

*Denisova O.O., Candidate of Economic Sciences, Associate Professor, Doctoral Candidate, Kyiv National Economic University named after Vadym Hetman,  
Sendziuk M.A., Candidate of Economic Sciences, Professor, Kyiv National Economic University named after Vadym Hetman*

## **CONCEPT FOR THE DEVELOPMENT OF GOVERNMENTAL INFORMATION SYSTEMS**

In recent years, Ukraine, in line with global trends, has witnessed rapid development of governmental information systems. This growth is a fundamental part of a broader digital transformation, which not only modernizes public services but also introduces advanced approaches in e-governance, the advancement of digital education, and enhances cybersecurity literacy among the population. These initiatives aim to improve the accessibility and quality of public services, ensuring transparency and openness in governmental activities. A significant facet of this transformation is Ukraine's integration into the global digital landscape, achieved through active participation in international cyber programs and cooperation with the European Union and other leading international organizations focused on digitalization and cybersecurity. This engagement not only promotes knowledge exchange and better international understanding but also opens new avenues for technological innovation development. In this context, establishing a strategic vision for digitalization and cybersecurity in government administration becomes a priority, necessitated by the need to adapt to a rapidly evolving technological environment and to effectively address the contemporary challenges posed by the digital age in the 21st century.

We are exploring two key areas in the development of governmental information systems. Firstly, internal digital transformation, which entails the modernization of infrastructure, improving the efficiency of data processing, and the adoption of advanced technologies to tackle administrative challenges. Secondly, the enhancement of digital governance, which focuses on expanding online services for citizens, improving public information access, and establishing transparent interaction mechanisms between the state and society.

To systematize approaches to organizing and analyzing issues associated with the use of these information systems in governmental administration, it is prudent to consider them at both the macro and micro levels.

At the **macro level**, governmental information systems (IS) are designed to create both long-term and current plans for the country, determine outcomes, regulate activities across different economic sectors, and develop and monitor the execution of the state budget [1]. These systems comprise numerous functional subsystems that can be categorized both vertically and horizontally within the framework of state administration. Vertically, subsystems are organized according to the administrative-territorial hierarchy, including at the national, regional, district, or community levels – for instance, the information systems of the Ministry of Finance, regional financial management, or district finance departments. In cases where an institution is not structured by territorial principles, such as the State Customs Service, functional subsystems are defined according to its organizational structure. Horizontally, subsystems are identified based on the list of functions or functional departments that are typical of the institution. For example, within the information system of the Ministry of Finance of Ukraine, distinct subsystems are identified for developing the state budget draft, detailing it, and accounting and analyzing budget execution, along with a subsystem for reporting. Within these subsystems, automated functions are specified for revenue and expenditure categories, as outlined in the Budget Code. It's important to note that the list of functional subsystems and departments is consistent across all levels of the Ministry of Finance. Further decomposition of functional tasks may be performed by identifying separate technological processes needed to execute classic administrative functions such as forecasting, planning, accounting, analysis, and regulation. Each function is executed following specific algorithms at the designated workstations of specialists.

The **micro-level** of state governance includes state-owned production enterprises and state institutions under regional and district subordination. The digital transformation of these state-owned enterprises involves several aspects such as aligning with national or regional digitalization strategies, support through state investments and regulation, adherence to state safety and privacy standards, higher social responsibility and transparency, and cooperation with other state enterprises and institutions to coordinate efforts and organize collaboration. Additionally, the heterogeneity in the structures of regional and local government bodies poses a significant challenge for their integration. Other challenges include differences in the level of technical equipment, access to qualified IT specialists, and internet connectivity across various regions and districts, limitations in budgets and resources, and the need to modernize obsolete infrastructure to

deploy modern information systems and integrate them with existing, often outdated systems. From the perspective of delineating interconnected functions, defining shared information resources, organizing informational links, and optimizing decision-making processes, information systems of state governance are considered within three spheres: financial-economic, social, and administrative-legal. The information systems functioning within the financial-economic sphere include systems such as the Information-Analytical System of the Ministry of Economy, the Automated Information-Analytical System of the Ministry of Finance, the Automated System of the State Treasury Service, the Information-Analytical System of the State Tax Service, the Unified Information-Analytical System of the State Customs Service, the Information System of the National Bank of Ukraine, the Information-Electronic System of the Central Depository of the National Securities and Stock Market Commission, the Information-Computational System of the State Statistics Service, and the Information-Analytical System of the Accounting Chamber. These information systems can be unified on a sectoral basis to create a unified information space for functions such as budget planning and forecasting, budget control and audit, public debt management, effective resource allocation, reporting, ensuring transparency of processes, analysis, and strategic management within the Public Financial Management System. This system maintains a strictly regulated exchange of information in accordance with regulatory documents [2].

