

Innovative technologies in fiscal policy as a driver of digital transformations of the Ukrainian economy

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ABSTRACT

This article presents the results of a study of the impact of the level of digital technology development in the sphere of Ukraine's fiscal policy on the digital transformation of the economy as a whole. Since the digitalization of the economy determines not only the level of possibilities for its integration into the global economic space but also the level of ensuring the competitiveness of all components of complex economic systems, the digitalization of the economy is an objective necessity, that is, the degree of sustainability of the monetary system depends on the level of digitalization. Since Ukraine has chosen the scenario of primacy in introducing innovative technologies in the fiscal policy sphere, other sectors of the economy should use the experience gained from the budgetary system to implement innovations. To obtain optimal data on the degree of readiness of the fiscal system to become a source of such knowledge and other components of the economy to accept the data obtained, a cross-sectional study was conducted, which involved business representatives, taxpayers, students of economic specialties, employees of state administration and local government bodies and employees of tax and customs authorities. As a result of the study, index characteristics were obtained in four areas of research: fiscal policy, business and finance, digital state, problems, and prospects of digitalization of the economy. According to the results obtained, employees of tax and customs authorities can participate in the process of transferring positive experience in the field of digitalization of economic processes to other sectors of the economy.

Keywords: Digital tools, Cross-sectional study, Digital state, Government-business communications

1. Introduction

State the objectives of the work and provide an adequate background, relevant literature review but avoid a detailed literature survey or a summary of the results.

Modern globalization processes in any country's economy are impossible without the large-scale use of digital tools. Like many other countries, Ukraine has chosen the vector of digital development of the economy. There are various approaches to defining the branch of economic activity that is the flagship of the digital transformation of the economy. These can be central banks and banking systems, systems for distributing budget allocations, or fiscal policy bodies.

Fiscal policy is an effective tool for regulating economic processes. It is closely involved with various population segments, collecting tax revenues and redistributing resources. Since significant bureaucratic barriers characterize Ukraine, a high level of corruption, and shadow economies, its high-quality economic development is threatened without high-quality digital transparency.

Innovative technologies, such as blockchain, artificial intelligence, big data, and various electronic platforms, not only significantly improve the quality indicators of the functioning of fiscal policy instruments, increase the transparency of financial flows in the state, but also raise the authority of state policy in the field of finance for both citizens of Ukraine and foreign partners. Ukraine has chosen an approach to the digital transformation of the economy through the leadership of fiscal instruments due to the importance of the effectiveness of the budgetary policy and the gradual bringing of other sectors of the economy to the intended levels of digitalization. This approach is logical and justified, given that all participants in economic processes are in direct contact with the fiscal service.



This study analyses the role of innovative technologies in Ukraine's fiscal policy and their impact on the digital transformation of the economy as a whole. It aims to identify institutions in Ukraine's fiscal policy whose employees are most adapted to digital changes in budgetary processes.

The study's objectives are to identify satisfaction with the pace and methods of introducing innovative technologies in fiscal policy among different users of digital budgetary policy instruments and to establish the strengths and weaknesses of the impact of innovative technologies in fiscal policy on Ukraine's digital transformation.

The current level of economic development is determined by the level of development of individual regions, industries, and enterprises [1], [2], [3]. Development is often associated with structural changes. Foster-McGregor notes that structural modifications are currently impossible without digital tools. Reference [4] emphasizes the importance of such structural changes for the Ukrainian economy, and Reference [5] for international business.

Reference [6] emphasizes the impossibility of optimal business process planning without using economic digitalization tools. Reference [7] highlight the need for cross-sectional data selection in economic research.

References [8] and [9] point to the importance of developing digital tools in tax administration for qualitative transformations in the system of servicing structural changes in the economy. Common digitalization standards are also important in these processes [10], [11], [12]. Reference [13] highlights the specificities of digital transformations for small and medium-sized enterprises in Europe, focusing on the role of fiscal policy instruments in these processes.

Examples of various tools for digitalizing economic processes at multiple levels are described in [14], [15], [16], [17], [18]. Reference [18] focuses on using BigData in tax strategy.

