The object of this study is the factors of implementation of the concept of government as a platform. The study solved the problem of identifying factors and choosing a model for analyzing the conditions for building a socio-technological model of interaction between society and the state. The concept of government as a platform is presented in the form of interrelated entities, components of technological infrastructure and digital assets. A feature of the described structure is the consideration of social value, which is explained by the principles of the concept under study. The factors of implementation of the concept include professional and personal characteristics of civil servants; organizational structure of the government; legal regulation; financial mechanisms; use of digital technologies of Industry 4.0; digital opportunities of the population and businesses; digital engagement. The identified factors take into account the need to take into account the needs and requirements of citizens, technological readiness, and competence of the government. It has been established that during 2022 there was a global trend towards an increase in the level of development of e-government. The results of the analysis of user experience on interaction with electronic public services confirm the need to focus on consumers. A theoretical model for adopting the state digital platform has been developed. The model consists of six independent variables, three intermediate variables, and one dependent variable. In the model, independent variables include tangible ease of use, uncertainty in technology, social pressure, efficiency of work with computer equipment, technical capabilities. Intermediate variables include attitude to use, tangible utility, user satisfaction, and intent to use. The dependent variable is the actual use of technology

Keywords: government as a platform, technological infrastructure, social value, model of technology perception

IMPLEMENTING THE "GOVERNMENT AS A PLATFORM" CONCEPT: THE ASSESSMENT METHOD AND AN OPTIMAL HUMAN-CENTERED STRUCTURE TO ADDRESS TECHNOLOGICAL CHALLENGES

Igor Dunayev
Corresponding author
Doctor of Science in Public Administration, Professor
Department of Economic Policy and Management*
E-mail: Dunaevigor@i.ua

Lyudmyla Byelova
Doctor of Sociological Sciences, Professor,
Honored Worker of Education of Ukraine, Director*

Aleksander Kud
General Director
Simcord LLC
Otakara Yarosha str., 18, Kharkiv, Ukraine, 61000
A Board Member of the NGO
Research Center of Economic and Legal Solutions
in the Area of Application of Distributed Ledger Technologies
Otakara Yarosha str., 18 a, Kharkiv, Ukraine, 61166

Volodymyr Rodchenko
Doctor of Economics, Professor, Associate Professor
Department of Management
Mendel University in Brno
Zemědělská str., 1, Brno, Czech Republic, 61300
*Educational and Research Institute "Institute of Public Administration"
V. N. Karazin Kharkiv National University
Svobody sq., 4, Kharkiv, Ukraine, 61022

1. Introduction

The fourth industrial revolution encompasses all dimensions and changed people's lifestyles. Disruptive digital technologies such as the Internet of Things, cloud technologies, artificial intelligence, big data, blockchain, and mobile technologies are changing the paradigm of economics, labor, social culture, politics, and public services.

Thus, owing to information technologies, time spent on performing routine operations is reduced, new goods and services arise, transactions are carried out remotely online. Technologies provide services with such qualities as safety, efficiency, reduction of maintenance costs, ease of use. Commercial companies are finding additional and creative ways to expand their business opportunities through e-commerce and platforms.

The most developed countries invest in the development of breakthrough information technologies, thus trying to solve economic and social problems. However, according to the global study "Edelman Trust Barometer" [1, 2], public trust in the state and in the technology sector is declining. This comes at the same time as growing concerns about climate change, military conflicts, the threat of nuclear war, job losses and cyberattacks. However, the informed part of the population has a significantly higher level of trust than society as a whole. It is indicative in the context of technological development that the informed part in studies [1, 2] includes citizens with education, higher incomes who are interested in politics, business development and, accordingly, have a sufficient level of erudition. Thus, against the background of the search for an optimal model of interaction between society and the state and increasing trust, information and communication technologies turned out to be the main drivers of the transformation of the public sector of management, making it possible to provide better public services.

In this context, there is growing interest in platform models that make it possible to rapidly change the business processes of service delivery and create value for consumers of these services, ensuring transparency of interaction between supplier and consumer. The idea of turning the state into a platform that would make it easy to provide public services and at the same time ensure transparency and reliability of user interaction with government agencies. The concept of government as a platform and the strategy built on its basis becomes the method that will solve the crisis of trust in the public sector.

Despite the fact that the use of information technology increases the efficiency of organizations, their implementation is usually an initiative of management, especially when it comes to state authorities. In this case, the activity of users of the respective systems is lower than expected, due to a number of factors. Therefore, although efficiency is a very important result of the implementation of the concept of government as a platform, it obviously affects other values that are created by public services and, accordingly, are perceived by citizens. So, if government agencies implement the concept of government as a platform, their goal is to increase citizen satisfaction. In this aspect, it is important to take into account the broader social value that is influenced by this new way of producing and providing services.

Therefore, the study of methods for assessing the implementation of the concept of government as a platform is relevant.

2. Literature review and problem statement

In [3], it is emphasized that the concept of government as a platform includes not only the technological component. Central to this concept is the radical and destructive nature of the new economic and organizational model, which has the potential to improve the way government operates. It is noted that within the framework of this approach, the binary problem of choosing centralized or local models of public services provision is being solved. So, in [3], the concept of government as a platform is represented in the form of an abstract model for evaluating platforms. This model includes three components:

1) collectively visualized organizational form;
2) market dynamics;
3) architecture of modular interrelated processes, provided by a common infrastructure.

The conceptual model for evaluating platforms in work [3] has been developed and used to analyze government platform initiatives in the UK. It was established that platform initiatives failed to develop the necessary market dynamics due to the assumption that the introduction of innovative technologies will invariably lead to organizational changes in the government. Moreover, the UK platform model is described as an internally managed, centralized hierarchical model based on its own assumptions and adopted without open public consultation. As a result, the government platform did not become the foundation for rethinking and innovative approach to the provision of public services. However, the disadvantage of work [3] is its overview nature, which is associated with the selected tasks and design of the study, as well as its object.

Work [4] considers the study of improving the efficiency of public administration based on platform organizational models. The platforms make it possible to reduce inconsistency and duplication of basic public services. Article [4] emphasizes the importance of the platform organization of the government in the coordination of state bodies in order to form a proposal for greater value of public administration without attracting additional resources. Thus, interdependences between platforms and ecosystems increase the ability of public administration to create services that better meet the needs of citizens. On the other hand, article [4] indicates the existence of a compromise between the value that is created in the process of providing various public services within the concept of government as a platform. To minimize the negative consequences of compromise and balance the value of various public services, article [4] uses the concept of orchestration, which is described on the example of Italy. Thus, the creation of ecosystems for each sector of public policy allows public authorities to orchestrate the contributions of private and public actors in order to create the expected social value. However, a significant limitation of article [4] is that the chosen method of the case study is difficult to generalize. This is explained by the fact that the case is selected according to criteria predetermined by researchers. This can lead to biased conclusions.