A key strategic direction for the modernization of the Public Financial Management System's information systems is the transition from a distributed to a centralized model. This approach includes creating a unified information space for state-level corporate use and ensuring reliable centralized storage of crucial financial services information in Kyiv and at regional financial administrations. Information from district databases is currently being consolidated at regional levels, establishing data centers that support state financial management and enhance cloud-based integration. This involves creating a comprehensive pool of configurable computing resources (networks, servers, storage systems, applications, and services) that can be rapidly deployed with minimal effort and without the need for direct interaction with the service provider. By migrating information interactions to the cloud, the model not only minimizes material costs but also expands user accessibility. This transition boosts operational efficiency, reduces corruption risks, and utilizes Internet technologies to ensure public transparency in the management of state and local

budgets. The benefits of this model extend beyond financial management to other areas of state governance, particularly in the **social sector**, where digital transformation includes developing and supporting information systems for the Ministry of Labor and Social Policy, the Ministry of Education and Science, the Pension Fund of Ukraine, and healthcare analytics, thereby promoting a comprehensive and transparent governance environment.

Within the third sector of state governance, specifically in the sphere of **administrative-legal** bodies' operations, several information systems have been established: the computer system for information-analytical support of legislative and legal enforcement activities, the corporate information system of the Ukrainian Prosecutor's Office, information support systems for the Ministry of Internal Affairs of Ukraine, the information system for justice bodies, and the information system for courts. The operation of these entities relies on a unified information space for legislative and legal protection activities, characterized by strictly regulated processes for information exchange.

The advancement of information and communication technologies and their broad implementation have catalyzed the emergence of digital governance, identified by experts [3] as evolving through three key stages. The first stage involved the development of e-government applications aimed at management and service delivery (e-services) to reduce transaction costs, transform public service methods, and enhance public service efficiency. This fostered Government-to-Citizen (G2C), Government-to-Business (G2B), and Government-to-Government (G2G) models. G2C systems have facilitated easier and cheaper access for citizens to essential information and services, such as tax payments and other bureaucratic processes. In Ukraine, all state authorities, ministries, agencies, and other entities maintain online presence. Through their websites, citizens can access official information, such as on the Verkhovna Rada of Ukraine's site and the official portal of the Cabinet of Ministers of Ukraine, and interact with government bodies, notably through the state electronic services portal «Diia» and the electronic taxpayer office. The State Statistics Service of Ukraine provides a significant volume of public statistical information. In 2011, Ukraine adopted the «Law on Access to Public Information», and in 2016, the term «open data» was introduced, significantly increasing the number and use of related services [4]. In October 2016, Ukraine officially joined the International Open Data Charter, committing to the international community to implement a national open data policy in accordance with the principles of the charter. Open data also provides a powerful anti-corruption effect,

promotes government transparency, and positively impacts economic development. The citizens show significant interest in public information, particularly that released by the Ministry of Social Policy, the State Tax Service, and the Ministry of Finance. Although the state policy in this area is quite effective, only a portion of the tens of thousands of open data providers fulfil their publication duties. The incompleteness of data, inconsistency of formats, and non-compliance with update procedures complicate their aggregation and use. Consequently, the procedures for data publication, along with the monitoring and control systems, require further refinement.

An example of a Ukrainian B2G e-commerce platform is «Prozorro», an online system where public and municipal buyers announce tenders for goods, works, and services, and business representatives compete to supply these. Since April 2016, «Prozorro» has become mandatory for all public entities, connecting over 35,000 government and municipal bodies and enterprises (buyers) with approximately 250,000 commercial suppliers. The adoption of «Prozorro» has eliminated many corrupt procurement schemes and resulted in significant public fund savings. However, the lack of detailed regulations for certain tender procedures and the exclusion of specific items or types of subcontracted works from bids limit its effectiveness. Overall, the main challenges in the initial stage are cybersecurity vulnerabilities and the legislative inadequacy to fully manage the risks associated with using ICT.

The second stage of digital governance development is characterized by the adoption of open government models, enhancing transparency and promoting collaboration with various stakeholders. At this stage, Web 2.0 technologies play a crucial role in improving service delivery, accountability, and citizen participation. These technologies have transformed the ways citizens interact, facilitating collaboration in creation, organization, connection, and sharing of content, which in turn creates public value. Social networks and specialized platforms are instrumental in supporting people's mobilization and social activities, contributing significantly to the development and resilience of civil society. During the Revolution of Dignity, social networks not only expedited the dissemination of information and coordinated protester actions but also provided a platform for international media coverage. With the onset of military actions, social networks have become vital for timely informing citizens about events and warning about dangers. They also serve as arenas for information warfare and tools for public support, including fundraising for the Armed Forces, assisting victims and displaced

persons, organizing volunteer initiatives, coordinating humanitarian aid, and distributing resources. In these challenging times, social networks also offer psychological support and mutual aid among Ukrainians and act as essential tools for documenting war crimes and human rights violations. These practices are integral to the development of digital diplomacy and are vital components of Ukraine's national security and cybersecurity strategies, as well as its foreign policy strategy [5–7].

