Assessment of scenarios for the development of the digital economy in Ukraine

Roman Gren[*]

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Abstract. This article is dedicated to the development of the digital economy as a key factor in ensuring a country's innovation security. The article discusses the development of a scenario approach to the development of the digital economy, which involves the following stages: identifying key factors in the development of the digital economy, their interdependence, and possible development options; identifying possible development scenarios depending on changes in key factors; forming the main scenarios for the development of the digital economy and conducting their analysis.

When identifying possible scenarios for development, two key factors were highlighted: «business interest in the implementation of digital technologies and readiness to invest in digital transformation» and «state policy in supporting the digital economy». A «scenario grid» was constructed that involves combining different variants of the combination of these factors. Four possible scenarios for the development of the digital economy in Ukraine were formulated: optimistic (active state participation in promoting the spread of digital technologies), conservative (state funding for fundamental research and business funding for digital technologies), moderately optimistic (business actively investing in digital technologies, and the state not playing a decisive role), and pessimistic (the state minimizes its role in promoting the development of the digital economy, and businesses finance the production of traditional products).

The post-war recovery of Ukraine's economy should be based on the development of the innovation sector and the spread of digital technologies. In the absence of a strategy for ensuring innovation security based on the development of the digital economy, there is a high probability of implementing a conservative scenario for the development of the digital economy.

Keywords: digital economy, scenario approach, cross-scenarios, scenarios of the development of the digital economy.

[*] candidate of educational and scientific degree «Doctor of Philosophy», Lviv State University of Internal Affairs, Ukraine

INTRODUCTION

The world today is on the threshold of a completely new technological paradigm and socio-economic reality. New technologies create opportunities in economic, social, energy, medical, and other spheres. The transition to a new model of society is a positive phenomenon, but the particularity of today's transition lies in the rapid pace of change. Under these conditions, to ensure sustainable economic growth, countries must create a technological, political, and economic foundation.

The change of technological paradigms creates many opportunities, especially for countries with a low level of economic development. With the timely choice of the right vector for further development, the country will gain advantages through the implementation of technological and digital innovations that will gradually develop, improve, and spread to all sectors of the economy. Under these conditions, the transition to a new model of economic development based on the use of digital technologies and human intellectual potential is the only opportunity for Ukraine to occupy a worthy place in the global economy.

RESULTS

One of the main threats to the economic security of Ukraine is the slow development of the digital economy. Addressing this issue is extremely important for the recovery, development, and increased competitiveness of the economy, as well as for ensuring its adequate level of security. This is due to the need to increase the share of innovative products in the domestic and exported markets, to transition from raw material to high-tech production, and to reduce dependence on global technologies and developments.

However, the development of the digital economy is a complex process influenced by many factors and conditions. Therefore, a scenario-based approach is necessary to forecast its development. This means considering different possible scenarios while taking into account the current state of the domestic and global economy. Only such an approach will enable successful development of the digital economy without chaos and impetuosity.

Michael Porter emphasized that using scenarios allows companies to avoid unfounded and limited forecasts of the future (Porter M., 2016). David Aaker considers scenario analysis as one of the methods for analyzing a complex environment, which consists of many interconnected trends and events (Aaker D.A.,2005). Francis Van Noten defines a scenario as a hypothetical sequence of possible events that reflects causal relationships between these events and possible points of intervention that can change the course and trajectory of the development of the entire system or its individual components (Van Notten Ph., 2006).

The development of scenarios is an intermediate step between intuitive analysis and forecast development, which allows identifying potential risks and developing several possible event development options. Unlike a forecast, which predicts the exact development of events under conditions of unchanged circumstances, a scenario approach allows for a high degree of uncertainty in event development. The scenario is most effective in the medium- and long-term perspective. The main goal of scenario development is to interpret current actions in the context of future events, develop actions that neutralize negative factors and avoid risks, as well as predict strategies of interested parties.

The scenario approach to the development of the digital economy involves the implementation of sequential stages:

1. Identification of key factors in the development of the digital economy, their interdependence, and possible development options. Among the main factors influencing the development of the digital economy, it is worth highlighting the level of technological development, education and knowledge, the readiness of the country to implement digital technologies, and investments (capital). In the context of shaping the digital economy in Ukraine, it is possible to mention factors that

have the greatest impact, such as the innovation activity of enterprises and funding for scientific research and development.

2. Determination of possible development scenarios depending on possible changes in key factors. The digital economy cannot be separated from the real economy, and there will come a time when the development of the digital economy will be key to further restoring the Ukrainian economy, regardless of the losses suffered during the war. The conditions of uncertainty and resource constraints in predicting the development of the digital economy in Ukraine require the use of a scenario approach. The formation of scenarios for the development of the digital economy in Ukraine will be influenced by the degree of state support, the volume of foreign direct investment, the conditions and volumes of transfer of foreign digital technologies, the interest of businesses in implementing digital tools and business models, and the state of scientific research. Under such conditions, the main «agents of influence» on the development of the digital economy can be identified as the government, domestic economic entities, foreign investors, and the population (Fig. 1). Depending on the combination of these factors, different scenarios of digital transformation of the economy may arise.