Work [5] focuses on prioritizing the factors of the concept of government as a platform based on the method of analyzing hierarchies. The results of study [5] showed that when building government as a platform, openness is a key factor. The results of [5] revealed the need to focus governments on their direct responsibilities, regardless of the origin and characteristics of the platform. Since the concept of government as a platform allows government agencies to become more innovative and horizontally integrated, the platform approach is designed to fundamentally change existing processes and the culture of the public sector. Among other important factors in the implementation of the state as a platform in [5] is the development of the use of information and communication technologies by citizens, as well as the introduction of big data technologies, smart contracts, and multi-level online and off-line channels. Such a public platform involves the partnership of government bodies, citizens, and private organizations in a directly managed hyper-connected society. The limitation of work [5] is the choice of key factors based on the opinions of experts while the attitude of users of public services remained unattended.

Paper [6] examines determining factors of the implementation of government as a platform. To this end, the perception of technology by South Korean civil servants has

been subjected to analysis, as they are the main implementers and stakeholders of the platform model. The main results of work [6] are the confirmation of the hypothesis of the positive impact of the quality of open data, the circle of stakeholders, and the attitude to civic activity on the perceived usefulness of technology. In turn, perceived utility has a positive effect on the intention to introduce platform technology. The results obtained are limited to the nature of the initial data, which include civil servants. South Korea is one of the leading countries with highly developed information and communication technologies. Therefore, the results obtained do not guarantee similar conclusions for other countries.

Study [7] proposed a conceptual model of open control systems, which can be built through the use of information and communication technologies. The structure of this model consists of open assets, open services, and open participation. This approach makes it possible to move from the ideas of lean and small government to the ideas of the government as a platform. The fact is that the concept of lean government is based on the principle of obtaining a greater result at a lower cost, so it makes it possible to solve short-term problems. The involvement in the organization of public administration of existing assets and resources of the whole society, and not just the public sector, makes it possible to obtain fundamentally new, additional synergistic effects in the long term. As a result, the concept of government as a platform is implemented not only as a set of technological solutions. In this interpretation, it involves re-awareness and reorganization of public administration. On the other hand, work [7] does not consider the barriers and threats of open management systems, the overcoming of which allows the development and implementation of platform solutions in government structures. This is due to the fact that this was not included in the range of tasks of work [7], so it requires additional research.

The purpose of [8] was to develop a conceptual model of the relationship between citizens and administration within the platform paradigm. At the same time, the platform paradigm of management, which provides for the distribution of responsibility between the administration and citizens for political and service processes, is established as a fundamentally new level of development of relations between citizens and the state. That is, the state leadership authorizes citizens to independently create state value through socio-technical systems (platforms) that combine data, services, technologies, and people to meet social needs. The conceptual model proposed in [8] includes 15 types of relationships, classified according to four management paradigms – the bureaucratic paradigm, the consumer paradigm, the participatory paradigm, and the platform paradigm. The structure of the model defines a comprehensive set of relations and explains how the decisions of citizens or administrations and the political environment they mutually agree contribute to the formation of such relations and the formation of individual and collective potential for achieving sustainable development. The limitation of work [8] is the chosen method of studying the case study, which subjectivizes the results obtained. In addition, the research left out the conditions under which the introduction of the platform paradigm is generally possible. This is due to the abstract nature of work [8].

Paper [9] considers the success factors of the IoT orchestration to create public value within the concept of smart government. This concept differs from the platform paradigm in that it involves transparency, not openness, and the introduction of business and scientific approaches along with innovative information and communication technologies. As part of work [9], a model of social value based on the Internet of Things was developed. Based on the results of the assessment of the perception of the Internet of Things technology by users of public services in Pakistan, based on the developed model, it was established that the organization of public services based on the Internet of Things can allow the government to provide public value. It was also found that public trust plays a key role in shaping the positive behavioral intentions of citizens regarding the use of the Internet of Things in e-government services. The disadvantage of [9] is, firstly, the limitation of its results due to the nature of the initial data. Secondly, a number of issues, such as:

1) scaling the developed model for relations between the state and business and within state bodies;

2) data security;

3) trust in technology left out of the study. The reason for this is the chosen research method.

Work [10] considers the problem of digital transformation of the public sector based on platforming. At the same time, work [10] considers the example of the state port of Ghana since in the scientific literature not enough attention is paid to poorly developed countries. The methodological basis of the study was the theory of technological affordans. As a result of the analysis of the case study, it was found that due to the formation of a platform ecosystem, a significant reduction in manual routine labor was achieved, and repetitive functions were completely eliminated. Transparency of processes has also increased, and corruption has decreased. Among the obstacles to platformization in [10] is political resistance to the complete digital transformation of port procedures. The disadvantage of [10] is the chosen method of the case study, which reduces the objectivity of the results obtained. In addition, the work emphasizes only positive changes from the introduction of platforms as a technology while the risks and problems were left out of the study.

Paper [11] analyzes the digital transformation of public services in Brazil. It has been established that digital transformation does not depend on the availability of innovative information and communication technologies but is determined by institutional factors and the organization of the provision of relevant services. Thus, the Brazilian model of digital transformation has proved heterogeneous and inconsistent in terms of completeness and transition to a platform model. Paper [11] points out the need for further awareness of the platform paradigm and the formation of state policy aimed at creating institutional mechanisms for the integration and coherence of public services.

Similar in terms of issues covered is work [12] which examines Estonia's experience in introducing information and communication technologies into public administration. The choice of this country as a case in the work is explained by the fact that it was here that the successful introduction of electronic ID cards and a secure data exchange architecture took place. In addition, Estonia is known for its exceptionally high trust in electronic government decisions. As a result of the analysis, the following paradox was revealed: the presence of uneven and very slow changes in technological capabilities in a positively tuned environment. This paradox is explained by the existence in Estonia of two types of organizations – dynamic and static. Dynamic organizations demonstrate radical changes in organizational capacity under the influence of citizen feedback and hierarchical feedback. At the same time, static organizations are mostly

unable to integrate user behavior directly into their feedback systems. They had little support or even resistance from political networks and considered the benefits of increased control, legitimacy and stability through technological innovation limited. This situation in work [12] is explained by the technological awareness of the staff and the presence in the organization of a manager with transformational leadership skills. The disadvantage of [12] is the chosen research method because the experience of a particular country can be limitedly applicable to build a reliable theoretical base. In addition, although the situation analyzed in the work corresponds to the concept of the government as a platform, this is not directly covered here.