The third stage of e-government development is centered on data utilization. This stage involves collecting data through technologies such as the Internet of Things devices, social media, cloud computing, and blockchain, and employing data analytics to support policy formulation and decision-making. The aim is to enable automated decision-making processes and empower citizens to drive these processes themselves. The implementation of this stage is a current priority for Ukrainian government authorities.

The adoption of advanced technologies and innovative approaches by government institutions to optimize public service delivery, enhance internal process efficiency, and encourage public engagement has become so significant that it has been coined as GovTech (from «government technology»). This encompasses a broad spectrum of technologies, including artificial intelligence, blockchain, cloud computing, and the Internet of Things (IoT). GovTech initiatives may involve developing digital platforms for citizen engagement, utilizing data analytics to refine decision-making processes, and deploying smart city solutions to improve urban living. A key benchmark for strategies and policies in this area is the GovTech Maturity Index (GTMI), developed by the World Bank to measure the level of digital transformation within the public sector. In 2022, the GTMI included 40 indicators to assess the maturity of four main GovTech directions, along with several external indicators from other relevant indices such as the United Nations E-Government Development Index (EGDI), the UN E-Participation Index (EPI), the International Telecommunication Union's Global Cybersecurity Index (GCI), and Identification for Development (ID4D) [8–12]. The GTMI represents the average of normalized scores across these four components:

- CGSI (The Core Government Systems Index) – this index evaluates core management systems across seventeen key indicators, including one external indicator. It reflects essential aspects of a «comprehensive government» approach, encompassing government cloud technologies, interoperability frameworks, and other platforms;

- PSDI (The Public Service Delivery Index) – an index of public service delivery, PSDI assesses nine key indicators, including two

external indicators. It measures the maturity of online public service portals with a focus on citizen-centric design and universal accessibility;

- DCEI (The Digital Citizen Engagement Index) – this index measures digital citizen engagement through six key indicators, including one external indicator. It evaluates public participation platforms, citizen feedback mechanisms, open data, and open government portals;

- GTEI (The GovTech Enablers Index) – the index includes sixteen key indicators, four of which are external. It reflects strategies, institutions, laws and regulations, digital skills, and policies and programs that promote GovTech.

In 2022, Ukraine was classified into Group «A» of countries with a high level of maturity in governmental technologies [12]. Unlike many fragile and conflict-affected economies where investments in GovTech are primarily aimed at improving core public financial management systems and ICT infrastructure to support essential functions, Ukraine channels investments into other areas of state management, shared platforms, and public online services as well. There is also considerable focus on enhancing citizen engagement and strengthening the necessary institutional and regulatory framework. However, there are gaps in monitoring and increasing the efficiency of existing platforms, ensuring their interoperability, implementing open-source software in the public sector, supporting GovTech startups and SMEs, refining policies and practices related to digital skills, innovating in public management, disruptive technologies, and developing local GovTech ecosystems. The digital transformation program for public administration must become a crucial component of the national strategy to build the country's digital economy, marking a significant factor in its development [13].

The study identified key directions for creating a competitive, innovative, and sustainable digital environment for public administration in Ukraine. The foundation should be an advanced digital infrastructure, which includes ensuring universal access to high-speed internet, particularly in remote and rural areas, to foster digital equity. Important elements include the deployment of next-generation networks, particularly 5G, across all regions of the country, and the construction and modernization of infrastructure to support digital services and applications. The development of digital platforms is also crucial, as they facilitate the integration of various services and provide easier access to both public and private services.

The further digitalization of Ukrainian state institutions and departments involves enhancing both state and sector-specific

information systems. These include the integrated information-analytical system «Transparent Budget», the multifunctional system «Electronic Customs», and automated systems like «Treasury» and «Taxes», all based on cutting-edge information and communication technologies. This initiative aims not only to update technology but also to significantly improve business processes within these domains. An example of such modernization is the Electronic Payments System of Ukraine, which, starting April 1, 2023, processes interbank payment operations continuously in a 24/7 mode. This system operates on the international message exchange standard ISO 20022, marking one of the first steps in the project «Development of Ukraine's Payment Infrastructure», aligned with Ukraine's Payment Infrastructure Development Strategy and the European Central Bank's strategy within the framework of Ukraine's integration into the EU [14–16]. Future plans include harmonizing Ukraine's payment space with global standards to join the Single Euro Payments Area (SEPA) and enable cross-border transfers via the SEPA Instant Credit Transfer system (connected to TIPS). Additionally, the transition to flexible and standardized XML-based information exchange formats, the introduction of instant payments, multi-currency functionality, payment tracking services, and other tools are anticipated.