Many authors describe the tools of digital transformation, namely mechanisms for selecting and implementing innovations, modeling innovation situations, and analyzing the implementation of innovations [19], [20], [21], [22], [23], [24], [25], [26]. Some authors point to structural changes in supply chains as a result of the implementation of innovations, especially in the form of digital tools [27], [28], [29].

References [30] and [31] describe digital tools for taxpayers. For business, the processes of digital integration of Ukraine into the European Economic Area and the adaptation of digitalization of business processes to European and world standards are described [32], [33], [34], [35], [36], [37], [38], [39], [40].

2. Research method

Cross-sectional studies are a type of research design used to collect information and analyze data simultaneously. It involves collecting data from different groups of people or subjects representing different populations, age groups, or other relevant categories [41].

A cross-sectional study aims to understand and describe the prevalence of specific characteristics, behaviors, or conditions in a selected population or set with a characteristic. The study is usually conducted by surveys, interviews, or observations, with the results recorded at a single point or by recording participants' opinions or health status over time [42], [43]. Because this type of study simultaneously studies a wide range of people, cross-sectional studies provide valuable information about the relationships between variables of interest and their distribution in different groups [44].

This study is beneficial for estimating the prevalence of diseases, behaviors, or attitudes and identifying patterns or associations between different factors the study will examine.

The following groups of respondents were selected for this study. The first respondents are entrepreneurs and individuals who independently determine their professional activities. The choice of this group of respondents is because they often independently deal with issues of simplified accounting and independently work with digital tools in the framework of communication with the fiscal service authorities; that is, they are direct users of the digital tools studied in this study. The second group of respondents are ordinary taxpayers whose activities are unrelated to the financial system, that is, those who occasionally encounter digital fiscal policy instruments and can objectively assess the dynamics of their development.

Since the digitalization of the economy is a process with broad prospects, the third group of respondents is students of educational institutions who are receiving diplomas in the current year in the specialties of finance

and management, that is, their experience of working with digital instruments of fiscal policy and other areas of the Ukrainian economy is limited by the framework of existing curricula in the specialties of the economic spectrum.

The fourth group of respondents are representatives of state administration bodies and local governments of Ukraine. This group of respondents was selected because the professional competencies of this group of specialists include working with digital tools for distributing state and public funds; that is, they can objectively assess the functionality of these components of the digitalization of the economy. The fifth group of respondents are employees of state tax and customs authorities of Ukraine, who not only constantly use existing digital tools of fiscal policy but also participate in developing and testing new digital tools or improving existing ones.

Participants in the cross-sectional study were asked to assess, in their own opinion, the degree of development of digital technologies as indicators in the main areas. Table 1 gives the scheme of areas and indicators by area.

Table 1. Research directions and indicators





Directions	Indicators, tools
Tax and customs policy	Electronic taxpayer account
	Automatic VAT refund system
	Unified register of tax invoices
	Automated customs clearance system
	Single Window for International Trade
	Automated systems for all business processes
Business and Finance	Electron Customer Relationship Systems
	Electronic banking, payment systems
	Investment platforms
	Electronic risk management systems
	Electronic consultation system, including tax consultations
Digital state	Electronic registers of property and income
	Mobile applications, such as "Diya"
	Administrative Service Provision Centers
Problems and Prospects	Insufficient level of digital literacy of potential users of digital services
	Risks caused by poor cybersecurity
	Reducing bureaucracy in the interaction between business and government
	Transparency of all financial flows

Source: Own elaboration.

Based on their personal and professional experience, each respondent assigns a significance level of 0 to 5 points to the digitalization indicator or tool. The significance level is also determined for each of the proposed components. Before conducting the survey, the goals and objectives of the experiment are explained, and the respondents are asked to set the significance level to 0 in the event of a complete lack of information about a particular element. Each respondent is allowed to express wishes for developing Ukraine's digital economy.

The results are processed in three stages. In the first stage, the average ratings are calculated for each direction and each instrument or criterion for all respondents and each group separately. The calculations are made by finding the ratio of the sum of all the received ratings to the number of responses received. In the second stage, the significance levels are determined, and for clarity, the results obtained are highlighted in color according to the scheme given in Table 2.

Table 2. Levels of significance

Level of significance	Number of points	Color designation
Low	0-1.5	
Medium	Color5	
Sufficient	2.5-3.5	
High	3.5-5	

Source: Own elaboration.