Thus, the results of our review of works [3–12] reveal that the concept of government as a platform has several insufficiently studied problems. Firstly, it is the problem of awareness and readiness for changes in the organizational structure of state bodies both in society as a whole and within the state organizations themselves. Secondly, it is a problem of citizens' readiness to participate in the formation of public services. Thirdly, it is the availability of technological infrastructure and resources necessary to build a socio-technological model of interaction between citizens and the state. Separate in the technological infrastructure is the problem of data security. Therefore, conducting research on the implementation of the concept of government as a platform is appropriate.

3. The aim and objectives of the study

The aim of this study is to substantiate the approach to assessing the influence of factors of technology adoption on the results of the implementation of the concept of "government as a platform". This will make it possible to determine the characteristics of users of the state digital platform and increase the effectiveness of its implementation on this basis.

To accomplish the aim, the following tasks have been set:
– to determine the structure of the promising concept of "government as a platform";
– to substantiate the factors of implementation of the concept of government as a platform;
– to form a structure of the model for assessing the impact of the perception of technology by users on the implementation of the concept of government as a platform.

4. The study materials and methods

The object of our research is the factors of implementation of the concept of government as a platform.

The main hypothesis of the study assumes that the model of technology adoption is the most suitable for assessing the social value created by the implementation of the concept of "government as a platform".

The assumptions made in the study refer to the fact that a person makes decisions based on personal experience and limited information. Therefore, the introduction of new technologies in the processes of providing public services requires the study of behavioral factors to create a user-oriented model.

The simplifications adopted in the study relate to empirical data that served as the basis for the study. To identify the factors that should be included in our model of technology adoption, only generalized trends were taken into account.

The study was conducted in several stages. The first part concerns the justification of the method of assessing the influence of factors of technology adoption on the results of the implementation of the concept of «government as a platform». To define the concept of «government as a platform», to isolate its components and the interrelationships between them, methods of structural analysis and a graphical method of system analysis were used. To substantiate the factors of implementation of the concept of «government as a platform», the classification method was applied, the objects of which were selected as the identified components of the concept. The method of systematization is used to fill the classification of factors with components. The components were chosen by the method of factual search and analysis of the information received, which is set out in the methods for assessing the level of development of e-government, the fundamental concepts of information technology management and the theory of organizational behavior. To assess the results of the implementation of the concept of «government as a platform» and determine the status of users of state digital platforms, methods of comparison, generalization, grouping, analogies were used.

The sources of initial data were the databases of scientific publications Scopus and ResearchGate, research data conducted under the United Nations Development Program and the World Bank. The theoretical basis for explaining the intentions of users to use the state digital platform was the model of technology adoption.

5. Results of the study of methods for assessing the implementation of the concept of government as a platform

5. 1. The structure of the concept of "government as a platform"

The concept of "government as a platform" (Government as a Platform, GaaP) [13], which was developed in [14], is based on the understanding of the government as an organizer and moderator, and not as an authoritative initiator of interactions in society. The key role in the concept is played by the technological infrastructure of the platform [15, 16] and technologically protected information (information resource), which is created by citizens. The main manager of an information asset in the case of a centralized platform is the government (for example, Ukrainian "Diia"). If the platform is decentralized, then the main manager may be a non-governmental entity technologically integrated with the government platform through API protocols and web modules (for example, the Bitbon system of Ukrainian origin).

The concept reflects the transition of perception of managerial relations from the management of social processes through power imposition and coercion to create conditions for involving citizens in management processes. This is facilitated by the provision of quality administrative services and taking into account the public and private interests of members of society. In this interpretation, the platform model turns out to be the best for organizing the interaction of the state and society. It means that the government acts as a provider of the platform, that is, it forms the infrastructure and creates its core, which allows external software developers to promote the platform. Thus, rules are automatically created that ensure the correct operation of various applications.

A pragmatic approach to the state as a platform means solving technical problems related to the digital transforma-

tion of state authorities. In this aspect, digital transformation has become part of state reforms and thus went beyond purely technological improvements. Thus, the interests of society, the state and commercial companies that need to be balanced are affected. The structure of the concept of the state as a platform is shown in Fig. 1.
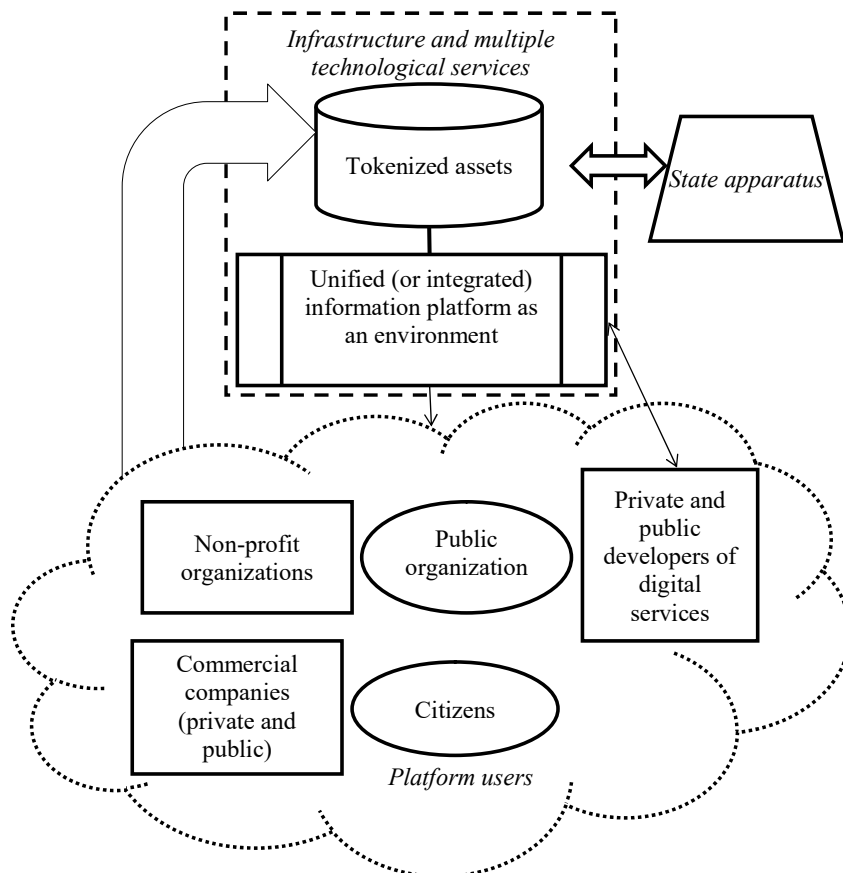

Fig. 1. The structure of the concept of government as a platform
Note: developed by authors based on [5, 6, 17−19]

Fig. 1 schematically depicts the implementation of the concept of government as a platform. Thus, the state apparatus acts as a platform provider and manager of digital assets. Digital service developers have the opportunity to create applications and place them on a public platform. In the role of a developer are persons among the users of the platform. The users of the platform are citizens and public organizations, commercial and non-profit companies that are the source of digital assets. The role of users of the platform is not only to consume public services but also to participate in creating their value. Such a mechanism, on the one hand, is currently quite well known due to the marketing paradigm, on the other hand, it corresponds to the foundations of democratic governance.