The improvement of public administration information systems is closely tied to the development of a unified information space in the country – a complex of databases, data repositories, technologies for their management and use, information-telecommunication systems, and networks. These operate on unified principles and common rules to ensure the informational interaction of organizations and citizens, as well as to meet their information needs. At the heart of this infrastructure should be a registry system—a collection of information and communication systems. These systems function and interact to create, store, process, and use information for licensing activities, delivering administrative, social, and other public services, conducting other management activities, and implementing state regulation [17]. Key Ukrainian registries include: «The Unified State Demographic Registry», «Unified State Registry of Legal Entities, Individual Entrepreneurs, and Public Organizations», «State Land Cadaster», «Unified State Registry of Vehicles», «Registry of Buildings and Structures», «Unified State Address Registry», «State Registry of Real Property Rights». Other registries are maintained by state authorities, local governments, and legal entities of public law, as defined by law. For instance, the Ministry of Justice of Ukraine develops and supports unified and legal registries, including the «Unified State Registry of

Normative Legal Acts», «The Unified Registry of Notaries of Ukraine», «Inheritance Registry», «Unified Registry of Powers of Attorney», and more than twenty other registries. The State Statistics Service maintains the «Unified State Registry of Enterprises, Organizations, and Institutions of Ukraine», among other registries and classifiers. The State Tax Service administers the «State Registry of Individual Taxpayers. The State Enforcement Service manages the «Unified State Registry of Enforcement Proceedings», and the State Service of Ukraine for the Protection of Personal Data oversees the «State Registry of Personal Data Databases». A number of state registries are operated by the State Enterprise «Diia». The operation of these registries is governed by Ukrainian laws including «On Public Electronic Registries», «On the Specifics of Providing Public (Electronic Public) Services», «On the Protection of Personal Data», «On Access to Public Information», «On Electronic Trust Services», «On Administrative Services», and other relevant laws and regulatory acts. The large number of registries and their custodians lead to data dispersion and usage difficulties, which can be addressed by the electronic office for accessing state registries. This office would offer capabilities for searching data in registries, obtaining extracts, searching for normative legal documents and related information, performing registration actions, and accessing a reporting system for individuals engaged in specialized professional activities, among other features. Additionally, the challenge of integrating information systems at both state and regional levels necessitates further research and the direct design of information processes.

To ensure swift, seamless, and reliable access to information needed by state authorities and local governments to perform their duties, a national electronic interaction system has been developed. This system integrates unified state information resources, electronic registries, and the information systems «Trembita» [18, 19]. It is designed to enable the use of standardized access to the nation's information resources, reduce data duplication across registries, and enhance the interoperability of information systems. The implementation of electronic interaction among priority state electronic information resources is governed by a Resolution of the Cabinet of Ministers of Ukraine [20].

The foundation of the «Trembita» system is the Estonian data exchange platform «X-ROAD». The system consists of a core and local components (Fig. 1). The core components manage a directory of entities participating in electronic interactions within the «Trembita» system, distribute updated details about them across secure exchange

gateways, and accumulate statistical data on system usage, such as the exchange of electronic messages. The local components are secure exchange gateways-software tools that provide access to web services using SOAP and REST technologies, and control access to them. These components ensure the integrity and confidentiality of data, record exchange activities, and support data processing tools. The latter include web services and web clients that are integrated with departmental information systems, including electronic registries. Legal significance is imparted to messages using trust services provided by qualified electronic trust service providers. The exchange of legally significant data adheres to principles of technological neutrality, using unified rules for electronic information interaction, open data formats, exchange protocols and standards, informing individuals about inquiries into their personal data, reusing data and software tools, and avoiding data redundancy and duplication.