3. Developing main scenarios for the development of the digital economy and conducting their analysis. Some authors before the war identified two main scenarios for the development of the digital economy: inertial and targeted (forced) (Glibka S.V., Strizhkova A.V., 2019). The inertial scenario involves the absence of measures to accelerate digital transformation. According to this scenario, the Ukrainian economy will continue to be resource-based, labor migration and «brain drain» will continue, and Ukrainian products will be uncompetitive in the global market. The targeted (forced) scenario involves active development of the digital economy, creating conditions for the development of people's potential, and increasing the share of the digital economy in GDP up to 65%.

Ukrainian legislation has identified digital technologies as a key factor for further economic development, reflected in the «Concept for the Development of Ukraine's Digital Economy and Society for 2018-2020». This regulatory document proposes an accelerated scenario for digital development, which involves stimulating demand for the use and implementation of digital technologies.

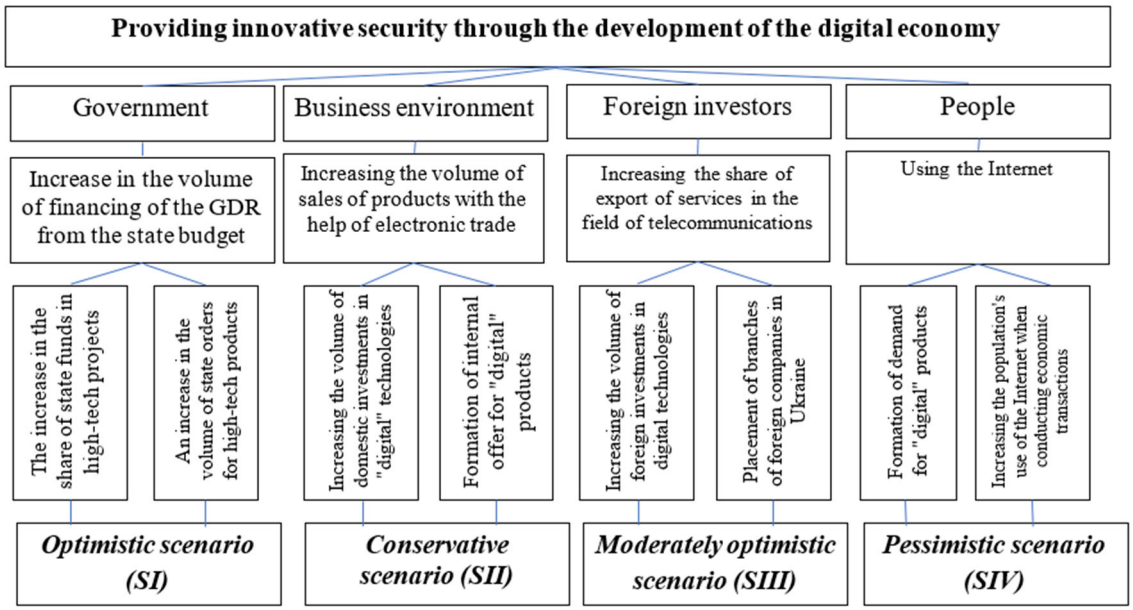

Fig. 1. Hierarchical model of scenario forecasting of the development of the digital economy

Source: compiled by the author

The state uses indirect methods to stimulate citizens and businesses to implement digital technologies, which are more efficient, qualitative, fast, and cheaper. This is achieved by creating accessible digital infrastructures. The concept proposes the implementation of an accelerated scenario through the following measures: elimination of legislative, institutional, fiscal, and other barriers that hinder the development of the digital economy; implementation of incentives and motivations to encourage businesses and industries in the economy as a whole towards digitization; creation of demand and formation of needs among citizens for digitization, including through large-scale digital transformation projects implemented by the state based on public-private partnership models; creation and development of digital infrastructures that will serve as the basis for using the advantages of the digital world in everyday life and as a platform for achieving overall economic efficiency; development and improvement of digital competencies among citizens to ensure their readiness to use digital opportunities and overcome associated risks; development of digital entrepreneurship, creation of appropriate (including analog) infrastructures to support and develop innovative activities, implementation of funding mechanisms, incentives, and support.

To develop scenarios for the development of the digital economy, we will use a method developed by M. Lindgren and H. Bandhold, which involves identifying two key uncertainties that have the greatest impact, and their combinations to create a «scenario cross» and determine four possible scenarios (Lyndgren M., Bandxold X., 2009). For the development of the digital economy, we have identified two key uncertainties: «Interest of business in adopting digital technologies and willingness to invest in digital transformation» and «Government policy to support the digital economy». The combination of these conditions allows us to form four different scenarios for the development of the digital economy (see Fig. 2).

According to the level of government support for the development of the digital economy and business interest in investing in digital transformation, the following scenarios for the development of the digital economy can be outlined:

S_I (optimistic) – this scenario involves active participation of the state in promoting the spread of digital technologies, funding large-scale projects with state funds, creating conditions for the use of digital technologies by businesses and citizens;

S_{II} (conservative) – this scenario involves the state financing fundamental research and promoting the involvement of businesses and citizens in the digital economy. Businesses cautiously invest in digital technologies and prefer projects with a short payback period when implementing this scenario.