5. 2. Factors of implementation of the concept of government as a platform

The results of our review of literary sources [3–12, 14, 20] revealed that the success of implementing the concept of government as a platform depends on the study and consideration of the needs and requirements of citizens, technological readiness, and competencies of the government. The concept thus expresses the democratic principles of power. After all, democracy is based on the trust of the people, their participation in the implementation of state policy, ethical

motivation of power structures, adherence to universal human values, and moral authority built on this basis [21].

Thus, the following approaches to assessing the digital transformation of the government are distinguished:
– EDGI, e-government development index;
– a model of digital readiness;
– the models of adoption and use of technology.

The EDGI e-Government Development Index is a comprehensive assessment of its effectiveness. The methodology for calculating the index and the list of evaluated parameters are described in detail in [22]. It is worth noting that the index itself is a weighted average value of normalized points for three parameters of e-government – the volume and quality of online services, the state of development of telecommunications infrastructure, and human capital. Since the index is calculated relative to the general level of all countries, the estimate is adequate for comparing countries relative to each other. One of the methodological caveats is that EDGI is a benchmarking tool that should be used as an indirect performance indicator [22].

The digital readiness model involves assessing an organization's readiness for change based on digital technologies. That is, the level of digital transformation recorded at the time of the study, which is expressed through the adaptability of the digital infrastructure to the implementation of digital solutions, the digital competencies of employees, as well as the organizational system for managing digital transformation, is subject to analysis. For for-profit companies, there are many approaches to assessing digital readiness, which differ in the set of indicators and assessment concepts. As for the state, this area of research is supported by the World Bank [23]. The methodology for assessing the digital readiness of the government consists of 67 issues and covers the following components of open and flexible government infrastructure and activities:
– leadership and management;
– user-oriented design;
– public administration and change management;
– opportunities, culture, and experience;
– technological infrastructure;
– data infrastructure, strategy, and management;
– cybersecurity, privacy, and resilience;
– legislation and regulations;
– digital ecosystem of services, in which they created a digital environment for the circulation of rights and technologically protected information resource [24].

Thus, the digital readiness model, like the e-government development index, is an integral indicator. However, it is not relative and makes it possible to evaluate the government's digital transformation strategy. The disadvantage of the digital readiness model is that it is in the pilot phase, so the data is available over a short period of time and for several countries.

It should be noted that in terms of cause-and-effect relationships, both the EDGI e-government development index and the government's digital readiness provide insight into the results of the functioning of e-government and, accordingly, further opportunities for digital transformation. On the other hand, these indicators do not provide an answer to the question of why users use the technology and how acceptable it is for them. However, the perception of technology from the point of view of behavioral motives is an important indicator of the diffusion of innovations, and therefore affects the speed and success of technology implementation [25–27].

Models of adoption and use of technologies are a group of theories and models [28–30] that consider the influence of various factors on user activity in the adoption and use of new information technologies. This method of evaluating the technology also makes it possible to modify the already known model by taking into account new factors and check the strength and direction of their influence. So, the basis of all these models is the assessment of the influence of motivating and interfering factors that shape user behavior on the use of information technology. This provides an opportunity to explain the introduction of new technologies in any organizations, taking into account social characteristics and the attitude of specific individuals to their use.

Based on the results of the analysis of approaches to assessing the digital transformation of the government, the main factors for the implementation of the concept of government as a platform are identified, given in Table 1.

Factors and their components that are given in Table 1 were chosen on the basis of the results of the analysis of the fundamental concepts of information technology management [32] and the theory of organizational behavior [33].

The components of the factors are distinguished on the basis of a heuristic analysis of the above methods for assessing the digital transformation of the government. The main features by which the components were singled out are their possible influence on the principles of the concept of government as a platform. These principles include openness and transparency of public administration for society and business, as well as participation and co-creation of platform content. During the selection of components, the barriers [34] and opportunities [35] provided by information platforms were also analyzed.

Table 1

Factors of implementation of the concept of government as a platform

Concept component	Factor	Components
State apparatus	Professional and personal characteristics of civil servants	Technological skills
		Technology perception and readiness to use
		Resistance to innovations
		Moral and ethical values
		Bureaucracy
		Corruption
State apparatus	Organizational structure of the government	Correspondence of the structure to the performed functions
		Homogeneity of the structure
		Number of administrative subordinates
		Duplication of functions
		Coordination and coordination of actions between the components of the organizational structure
State apparatus	Legal regulation	The possibility of transformation of normative legal acts into platform rules
		Consistency of norms and rules
		Enforceability of normative legal acts
State apparatus	Financial mechanisms	Tax mechanism
		Budget mechanism
		Accounting mechanism
		Financing mechanism of technological infrastructure
		Funding mechanism for platform administrators
		Payment mechanisms for platform services
Technological infrastructure	Digital Technologies Industry 4.0	Software architecture
		Boundary resources of the platform
		Data repositories and their protection
		Standards
		Technological architecture
Users	Digital opportunities for households and businesses	Access to technology
		Availability of experience in the use of technologies
		Perception and willingness to use technology
		Technological skills
Users	Digital engagement	Social participation
		Information culture
		Culture parameters

Note: developed by authors based on [14, 16, 20, 31]

5. 3. Structure of the model for assessing the impact of technology perception on the implementation of the concept of government as a platform

During 2022, according to the results of the analysis of the e-government development index EDGI [22], there was a global trend towards increasing the level of development of e-government. At the level of analysis of the values of the index, this is due to the transition of countries from a lower group to a higher one. From the point of view of the purpose and objectives of this study, the key is to identify the main factors that contributed to finding or moving a country to a group with high index values.

Thus, the group of leading countries in the development of e-government includes Denmark, Finland, the Republic of Korea, New Zealand, Sweden, Iceland, Australia, Estonia, the Netherlands, the USA, the United Kingdom, Singapore, the UAE, Japan, and Malta. All these countries are in the group of high-income countries, which suggests a significant contribution of this factor to improving the effectiveness of the implementation of the concept of government as a platform. The high level of income makes it possible to increase the opportunities of citizens through investments in improving digital literacy and competencies, expanding technological infrastructure.