The obtained result Matrices with color shading allow for a high-quality interpretation and visual presentation.

The third stage of processing the research results is analyzing the wishes that respondents expressed during the research concerning the expected changes in the digitalization of the Ukrainian economy, their generalization, and systematization. Based on the results of the conducted study, general recommendations are synthesized to improve the process of applying achievements in the field of digitalization obtained in the fiscal policy system of Ukraine to other sectors of the economy.

The expected results of the study are to establish the level of digitalization of Ukraine's fiscal policy based on the survey results and summarise the recommendations given by representatives of various groups of users of economic digital instruments for further improvement.

Since representatives of five different groups of respondents from all regions of Ukraine simultaneously participated in the study, the presented sample is representative and allows conclusions to be drawn based on the results obtained.

3. Results and discussion

Since the study was conducted using digital tools, it was possible to obtain responses from all categories of respondents in all regions of Ukraine. Table 3 shows data on the number of respondents in all areas of Ukraine in the context of the specified groups.

Table 3. Sample of respondents.

Region	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Vinnitsia Region	399	124	78	36	84	77
Volyn Region	335	97	64	27	74	73
Dnipropetrovsk Region	589	138	106	94	167	84
Donetsk Region	484	127	98	44	121	94
Zhytomyr Region	412	94	89	36	117	76
Zakarpattia Region	475	135	116	24	94	106
Zaporizhzhia Region	363	95	74	17	86	91
Ivano-Frankivsk Region	669	138	146	73	145	167
Kyiv Region	2429	369	518	211	817	514
Kirovohrad Region	177	39	28	14	62	34
Luhansk Region	439	117	89	37	94	102
Lviv Region	877	186	174	102	199	216
Mykolaiv Region	350	97	86	17	89	61
Odesa Region	1373	286	317	185	318	267
Poltava Region	606	124	97	84	177	124
Rivne Region	327	93	72	26	84	52

Region	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Sumy Region	202	71	52	18	35	26
Ternopil Region	208	63	28	27	59	31
Kharkiv Region	726	217	147	65	179	118
Kherson Region	174	24	17	12	69	52
Khmelnytskyi Region	488	76	88	34	187	103
Cherkasy Region	378	84	31	67	105	91
Chernivtsi Region	154	34	17	16	53	34
Chernihiv Region	115	18	12	11	46	28

Source: Own elaboration.

If consider the groups of respondents, the most numerous group is the group of representatives of state governing bodies and local government bodies, and the smallest in number is the group of students (Figure 1).

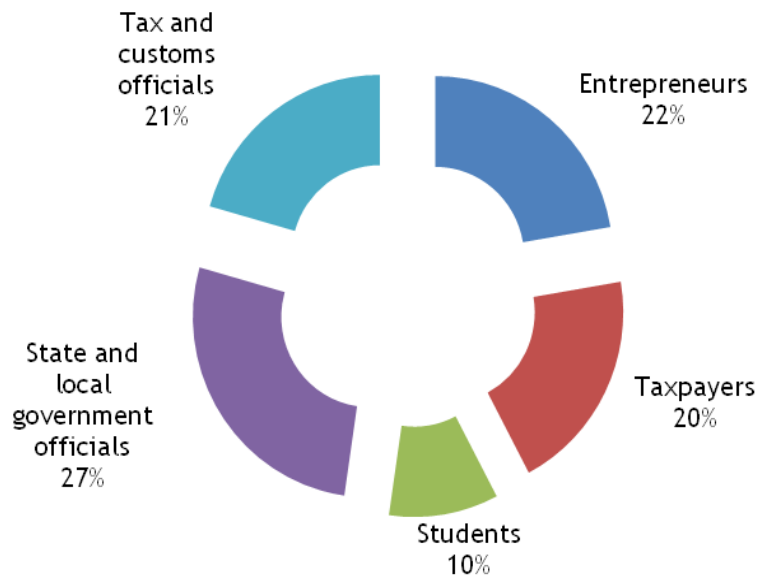


Figure 1. General composition of respondents

Source: Own elaboration.

Since the students were involved in quality control of educational programs of higher education institutions providing economic specialties, the size of this group will allow us to obtain general results for the education system. The remaining groups of respondents are represented in approximately equal shares. This will enable us to obtain objective results for analyzing the impact of existing digital tools on the further development of the digital economy.