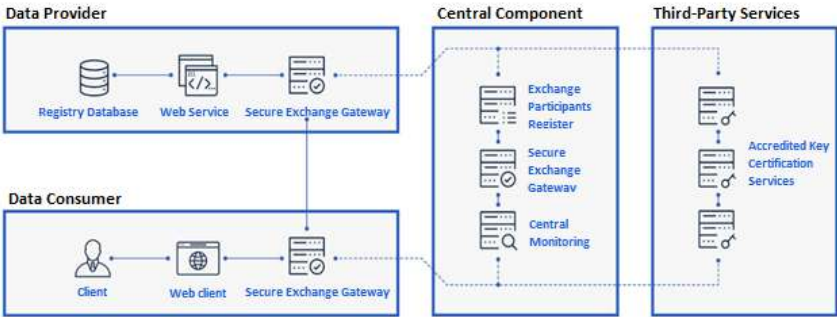


Figure 1. Components of the e-Interaction System «Trembita»

Source: [egov.dp.gov.ua site]

To provide administrative services to citizens with access to state registries, an information system for administrative service centers called «Vulyk» has been implemented, facilitating online data exchanges through the «Trembita» system [21]. Administrative service centers connected to «Vulyk» can interact with the «Diia» mobile app, which allows users to access services without requiring an identity card or taxpayer number and enables online payment via QR code or email. The system’s capabilities include comprehensive processing of applications, involving the reception, sending, and receiving of documents, as well as their immediate scanning and automatic linkage

to the corresponding electronic case file. The system also automates the archiving of processed applications, thus enhancing the management of administrative services. Additionally, it allows for the creation and printing of necessary application forms, document lists and their descriptions, collects detailed internal statistics and reference information, and provides the ability to check the status of applications via the website.

Applications from the IS «Vulyk» are transferred to external government bodies via the «System of Electronic Interaction of Executive Authorities» (SEI EA) – a state telecommunications system designed for the automation of processes including creation, sending, transfer, receipt, processing, usage, storage, and destruction of electronic documents that do not contain restricted access information. This system utilizes qualified electronic signatures and/or seals and also facilitates interdepartmental monitoring of the implementation of administrative decisions [22]. The SEI EA operates according to regulations governing the electronic interaction of executive authorities.

The laws of Ukraine «On Electronic Documents and Electronic Document Management» and «On Electronic Trust Services» [23, 24] have established the groundwork for organizing electronic document management in Ukraine. However, ensuring the standardization and interoperability of information systems in state institutions also requires the establishment of universally accepted standards for data formats, information exchange protocols, and user interfaces. This involves ensuring system compatibility, standardizing data processing procedures, using open standards for flexibility, broader compatibility, and independence from specific software manufacturers, integrating security and privacy measures across all levels of information systems, and supporting continuous integration and updates. Examples of approaches to data format standardization include the adoption of the standard XML format for banking reporting through the National Bank of Ukraine's web portal and the introduction of a unified electronic financial reporting format according to the Financial Reporting Taxonomy based on international standards, specifically the UA XBRL IFRS taxonomy [25]. The use of the iXBRL format helps raise the standards of information disclosure in the domestic financial market. A practical example of software implementation for integrating electronic document management systems is the «Ptah» roaming platform, which has integrated with the SEI EA platform. «Ptah» also establishes a unified standard for exchanging, verifying, and protecting legally significant documents signed with a qualified electronic signature [26].

As a result, electronic document management systems such as «Vchasno», «Paperless», «M.E.Doc», and SEI EA can exchange electronic documents without the need for additional software – «Ptah» operates as a universal delivery system.

In the context of digital government evolution and increasing cyber threats, the issue of digital identification of individuals is becoming increasingly critical. A digital identifier is not just a key to modernizing state services like healthcare, social payments, certifications, and licensing but also a crucial element for the security of a digital society. Given the importance of this issue and the sensitivity of the technologies involved, the government needs to retain control in this area rather than outsourcing decisions to large tech companies [27]. Ukraine has become the first country in the world to legalize electronic passports and give them the same legal status as paper ones. The Ukrainian citizen's e-passport is a digital replica of passport information formatted as a card, issued through the Unified State Demographic Registry, complete with a unique electronic identifier (QR code, barcode, digital code), and includes residency information [28]. When personal and biometric data are embedded in a contactless integrated circuit implanted in the passport, it enables identity verification and can serve as a qualified electronic signature. Currently, the use of the banking identifier, BankID, which was adopted for identifying individuals for the remote opening of personal bank accounts, is seen as a temporary solution for digitally integrating Ukrainian citizens. This approach faces challenges such as insufficient privacy protection and potential risks arising from close integration with banking systems, which may be vulnerable to failures, technical malfunctions, or cyberattacks on financial institutions. Additionally, this approach can create barriers for people without bank accounts, those who do not use internet banking, or those who lack extensive IT knowledge. Limitations on the use of BankID for international transactions or services due to the legal and regulatory norms of other countries should also be considered. The transition to a state-centralized digital identification system is feasible with the readiness of the necessary infrastructure and the implementation of a comprehensive set of laws, regulatory acts, and policies that define rights and responsibilities regarding the collection, preservation, processing, and use of relevant information. Citizens' adoption of this system depends on their overall trust in it and the range of services it provides. Looking forward, digital identity should not only cover individuals but also devices, software systems, artificial intelligence systems, robots, and other potential participants in digital interactions.