Typical for these countries is the development of infrastructure on the basis of such provisions. First, a clear vision by governments of the future of their countries through the use of breakthrough digital technologies such as big data, the Internet of Things, blockchain, artificial intelligence. Secondly, readiness to cooperate with the private sector on the rapid development of digital services in the platform. Such infrastructure includes a government-wide institute (department, ministry or agency) responsible for the development, coordination and implementation of a multi-year digital program. It is important that this central authority is responsible for developing and implementing breakthrough technologies such as big data, artificial intelligence, cloud infrastructure, cybersecurity, the Internet of Things, etc. into e-government digital services. Also, this group is characterized by the presence of specialized portals of electronic services, electronic participation, open data, public procurement, and relevant specialized legislation. Much attention in these countries is paid to digital inclusivity, electronic engagement measures for vulnerable groups are being implemented. This is achieved by setting standards for expanding access to digital technologies that extend to the government and the public and private sectors of the economy.

High incomes, developed infrastructure, and a high level of human capital development are ideal conditions for the development of digital government. But in other countries, despite certain problems, there have been significant progress in implementing digital government initiatives. Thus, with limited resources, a high and very high level of development of online services reached Albania, Argentina, Brazil, China, Ecuador, Republic of Kazakhstan, Malaysia, Mexico, Peru, Serbia, Thailand, and Turkey. This happened due to the very high level of human capital development and the high and medium level of infrastructure development. India, Indonesia, Rwanda, and Ukraine are low-income countries but have very high levels of development of online services. Indonesia and Ukraine have a relatively developed infrastructure and highly developed human capital. India and Rwanda have a low level of infrastructure development but a very high level of human capital development. These two countries are dis-

tinguished by the high efficiency of investments in the development and strengthening of inclusive, user-centric services.

Thus, the technocratic approach to the development of e-government within the concept of government as a platform is significant but does not provide a rethinking of the role of the state and a change in the views of citizens. The prospect of achieving success here is fixed by the focus on users, the focus of investments in the development of technology, the development of human capital and infrastructure.

In Ukraine, user experience on interaction with electronic public services during 2020–2022, the description of which is contained in works [36–38], is characterized as follows. Users of public e-services are more often men, persons who have higher education, work or study and have a medium or high level of income. In general, there are very few such persons among pensioners, rural residents, and low-income people. In general, the number of users of electronic public services has increased from 53 % in 2020 to 63 % in 2022. Electronic public services are available on various electronic resources. At the same time, in 2022, 52 % of users received services through Diia while in 2020 there were only 13 % of such users. Ukrainian users consider the following important aspects when receiving electronic services:

– protection of personal data;
– availability of a phone number for appeal if something went wrong;
– short and clear explanations;
– online chat with consultants;
– access to the service without registration or with minimal verification;
– saving data in a draft;
– video instructions;
– access only with a digital signature;
– clear design;
– minimum transitions;
– the ability to track the progress of implementation.

Among the reasons why citizens do not use electronic services, the main one is the lack of need for 70 % of such citizens. Also among the main reasons are the lack of skills and the lack of a device connected to the Internet. Among citizens who indicate a lack of skills, the number of people who do not want to develop them at all is growing (from 38 % in 2021 to 43 % in 2022). Another 9 % of citizens do not trust electronic services at all. Among the barriers to use, one should point out the unwillingness to become victims of fraudsters due to insufficient data security, dissatisfaction with electronic services due to their limited capabilities, and the need to visit the institution.

In general, the majority of Ukrainian citizens perceive electronic services as an integral part of life and have a positive attitude to their development since savings of effort and ease of use are important for them. The main positive features also include avoiding discomfort from queues and bureaucracy and reducing the negative impact of the human factor.

Thus, the conceptual model of adopting technologies of electronic public services for Ukrainian society is shown in Fig. 2.

Fig. 2 shows a theoretical model of the influence of user behavioral variables on the intention and, accordingly, the actual use of the state digital platform. The model consists of six independent variables, three intermediate variables, and one dependent variable.
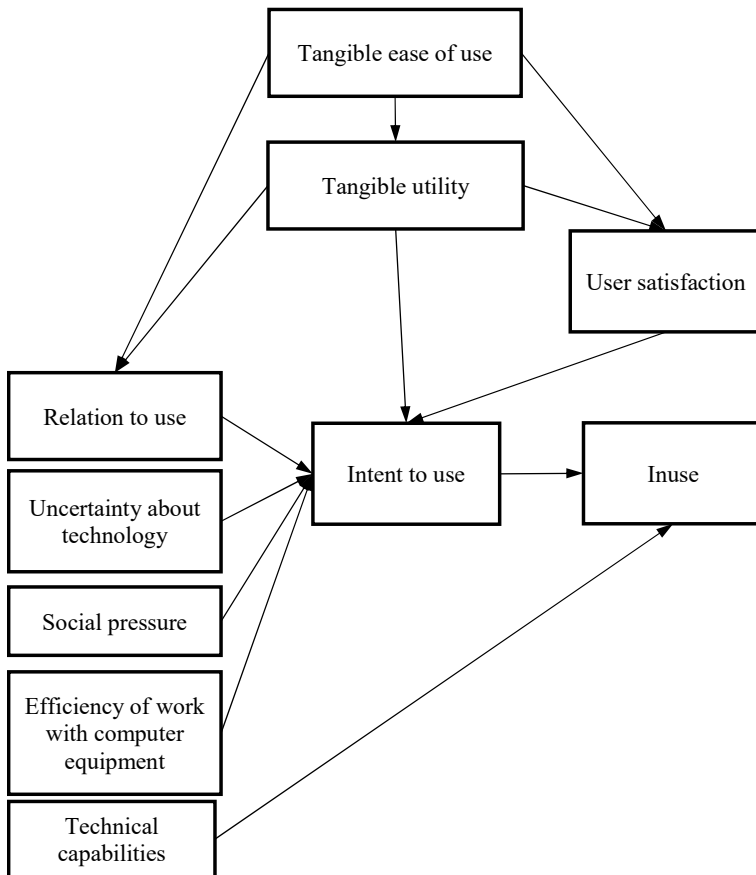
Fig. 2. Conceptual model of adoption of electronic public services technologies

Selected variables include the following:

– tangible ease of use characterizes the user's expected ease of mastering and using the technology, and this also includes the user's assessment of the volume and intensity of the effort expended during use;

– tangible utility takes into account the user's expectations of how much the use of the information system will facilitate the receipt of public services;

– attitude to use means a positive or negative emotional attitude to the use of technology;

– user satisfaction is the perception by users of the degree of fulfillment of their requirements for public services provided using technology;

– social pressure expresses how significant representatives of the user's social environment are positive about the use of technology;

– uncertainty in technology reflects the presence of psychological factors in the user that make it difficult to use information technologies;

– efficiency of work with computer equipment is the user's ability to work with information systems, in particular, centralized platforms and decentralized platforms on the blockchain [39];

– technical capabilities – this is the level of technical and organizational infrastructure, which is designed to support the use of information technology;

– the intention to use technology is how the user perceives the intention to actively use the technology to receive public services.