3.1. Tax and customs policy

Since state policy in the field of tax collection is the basis of the state's welfare, when considering this area, the features of the process of facilitating taxpayers' work with documentation that allows determining the amounts and specific amounts of taxes, i.e., the work of the electronic taxpayer account, were taken into account. Also considered were the possibilities of obtaining information on collecting and distributing taxes by all interested parties, including electronic communication.

The features of VAT refunds and a single register of tax invoices are also given some attention since these electronic systems help guarantee the timely fulfillment of the conditions prescribed in the Tax Code of Ukraine.

A single window for international trade is also used to study the availability of global transactions. Table 4 shows the results of indexing the degree of availability of these services by different groups of respondents.

Table 4. Results in tax and customs policy

Indicators, tools	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Electronic taxpayer account	3.3	4.6	3.2	1.7	2.4	4.4
Automatic VAT refund system	2.7	3.7	1.4	0.8	3	4.6
Unified register of tax invoices	3.8	4.8	2.7	3.1	4.2	4.3
Automated customs clearance system	4.1	3.9	3.7	4.6	4.9	3.5
Single window for international trade	2.6	4.1	2.6	2.1	1.8	2.2

Source: Own elaboration.

3.2. Business and finance

To study the level of availability of digital business tools and the financial system, the following areas of digitalization of the economy were selected. Since fast and timely analysis of large volumes of data is necessary for making optimal management decisions, the Processed information must be presented conveniently. Automated systems for all business processes play an essential role. In turn, for the convenience of customers, a wide range of electronic systems is needed to provide customers with all the information they are interested in. Electronic banking and payment systems are necessary for the convenience of making transactions. Investments also require digital support, carried out through functioning digital investment platforms. Electronic risk management systems are needed for the stability of the economy. For all these areas, respondents indexed the levels of availability of these digital tools, and the results are presented in Table 5.

Table 5. Results in business and finance

Indicators, tools	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Automated systems for all business processes	4	4.8	4.4	2.6	3.9	4.2
Electron Customer Relationship Systems	2.1	2.6	2.2	0.7	1.3	3.9
Electronic banking, payment systems	4.2	3.9	3.4	4.6	4.2	4.7
Investment platforms	1.6	1.8	2.1	0.3	1.4	2.3
Electronic risk management systems	1.8	2.2	1.7	0.9	1.8	2.6

Source: Own elaboration.

3.3. Digital state

In addition to the functioning of digital systems in the economic sector, digitalisation in the public administration sector is significant since information and documentary support for business is critical. To identify the state's readiness for administrative support for business, such areas as electronic consulting systems, including taxation issues, electronic registers of property and income, mobile applications such as "Diya", and the work of administrative service centers were studied. The results of the respondents' indexing of these areas of digitalization of public services are presented in Table 6.

Table 6. Results of digital state

Indicators, tools	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Electronic consultation system, including tax consultations	3.5	3.7	3.3	2.4	3.8	4.1
Electronic registers of property and income	4.6	4.6	4.5	4.1	4.9	4.8
Mobile applications, such as "Diya"	4.6	4.3	4.4	4.8	4.7	4.9
Administrative Service Provision Centers	4.3	4.2	4.1	3.7	4.8	4.7

Source: Own elaboration.

3.4. Problems and prospects

Since the study, in addition to the constant current state in the field of digitalisation of the fiscal service, is aimed at obtaining information on the possibilities of further development of digital transformations in the economy of Ukraine, it is necessary to study problematic issues and prospects. The respondents presented the following as the main troublesome issues for indexing: the low level of digital competencies of users of the digital economy and digital state services and risks caused by the low level of cybersecurity. The following are promising indicators: reducing bureaucracy in relations between business and the state and transformations in all financial sectors. The indexing results for these areas are presented in Table 7.

Table 7. Results in problems and perspectives

Indicators, tools	Total	Entrepreneurs	Taxpayers	Students	State and local government officials	Tax and customs officials
Insufficient digital literacy among potential users of digital services	2.9	2.4	3.1	4.7	2.6	1.6
Risks caused by poor cybersecurity	4	4.2	4.8	3.6	4.4	3.1
Reducing bureaucracy in the interaction between business and government	4.2	4.6	4.9	4.5	3.1	3.9
Transparency of all financial flows	3.4	4.1	3.6	3.3	2.4	3.7

Source: Own elaboration.