The accumulation of digital data resulting from the operation of information systems and electronic document flows creates opportunities for expanding the scope of analytical tasks. Previously, some of these tasks were addressed using economic-mathematical methods, particularly within the information systems of state-owned industrial enterprises for optimizing the load on production capacities, assessing the profitability of individual departments or the enterprise as a whole, and for developing product supply chains. While administrative data can be used for quantitative evaluations of resources and processes, obtaining qualitative assessments is beneficial when supplemented with results from surveys of government officials and external evaluations (for example, household surveys or anthropological studies) [29]. Integrating data from various sources and updating it in real-time, and employing Big Data technologies, machine learning, and artificial intelligence enable the undertaking of new tasks, including:

- enhancing automation in administrative tasks and public service delivery – employing computer vision and natural language processing systems to manage document workflows, utilizing chatbots and virtual assistants for personalizing government services, providing 24/7 support, and preventing corruption and misuse;
- supporting decision-making and policy development – utilizing big data analytics to identify community needs, demographic layers, regional demands, and other characteristics, along with predictive analytics and automated analysis of legal and regulatory documents;
- risk management – identifying and assessing risks, classifying «risk objects» which could include individuals or categories thereof, as well as entities such as organizations, buildings, river states, residential areas, vehicles, and energy consumption processes;
- optimizing dynamic capacity and coordinating mobile units – addressing bottlenecks in operational processes, including scheduling, route planning, or managing resources under constraints;
- resource and infrastructure management – monitoring assets, analyzing expenditure patterns, forecasting revenue, and identifying opportunities for cost savings;
- enhancing public safety – detecting fraud and ensuring compliance through automated monitoring, identification, and classification of objects and individuals, characterizing their behavior, and modeling scenarios.

Although Ukraine is making progress in each identified the critical direction of information systems development for public administration and is implementing numerous individual projects that enhance

transparency and efficiency, enable sound decision-making, and improve access to public information and services, the absence of a coordinated systemic strategic approach, formalized as the National Concept of Digital Development, significantly hampers the potential for further development. It is essential to acknowledge that the effective deployment of advanced information and communication technologies, and consequently, the development of information systems in public administration, depend on a broad spectrum of factors, among which some are particularly significant:

- stimulating research and development – innovative ICT emerges from scientific research and technological developments. Investments in this area open new opportunities and technologies that can later be utilized to create new products and services. These processes require contributions not only from private investors and venture capital but also from governmental support;

- infrastructure development – the growth in computing power, advances in sensors, increased network speeds, and expanded memory capacities facilitate the implementation of more complex and powerful technologies and systems;

- demand for innovation – the market and societal needs for new solutions and opportunities drive enterprises and research groups to develop technologies that meet these demands;

- legislation and regulation – constructive and supportive legal frameworks can stimulate innovation by facilitating the development of new technologies and providing legal protection for them;

- education and workforce – the development and application of ICT require highly skilled professionals from various fields who are capable of developing, managing, and supporting innovative technologies;

- cultural changes – introducing new technologies may necessitate shifts in thinking and work practices, as well as adaptations to new methods of interaction and communication among all potential users.

The government should not only actively engage with national digital ecosystems but also take an active part in international initiatives aimed at addressing global challenges. These initiatives focus on strengthening digital connections between governments, economies, and societies through coordinated strategies, standards, and principles of digital transformation management. In particular, enhancing Ukraine's cybersecurity involves collaboration with organizations such as the European Union Agency for Cybersecurity (ENISA), the NATO StratCom Centre of Excellence, the NATO Cooperative Cyber Defence Centre of Excellence, the European Cybersecurity Competence Centre,

and the EU Cyber Academia and Innovation Hub (EU CAIH), etc. Ukraine's participation in the EU eGovernment Action Plan and the EU Digital Decade policy program is crucial for its integration into digital Europe.

## Conclusions

This study provides a detailed analysis of the strategic development of state information systems in Ukraine within the context of global digital transformation trends. It assesses the current status and future prospects of these systems across financial-economic, social, and administrative-legal dimensions, both at macro and micro levels. The research outlines three phases in the evolution of GovTech in Ukraine and delineates strategies for creating a competitive, innovative, and sustainable digital environment. The critical need for establishing an effective legislative framework and standardization to ensure data compatibility and security, which are essential for successful digital transformation in public administration, is emphasized. Moreover, the importance of integrating Ukraine into the global digital space through collaboration with international organizations and the European Union is highlighted, which aids in the exchange of knowledge and technological innovations crucial for developing digital governance strategies.