It is also possible to include control variables in the described model that indicate the gender and age of users, their experience, and income level.

Tangible ease of use affects the attitude to use, tangible usefulness, and user satisfaction. Tangible utility affects usage attitudes, intent to use, and user satisfaction. Attitudes towards use, uncertainty about technology, social pressure, computer efficiency, and user satisfaction affect the intent to use. Technical capabilities and intent to use affect actual use. Control variables, if there is a need to include them in the model, will affect the strength of the relationship between the described variables.

6. Discussion of results of the study of methods for assessing the implementation of the concept of government as a platform

The structure of the concept of government as a platform, shown in Fig. 1, was formed on the basis of the analysis of the model of the digital platform given in works [5, 6, 17, 18]. The structure is transformed taking into account the essence of public administration, the principles of public services and democratic governance, which ultimately underlies the concept of government as a platform.

The factors of implementation of the concept of government as a platform hiven in Table 1 are explained, first of all, by the structure of the concept of government as a platform and form the framework for its implementation. In this framework, the components that need to be transformed in order to comply with the principles of the platform model are distinguished. Therefore, the concept of the state as a platform concerns not only technical steps to introduce innovative technology in the public sector but provides for a rethinking of the role of public administration in the social and economic context of the country. In contrast to the well-known global methods [23, 24], in this study, firstly, the focus is on the platform model as the final result of the digital transformation of public administration, regardless of the level of development of the country. Secondly, the factors are added to the perception of technologies and readiness for their use, which are evaluated within known theoretical models and for which there are methods for checking adequacy and verification. Thirdly, the components of the factors are formulated in such a way as to take into account the difficulties and obstacles to the implementation of the concept of government as a platform. For example, the low level of technological skills of civil servants makes it impossible to use digital platforms effectively. The high level of bureaucracy and corruption excludes the motivation to implement the platform through the requirement of government transparency. The insufficient level of development of technological infrastructure significantly complicates the implementation of the concept.

The results of our analysis of the e-government development index EDGI can be explained by several reasons. First, it is a method of calculating the index, which puts the dependence of its value on the totality of the countries involved in its study. That is, it assesses the level of development of the e-government of a particular country relative to other countries. Secondly, there are basic indicators that determine the potential of digital transformation in the country.

These include the level of income in the country, the level of development of information and communication infrastructure, and the level of human development. Thus, the low level of income in the country does not allow investing in the development of innovative technologies, human capital, and physical infrastructure, which prevents the introduction of government as a platform. This is confirmed by the fact that the leading countries with a high level of e-government development include only high-income countries. Insufficient infrastructure development has also proved to be a significant obstacle to implementing the concept of government as a platform. The development of infrastructure, in this case, involves not only the expansion, for example, of access to the Internet or the amount of computer equipment. This also includes the level of use and readiness to use digital breakthrough technologies at the state level, the quality of the state management apparatus in terms of transparency, optimization of the organizational structure and consistency of regulations. The third essential component is human capital development, as evidenced by the high and very high EDGI index for countries with limited infrastructure or low-income levels.

The results of the analysis of user experience of interaction with electronic public services in Ukraine can also be explained by income levels, development of information and communication infrastructure, and human development, but specific factors due to the peculiarities of Ukrainian society have also been identified. Among them are distrust of data security in state information systems, fear of making a mistake, the need to control the performance of the service, unwillingness to develop digital skills.

However, the results obtained regarding development trends and perception in society of the concept of government as a platform do not give an understanding of the extent and direction of influence of certain factors on its actual implementation. For this purpose, a conceptual model for the adoption of electronic public services technologies has been developed, shown in Fig. 2. At the heart of its development are the models described in works [5, 7, 21–23, 40], but they are complemented by variables such as user satisfaction and uncertainty in technology. In addition, in the proposed model, specificity can be expressed through the filling of structures.

Thus, the method of assessing the implementation of the concept of government as a platform based on the theory of technology perception will help in solving the problems of awareness and readiness for changes in the organizational structure of state bodies both in society as a whole and within the state organizations themselves and the readiness of citizens to participate in the formation of public services [39]. This is possible due to the construction of a new social value of public services based on further analysis of the developed structural model of perception of the concept of the state as a platform.

The limitation of this study is its focus on taking into account the perception of technology by individual citizens. However, for the successful implementation of the concept of government as a platform, it is necessary to take into account the same parameters of other users, that is, commercial and public companies, government agencies, public organizations. In addition, the model is adapted for Ukrainian citizens, in other countries there may be other significant factors. However, the nature of the chosen theoretical basis makes it possible to include in the model an almost unlimited number of factors, if there are technical possibilities for collecting and processing large amounts of information. The disadvantage of the study is the need to verify the adequacy of the developed conceptual model since it is at the verification stage.

In general, restrictions form the basis for the development of this study. In the future, it is advisable to test the formulated model on real empirical data, as well as to conduct similar studies for other groups of users of the state digital platform. Also, as future research, such areas as taking into account the specifics of the interaction of society with local authorities (the concept of smart cities), checking the developed model for other countries or local communities are important.

7. Conclusions

1. The concept of government as a platform is presented in the form of interrelated entities, components of technological infrastructure and digital assets. The role of the state entity is to dispose of digital assets, create and maintain a digital platform, create and monitor compliance with the rules and regulations for using the platform, and involve users in creating social value. External users of the platform, which include citizens, public organizations, commercial and public companies, are owners of digital assets. A feature of the described structure is the consideration in it not only of the technological aspect but also social value, which is explained by the principles of the concept of government as a platform. The role of the state as a significant participant in the market of platform solutions should be proactive, transparent and predictable. At the same time, it is important to ensure a comprehensive, rather than a single, one-time adoption by the state of approaches to the use of digital technologies, avoiding the previously declared equidistance of the state from private market participants. It is also important that there is no exclusion in access to state information systems. At the same time, the attention of regulators should be focused on such goals. Firstly, it is minimizing risks and supporting the interest of its citizens in receiving and paying public services at the expense of taxes digitally in their jurisdiction. Secondly, it is to promote innovation and ensure the maximization of the benefits that the population and business of the country receive from the implementation of platform and ecosystem solutions in the economy and public government.