3.5. Results of processing respondents' wishes in the field of digitalisation of the economy

Of the 12,749 respondents, 3,671 (28.8%) wished to leave comments. The following results were obtained when summarising the responses.

273 respondents believe the number of mobile applications for obtaining information on taxes and customs regulations must increase. A mock-up of the application's functionality was presented, and the request was proposed to be formed as a set from a list of words. 284 respondents believe that it is necessary to improve the operation of the electronic cash register system. 196 respondents suggest transferring businesses from the single

tax system to the general taxation system with simplified electronic accounting. 389 respondents see the need to expand the capabilities of payment systems and increase the scope of cryptocurrency applications. 673 respondents see the need to increase the security of the data available on the Diya portal and suggest significantly increasing the functionality of this portal if the level of cybersecurity is increased. 317 respondents are interested in expanding investment opportunities by participating in remote exchange trading and other investment projects, which can be consolidated on one portal. 485 respondents suggest increasing the capacity of administrative service centers, including outside Ukraine, for citizens currently outside Ukraine. 637 respondents believe that electronic digital signatures are currently poorly used. However, their scope of application can be significantly expanded, which will remove a number of bureaucratic problems and help expand remote forms of cooperation. 417 respondents suggest other opportunities for improving the digitalization of the economy. However, they are either less significant or insignificant than those presented in the sample.

Innovative technologies in fiscal policy are key both in the system of tax and customs authorities and in the digital transformation of the Ukrainian economy. They play an essential role in forming a digital state in Ukraine. Existing tools and innovative technologies that have already been implemented help to increase the transparency of public finances, fight corruption, and improve administration in the system of taxes and fees. And in the system of distribution of budget funds. Simplifying interactions between the state and business stimulates economic growth and motivates the formation of innovative solutions in all sectors of the economy.

The study obtained the results of the significance levels of innovative tools and indicators for different categories of users of modern digital products in the field of fiscal policy of Ukraine in four distinct areas—the first area of the study aimed at studying budgetary and tax policy tools. Two tools received high-level indices. The highest score (4.1) was obtained in automated communications with clients on issues of providing consultations in the field of fiscal policy; the results for the unified register of tax invoices were rated slightly lower (3.8). The remaining tools were indexed at a sufficient level. It should be noted that students indexed the automatic VAT refund system at a low level (0.8), which indicates the need to introduce theoretical and practical classes on the automatic VAT refund system into their special training programs.

The digitalization of business and finance is indexed lower than in other areas. Indexing of digital business and finance tools is heterogeneous. Thus, electronic banking and payment systems have high indexation (4.2) and automated systems for managing all business processes (4). The remaining instruments received average indexes. The lowest index was obtained by investment platforms (1.6) since all groups of respondents noted low indexation of the work in this area of digital tools, and the highest index was received by this instrument by employees of the tax and customs authorities (2.3), who, due to their professional duties, regularly familiarise themselves with various instruments of the digital economy. Also, at an average level, investment instruments were indexed by taxpayers (2.1) and entrepreneurs (1.8). Investment platforms received low indexation among state administration employees, local government bodies (1.4), and students (0.3). Such low indicators for investment platforms indicate a low level of skills that allow ordinary citizens to use investment instruments, making the system of small private investments inaccessible, which is the basis for the success of modern developed economies. Electronic customer interaction systems are also indexed at an average level (2.1). They are indexed lowest by young people (0.7) and government employees (1.3), which may indicate, on the one hand, that students do not identify electronic customer relationship systems as a tool since their skills in working with such platforms are often high. They do not attach importance to this, and government employees are often representatives of the older generation who do not have the skills as consumers working with these tools.

Electronic risk analysis systems also received an average index (1.8). Students' low indexation of these systems (0.9) indicates the need to introduce them into educational programs. The average scores of most respondent groups indicate a low professional level in the field of risk prevention through the use of relevant electronic systems and motivation to organize the study of the operation of these systems in the field of adult education. Risk prevention is the basis for the stability of the economy. Therefore, the issue of improving the skills in working with these electronic systems must be approached from the point of view of the desire to stabilize the economy.