## References

1. Denisova, O.O., & Sendziuk, M.A. (2023). *Informatsiyni systemy v ekonomitsi [Information Systems in Economics]*. KNEU. [in Ukrainian]
2. Cabinet of Ministers of Ukraine. (2021). *Stratehiia zdiisnennia tsyfrovoho rozvytku, tsyfrovyykh transformatsii i tsyfrovizatsii systemy upravlinnia derzhavnymy finansamy na period do 2025 roku. Rozporiadzhennia № 1467 [Strategy for digital development, digital transformations, and digitalization of the public financial management system for the period up to 2025. Order No. 1467]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/1467-2021-%D1%80#Text> [in Ukrainian]
3. Rodríguez Bolívar, P.M., & Cortés Cediél, M.E. (2020). *Digital government and achieving E-public participation: Emerging research and opportunities*. Information Science Reference.
4. BRDO. (2021). *Zelena knyha «Polityka vidkrytykh danykh» [Green book «Open data policy»]*. <https://regulation.gov.ua/book/145-zelena-kniga-politika-vidkritih-danih> [in Ukrainian]
5. National Security and Defense Council of Ukraine. (2020). *Pro stratehiyu natsional'noyi bezpeky Ukrayiny [About the strategy of national*

*security of Ukraine*]. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/n0005525-20#Text> [in Ukrainian]

6. National Security and Defense Council of Ukraine. (2021). *Pro Stratehiyu kiberbezpeky Ukrayiny [About the Cybersecurity Strategy of Ukraine]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/n0005525-21#n2> [in Ukrainian]

7. National Security and Defense Council of Ukraine. (2021). *Pro Stratehiyu zovnishnopolitychnoyi diyalnosti Ukrayiny [On the strategy of foreign policy activities of Ukraine]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/n0054525-21#n2> [in Ukrainian]

8. World Bank. (2022). *GovTech Maturity Index, 2022 Update: Trends in public sector digital transformation. Equitable Growth, Finance and Institutions Insight – Governance*. Open Knowledge Repository. <http://hdl.handle.net/10986/38499>

9. United Nations. (2022). *E-Government Development Index (EGDI)*. UN E-Government Knowledgebase. <https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government-Development-Index>

10. United Nations. (2022). *E-Participation Index*. UN E-Government Knowledgebase. <https://publicadministration.un.org/egovkb/en-us/About/Overview/E-Participation-Index>

11. ITU. (2024). *Global Cybersecurity Index 2020*. International Telecommunication Union Publication. [https://www.itu.int/dms\\_pub/itu-d/opb/str/D-STR-GCI.01-2021-PDF-E.pdf](https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2021-PDF-E.pdf)

12. World Bank. (2022). *The 2022 ID4D and G2Px Annual Report*. Open Knowledge Repository. <https://documents1.worldbank.org/en/publication/documents-reports/documentdetail/099437402012317995>

13. Antoniuk, L.L., Ilnytskyi, D.O., Ligonenko, L.O., & others. (2021). *Digital economy: Impact of ICT on human capital and formation of future competencies*. KNEU.

14. Shaban, O.V. (2020). *Systema elektronnykh platezhiv Natsional'noho banku Ukrayiny (shyfr SEP-4). Bazovi pryntsyipy pobudovy [Electronic payment system of the National Bank of Ukraine (code SEP-4). Basic principles of construction]*. National Bank of Ukraine. [https://bank.gov.ua/files/ISO20022/NBU\\_Bazovi\\_principy\\_pobudovy\\_SEP4\\_04.09.2020.pdf](https://bank.gov.ua/files/ISO20022/NBU_Bazovi_principy_pobudovy_SEP4_04.09.2020.pdf) [in Ukrainian]

15. Shaban, O.V. (2023). *Systema elektronnykh platezhiv Natsional'noho banku Ukrayiny (shyfr SEP-4) Zahal'ni pravyla realizatsii standartu ISO 20022, spil'ni dlya vsikh instrumentiv. Chastyna 1. Zahal'ni ponyattya ta domovlenosti. [System of electronic payments of the National Bank of Ukraine (code SEP-4) General rules for the implementation of the ISO 20022 standard, common for all instruments. Part 1. General concepts and agreements]*. National Bank of Ukraine. [https://bank.gov.ua/files/ISO20022/SEP4\\_zagalne\\_1\\_zagalni\\_pravila.NBU.ver.1.1\\_16.03.2023.pdf](https://bank.gov.ua/files/ISO20022/SEP4_zagalne_1_zagalni_pravila.NBU.ver.1.1_16.03.2023.pdf) [in Ukrainian]