2. The factors of implementation of the concept of government as a platform are identified. These include the following:
– professional and personal characteristics of civil servants;
– organizational structure of the government;
– legal regulation;
– financial mechanisms;
– use of digital technologies of Industry 4.0;
– digital opportunities of the population and business;
– digital engagement.

The identified factors take into account the study and consideration of the needs and requirements of citizens, technological readiness, and competence of the government. To revive cooperation on the implementation of the concept of government as a platform, attention should be paid to two factors. The technological factor is important in terms of mutual technological integration of public and private registers based on blockchain. The legal factor is subject to transformation in the international field in the context of the formation of digital interoperability between countries and the creation of a set of global rules taking into account the economic, political, and cultural differences of countries. Such a set of rules provides

for the development of a global document to determine the principles and priorities of the dissemination of digital technologies proven by international practice in order to ensure their interoperability and prevent the spread of digital unevenness.

3. It has been established that during 2022 there was a global trend towards a significant increase in the level of technological development of e-government towards a digital ecosystem of services based on a centralized information platform. However, the technocratic approach to the development of e-government within the concept of government as a platform is significant but does not provide a rethinking of the role of the state and a change in the views of citizens. The prospect of achieving success here is fixed by the focus on users, the focus of investments in the development of technology, the development of human capital and infrastructure. The results of the analysis of user experience on interaction with electronic public services in Ukraine confirm the need to focus on consumers. In general, the majority of Ukrainian citizens perceive electronic services as an integral part of life and have a positive attitude towards their development. However, important aspects that hinder the use are insufficient development of digital infrastructure, insufficient level of digital literacy, especially in rural areas, cybersecurity, technical support, and specialist consultation. Taking into account the obtained results of the analysis of global trends in the development of digital government and user experience in Ukraine, the structure of the model for adopting technologies for the provision of electronic public services for Ukrainian society has been developed. The model consists of six independent variables, three intermediate variables, and one dependent variable. Independent variables include tangible ease of use, uncertainty in technology, social pressure and efficiency of working with computer equipment, technical capabilities. Intermediate variables include attitude to use, tangible utility, user satisfaction, and intent to use. The dependent variable in the model is the actual use of technology. It is also possible to include control variables in the described model that indicate the gender and age of users, their experience and income level. A feature of the developed model is its adaptability to evaluate public services within the concept of the government as a platform by taking into account the relevant factors that distinguish it from the already known models of technology adoption.

Conflicts of interest

The authors declare that they have no conflicts of interest in relation to the current study, including financial, personal, authorship, or any other, that could affect the study and the results reported in this paper.

Funding

The study was conducted without financial support.

Data availability

All data are available in the main text of the manuscript.

References

1. 2023 Edelman Trust Barometer. Global Report. Edelman. Available at: https://www.edelman.com/sites/g/files/aatuss191/files/2023-02/2023%20Edelman%20Trust%20Barometer%20Global%20Report.pdf

2. Edelman Trust Barometer 2022. Special Report. Trust and climate change. Edelman. Available at: https://www.edelman.com/sites/g/files/aatuss191/files/2022-11/2022%20Edelman%20Trust%20Barometer%20Special%20Report%20Trust%20and%20Climate%20Change%20FINAL_0.pdf

3. Brown, A., Fishenden, J., Thompson, M., Venters, W. (2017). Appraising the impact and role of platform models and Government as a Platform (GaaP) in UK Government public service reform: Towards a Platform Assessment Framework (PAF). Government Information Quarterly, 34 (2), 167–182. doi: https://doi.org/10.1016/j.giq.2017.03.003

4. Cordella, A., Paletti, A. (2019). Government as a platform, orchestration, and public value creation: The Italian case. Government Information Quarterly, 36 (4), 101409. doi: https://doi.org/10.1016/j.giq.2019.101409

5. Seo, H., Myeong, S. (2020). The Priority of Factors of Building Government as a Platform with Analytic Hierarchy Process Analysis. Sustainability, 12 (14), 5615. doi: https://doi.org/10.3390/su12145615

6. Seo, H., Myeong, S. (2021). Determinant Factors for Adoption of Government as a Platform in South Korea: Mediating Effects on the Perception of Intelligent Information Technology. Sustainability, 13 (18), 10464. doi: https://doi.org/10.3390/su131810464

7. Millard, J. (2018). Open governance systems: Doing more with more. Government Information Quarterly, 35 (4), S77–S87. doi: https://doi.org/10.1016/j.giq.2015.08.003

8. Janowski, T., Estevez, E., Baguma, R. (2018). Platform governance for sustainable development: Reshaping citizen-administration relationships in the digital age. Government Information Quarterly, 35 (4), S1–S16. doi: https://doi.org/10.1016/j.giq.2018.09.002

9. Chohan, S. R., Hu, G. (2020). Success Factors Influencing Citizens' Adoption of IoT Service Orchestration for Public Value Creation in Smart Government. IEEE Access, 8, 208427–208448. doi: https://doi.org/10.1109/access.2020.3036054

10. Senyo, P., Effah, J., Osabutey, E. L. (2021). Digital platformisation as public sector transformation strategy: A case of Ghana's paperless port. Technological Forecasting and Social Change, 162, 120387. doi: https://doi.org/10.1016/j.techfore.2020.120387

11. Filgueiras, F., Flávio, C., Palotti, P. (2019). Digital Transformation and Public Service Delivery in Brazil. Latin American Policy, 10 (2), 195–219. doi: https://doi.org/10.1111/lamp.12169

12. Lember, V., Kattel, R., Tõnurist, P. (2018). Technological capacity in the public sector: the case of Estonia. International Review of Administrative Sciences, 84 (2), 214–230. doi: https://doi.org/10.1177/0020852317735164

13. O'Reilly, T. (2011). Government as a Platform. Innovations: Technology, Governance, Globalization, 6 (1), 13–40. doi: https://doi.org/10.1162/inov_a_00056

14. Kud, A. (2021). Decentralized Information Platforms in Public Governance: Reconstruction of the Modern Democracy or Comfort Blinding? International Journal of Public Administration, 46 (3), 195–221. doi: https://doi.org/10.1080/01900692.2021.1993905

15. Dunayev, I., Hotlib, I., Olvinskaya, J., Fomina, O., Hrybova, D., Olentsevych, N. et al. (2022). Development of a system for statistical measurement of the influence of digital technologies on the efficiency of management. Eastern-European Journal of Enterprise Technologies, 1 (13 (115)), 49–58. doi: https://doi.org/10.15587/1729-4061.2022.252911

