solutions can accelerate adaptation and transformation processes on a national scale.

The practical dimension of this study is also worth emphasizing. The research findings provide a basis for formulating recommendations for EU countries, which will have to face a growing number of threats and uncertainties in the 2025-2035 perspective. The development of common platforms, harmonization of cybersecurity regulations, support for SMEs, and investment in digital education are not just public policy demands, but real conditions for ensuring the security and sustainable development of European economies (European Union, 2024).

This article argues that digitalization is currently becoming an integral element of resilience, and research on this phenomenon is crucial for the theory of management and quality sciences, economics and finance, as well as for the practice of public policy.

The findings confirm that digital transformation not only enhances institutional and economic resilience but also supports the broader agenda of sustainable development by promoting inclusive, transparent, and efficient governance. These recommendations align with the European Union's Digital Decade policy goals.

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