The best indexation was obtained in the direction of digital state development (4.3). Such tools as electronic property and income registers (4.6), mobile applications such as "Diya" (4.6), and the work of administrative service centers (4.3) were highly rated by all groups of respondents. The tools of electronic consulting systems, including those providing tax consulting services (3.6), were indexed at a sufficient level. Only employees of

tax and customs authorities rated the work of these services at a high level (4.1). For other groups of respondents, it was an average (for students 2.4) and sufficient (for entrepreneurs 3.7, for taxpayers 3.3, for employees of state administration and local government 3.8) level of indexation of the efficiency of this system.

When considering the indexation of problems and prospects for the development of digital instruments in the Ukrainian economy under the influence of innovative solutions implemented in the field of fiscal policy, the highest index was obtained for the prospect of eliminating bureaucratic problems in relations between government and business (4.2). Most categories of respondents indexed this prospect at a high level, except for employees of public administration and local government (3.1), which means skepticism on their part regarding the prospects for the development of digital state instruments. The risk in the field of cybersecurity was also indexed at a high level (4), and employees of tax and customs authorities consider this risk to be the least significant (3.1), which means their awareness of the security of the digital instruments of fiscal policy at their disposal.

The prospect of digitalization of all areas of financial activity was indexed at a sufficient level (3.4), and entrepreneurs (4.1) and taxpayers (3.6) highly evaluate this prospect, employees of fiscal authorities (3.7), and students (3.3) assess it at a sufficient level. Employees of the state apparatus and local governments are more skeptical and index the prospect of digitalization of all areas of financial activity at an average level (2.4). The problem of the level of digital skills of users of digital services received the lowest indexation (2.9). Students are the most optimistic in this area (4.7), and employees of tax and customs authorities are the least confident in eliminating this problem (1.6). The problem of disproportion in the digital skills of users of digital tools remains very relevant. Still, its solution requires a systematic approach since, at present, there is a huge disproportion in the digital skills of not only representatives of different generations but also between representatives of different segments of the population in terms of the availability of digital tools for their study and use. Since previously conducted studies did not provide results in measurable quantities, it isn't easy to compare them. The study showed unique quantifiable results that can be used to create a network of consultation points for fiscal sphere employees.

The comments received from the survey participants indicate that less than a third of respondents show deep interest in the processes taking place in the digitalization of the economy. However, when analyzing the responses received, it was revealed that respondents not only consider the prospects of digitalization itself but also see ways to improve the system of economic interactions between the state and business using digital means. The conducted research was limited by the respondents' choice since the list of respondents was determined in each institution directly by the head, which could affect the results. To expand these limitations, it is possible to conduct a repeated study for the entire contingent of those responsible for direct communications with fiscal payment payers. Among the proposals presented are recommendations on the functionality of hardware and software for digitalization processes, proposals for changes in the system of taxation and accounting of financial results of commercial activities, and recommendations for improving the system of interaction between the state and citizens. In general, the recommendations received from respondents can be considered in the strategic planning of government bodies' activities in digitalizing the economy.

4. Conclusions

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and discussion section.

The digitalization of fiscal authorities in Ukraine has become a key driver of economic development, increasing the country's competitiveness and, therefore, developing the digitalization of the economy as a whole. Digital tools allow for a transparent dialogue between business and the state, automate routine processes, and reduce the risk of untimely receipt of information.

Based on the study's results, problems in the field of special education of students of higher educational institutions studying in economic specialties are outlined, and prospects for expanding the level of digital skills of the older population and specialists in various fields are considered. Respondents' proposals for developing Ukraine's digital economy are also studied.

Based on the study's results, respondents index digitalization in the tax and customs spheres at a sufficient level (3.3), in the sphere of business and finance at an adequate level (2.8), and in the sphere of digitalization of the state and prospects at a high level (4.3 and 3.6, respectively).

The digitalization of business and finance in Ukraine is not a fashionable trend but a strategic necessity. The integration of digital tools helps to increase the efficiency of all sectors of the economy. It gives hope for high development rates of the Ukrainian economy both during and after the war. However, to achieve a high level of digitalization, a systemic approach is needed, including effective instruments of state regulation, changes in the higher and postgraduate education system, and infrastructure improvement.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

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