16. Dunayev, I., Hromov, S., Tymchenko, Y., Proskurina, M. (2022). Explication of the role of digital technologies in marketing management of a modern company. Eastern-European Journal of Enterprise Technologies, 5 (13 (119)), 89–99. doi: https://doi.org/10.15587/1729-4061.2022.265017

17. Bender, B., Heine, M. (2021). Government as a Platform? Constitutive Elements of Public Service Platforms. Lecture Notes in Computer Science, 3–20. doi: https://doi.org/10.1007/978-3-030-86611-2_1

18. Hein, A., Schreieck, M., Riasanow, T., Setzke, D. S., Wiesche, M., Böhm, M., Krcmar, H. (2019). Digital platform ecosystems. Electronic Markets, 30 (1), 87–98. doi: https://doi.org/10.1007/s12525-019-00377-4

19. Kud, A. (2021). Comprehensive Classification of Virtual Assets. International Journal of Education and Science, 4 (3-4). doi: https://doi.org/10.26697/ijes.2021.3.6

20. Kud, A. (2021). Legal regulation of decentralized information platforms: problems and the suggested private-law approach to their solution in Ukraine. Theory and Practice of Public Administration, 2 (73), 47–66. Available at: https://www.blockchainukraine.org/wp-content/uploads/2021/09/legal-regulation-of-decentralized-information-platforms-in-ukraine.pdf

21. Rudych, F. M. (Ed.) (2016). Politychna vlada i opozytsiya v Ukraini: porivnialnyi analiz iz zarubizhnymy krainamy. Kyiv: IPiEND im. I.F. Kurasa NAN Ukrainy, 488. Available at: https://ipiend.gov.ua/publication/politychna-vlada-i-opozytsiia-v-ukraini-porivnialnyj-analiz-iz-zarubizhnymy-krainamy-monohrafiia/

22. United Nations E-Government Survey 2022. The Future of Digital Government. United Nations. Available at: https://desapublications.un.org/sites/default/files/publications/2022-09/Web%20version%20E-Government%202022.pdf

23. Melhem, S., Lee, Y., Dener, C., Yamamichi, M., Priftis, M. L., Pahlavooni, S. et al. (2020). Digital Government Readiness Assessment (DGRA) Toolkit V.31: Guidelines for Task Teams (English). World Bank Group. Available at: http://documents.worldbank.org/curated/en/999901588145595011/Digital-Government-Readiness-Assessment-DGRA-Toolkit-V-31-Guidelines-for-Task-Teams

24. Kud, A. (2022). Transformation of existing economic relations and ways of their implementation impacted by digital technologies. Visnyk of the Lviv University. Series Economics, 62, 42–58. Available at: https://www.blockchainukraine.org/wp-content/uploads/2022/10/a-kud-transformation-economic-relations-and-ways-their-implementation-under-development-digital-technologies-en.pdf

25. Dearing, J. W., Cox, J. G. (2018). Diffusion Of Innovations Theory, Principles, And Practice. Health Affairs, 37 (2), 183–190. doi: https://doi.org/10.1377/hlthaff.2017.1104

26. Al-Rahmi, W. M., Yahaya, N., Aldraiweesh, A. A., Alamri, M. M., Aljarboa, N. A., Alturki, U., Aljeraiwi, A. A. (2019). Integrating Technology Acceptance Model With Innovation Diffusion Theory: An Empirical Investigation on Students' Intention to Use E-Learning Systems. IEEE Access, 7, 26797–26809. doi: https://doi.org/10.1109/access.2019.2899368

27. Vargo, S. L., Akaka, M. A., Wieland, H. (2020). Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. Journal of Business Research, 116, 526–534. doi: https://doi.org/10.1016/j.jbusres.2020.01.038

28. Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13 (3), 319. doi: https://doi.org/10.2307/249008

29. Davis, F. D., Bagozzi, R. P., Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, 35 (8), 982–1003. doi: https://doi.org/10.1287/mnsc.35.8.982

30. Venkatesh, V., Morris, M. G., Davis, G. B., Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27 (3), 425. doi: https://doi.org/10.2307/30036540

31. Dunayev, I., Kud, A., Latynin, M., Kosenko, A., Kosenko, V., Kobzev, I. (2021). Improving methods for evaluating the results of digitizing public corporations. Eastern-European Journal of Enterprise Technologies, 6 (13 (114)), 17–28. doi: https://doi.org/10.15587/1729-4061.2021.248122

32. Laudon, K. C., Laudon, J. P. (2019). Management Information Systems: Managing the Digital Firm. Pearson UK.

33. Robbins, S. J., Judge, T. (2021). Essentials of Organizational Behaviour. Pearson UK.

34. Kuhn, P., Buchinger, M., Balta, D., Matthes, F. (2022). Barriers of applying Government as a Platform in Practice: Evidence from Germany. Proceedings of the 55th Hawaii International Conference on System Sciences. doi: https://doi.org/10.24251/hicss.2022.328

35. Al-Ani, A. (2017). Government as a Platform: Services, Participation and Policies. Digital Transformation in Journalism and News Media, 179–196. doi: https://doi.org/10.1007/978-3-319-27786-8_14

36. Dumky i pohliady naselennia Ukrainy shchodo derzhavnykh elektronnykh posluh. Analitychnyi zvit (2022). Kyiv. Available at: https://www.undp.org/sites/g/files/zskgke326/files/2023-01/Report%20Opinions%20and%20views%20of%20the%20Ukrainian%20population%20regarding%20state%20electronic%20services.pdf

37. Dumky i pohliady naselennia Ukrainy shchodo derzhavnykh elektronnykh posluh: veresen 2021 roku. Analitychnyi zvit (2021). Kyiv. Available at: https://www.undp.org/sites/g/files/zskgke326/files/migration/ua/KIIS_DIA_Adult_population_on_eservices_Sept_2021.pdf

38. Elektronni posluhy: dosvid, dovira, dostupnist (2020). Kyivskyi mizhnarodnyi instytut sotsiolohiyi. Available at: https://www.undp.org/sites/g/files/zskgke326/files/migration/ua/Report_KIIS_Ukrainian_18.03.2021.pdf

39. Dunayev, I. (2017). Moving regional economic policy modernization ahead: Systems basis for organizational and deblocking mechanisms in present-day Ukraine. Regional Science Inquiry, 9 (1), 21–39. Available at: http://www.rsijournal.eu/ARTICLES/June_2017/RSI_June_2017_IX_(1).pdf

40. Kud, A. (2022). System modernization public administration in the information age platform. Kharkiv, 432. doi: https://doi.org/10.31359/9789669984296