16. National Bank of Ukraine. (2022). *Vprovadzhennia standartu ISO 20022 v platizhnii infrastrukturi Ukrainy [Implementation of the ISO 20022*

*standard in the payment infrastructure of Ukraine*]. National Bank of Ukraine Files. [https://bank.gov.ua/files/ISO20022/Review\\_ISO20022.pdf](https://bank.gov.ua/files/ISO20022/Review_ISO20022.pdf) [in Ukrainian]

17. National Security and Defense Council of Ukraine. (2021). *Pro publichni elektronni reyestry. Zakon Ukrayiny № 1907-IX. [On public electronic registers. Law of Ukraine No. 1907-IX]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/1907-20#Text> [in Ukrainian]

18. Cabinet of Ministers of Ukraine. (2016). *Polozhennia pro systemu elektronnoi vzaïemodii derzhavnykh elektronnykh informatsiinykh resursiv «Trembita»*. [Regulations on the electronic interaction system of state electronic information resources «Trembita»]. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/606-2016-%D0%BF#n14> [in Ukrainian]

19. Ministry of Digital Transformation of Ukraine. (2023). *Systema elektronnoi vzaïemodii derzhavnykh elektronnykh informatsiinykh resursiv «Trembita»*. [System of electronic interaction of state electronic information resources «Trembita»]. Trembita. <https://trembita.gov.ua/ua> [in Ukrainian]

20. Cabinet of Ministers of Ukraine. (2018). *Deyaki pytannya orhanizatsii elektronnoi vzaïemodii derzhavnykh elektronnykh informatsiinykh resursiv [Some issues of organization of electronic interaction of state electronic information resources]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/357-2018-%D0%BF#Text> [in Ukrainian]

21. Ministry of Digital Transformation of Ukraine. (2019). *Vulyk. Suchasna informatsiyna systema dlya TsNAP [Vulyk. Modern information system for Administrative Service Centres]*. [https://tsnap2ulead.org.ua/wp-content/uploads/2019/10/Booklet\\_VULYKUA\\_web1.pdf](https://tsnap2ulead.org.ua/wp-content/uploads/2019/10/Booklet_VULYKUA_web1.pdf) [in Ukrainian]

22. Cabinet of Ministers of Ukraine. (2018). *Deyaki pytannya dokumentuvannya upravlins'koyi diyal'nosti. Postanova № 55. [Some issues of documenting management activities]*. Resolution No. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/55-2018-%D0%BF#Text> [in Ukrainian]

23. Cabinet of Ministers of Ukraine. (2003). *Pro elektronni dokumenty ta elektronnyi dokumentoobig. Zakon Ukrainy № 851-IV [On electronic documents and electronic workflow. Law of Ukraine No. 851-IV]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/851-15#Text> [in Ukrainian]

24. Cabinet of Ministers of Ukraine. (2017). *Pro elektronnu identyfikatsiyu ta elektronni dovirchi posluhy. Zakon Ukrayiny № 2155-VIII [On electronic identification and electronic trust services. Law of Ukraine No. 2155-VIII]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/2155-19#Text> [in Ukrainian]

25. *National Commission for Securities and Stock Market of Ukraine*. (2021). XBRL Taksonomiia [XBRL Taxonomy]. <https://www.nssmc.gov.ua/taksonomiia-xbrl/> [in Ukrainian]

26. *Ptakh – platforma, shcho ob'iednuie [Ptah – a platform that unites]*. (2022). MEDoc. <https://medoc.ua/news/ptah-platforma-shho-obdnu> [in Ukrainian]

27. Domeyer, A., McCarthy, M., Pfeiffer, S., & Scherf, G. (2020). *How governments can deliver on the promise of digital ID*. McKinsey & Company.

<https://www.mckinsey.com/industries/public-sector/our-insights/how-governments-can-deliver-on-the-promise-of-digital-id>

28. Cabinet of Ministers of Ukraine. (2012). *Pro Yedynyi derzhavnyi demohrafichnyi reiestr ta dokumenty, shcho pidtverdzhuvaiat' hromadianstvo Ukrainy, posvidchuiut' osobu chy ii spetsial'nyi status. Zakon Ukrainy № 5492-VI [On the Unified State Demographic Register and documents confirming the citizenship of Ukraine, certifying the identity or its special status. Law of Ukraine No. 5492-VI]*. Verkhovna Rada of Ukraine. <https://zakon.rada.gov.ua/laws/show/5492-17#Text> [in Ukrainian]

World Bank. (2023). *The Government Analytics Handbook. Leveraging Data To Strengthen Public Administration*. Open Knowledge Repository. <https://www.worldbank.org/en/publication/government-analytics>