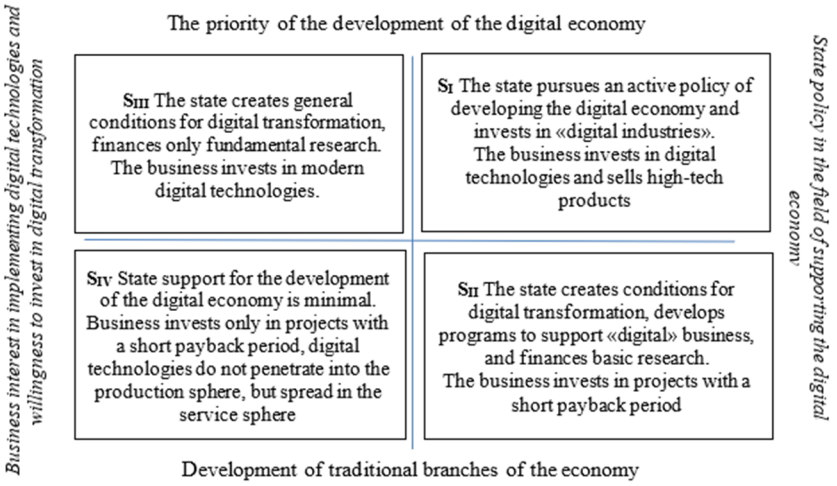

Fig. 1. Matrix of strategic alternatives for the development of the digital economy

Source: compiled by the author

S_{III} (moderately optimistic) – in this scenario, businesses respond to the growing demand for digital products and actively invest in digital technologies. The state does not play a decisive role and limits its participation to the adoption of regulatory acts that promote digital transformation. Funding for fundamental research and development is provided through state funds.

S_{IV} (pessimistic) – in this scenario, the state minimizes its role in promoting the development of the digital economy and only funds projects that have important strategic significance. Businesses are more interested in producing traditional products and do not want to invest in digital technologies.

Table 1

A brief description of the scenarios of the development of the digital economy and their impact on the level of innovative security

Scenario	Impact on innovative safety
S_I (optimistic)	Increasing the level of innovation security through the growth of enterprise innovation activity, the Digital Economy Development Index, the implementation of digital technologies, and the growth of domestic demand for «digital» products.
S_{II} (conservative)	The implementation of the SII strategy will not significantly affect the level of innovation security, nor will it promote an increase in innovation activity and the growth of the share of «digital» products in exports.
S_{III} (moderately optimistic)	Moderate improvement of innovation security is limited by weak government support for digitalization. The positive impact on the level of innovation security is exerted by the increase in the volume of «digital» products sales driven by consumer demand pressure.
S_{IV} (pessimistic)	This poses a real threat to innovation security. Implementation of this scenario will contribute to Ukraine's lag behind global leaders and its transformation into their raw material supplier.

Source: compiled by the author

When considering scenarios for the development of the digital economy, it is important to note that the optimistic scenario involves significant government support in the form of regulatory framework, incentives, and economic assistance, as well as the involvement of domestic and foreign business structures. This will promote an increase in the share of «digital» products in the GDP and the export of Ukrainian goods and services, the establishment of cooperation between the state and business environment, the creation of innovation clusters and scientific parks. However, the implementation of this scenario requires significant financial costs, including extensive government funding and investment from the entrepreneurial sector. Despite this, the optimistic scenario for the development of the digital economy can have a positive impact on demand for domestic «digital» products and services, active development of Ukrainian science, the creation of demand for scientific and engineering personnel, which in turn can help Ukraine take a worthy place in the global «digital» market and increase the level of innovation security of the state. It should be noted that in modern Ukrainian conditions, the implementation of this scenario is quite difficult.

The Conservative scenario for the development of the digital economy predicts that the low level of innovation activity among domestic enterprises, the insignificant impact of digital production on GDP formation, and the satisfaction of population demand for «digital» products through the import of technologies and inertia-driven import-oriented technological development will continue. Under this scenario, the state will only finance individual fundamental scientific research and development, while

business structures will invest in high-yield projects with a short payback period. However, the implementation of this scenario may lead to further weakening of the national innovation system, the use of foreign «digital» technologies and equipment, which puts the domestic economy in dependence and transforms Ukraine into a raw material appendage. The realization of this scenario will maintain the lag in the development of the digital economy and may lead to brain drain, which will significantly worsen the level of innovation security.

The moderately optimistic scenario for the development of the digital economy involves the creation of a «receiving economy» where domestic investors will invest in foreign technologies and modernize them for use in the domestic market. Foreign investors will also invest in the Ukrainian economy and create their own enterprises. However, the concentration of efforts will remain on a limited number of directions, and funding will be mainly provided by the business sector. The government will only finance certain fundamental research. Implementation of this scenario will contribute to an increase in the share of the digital economy in GDP and exports, but will not create a basis for the development of domestic «digital» innovations, as it will be based on the use of foreign technologies.

The pessimistic scenario for the development of the digital economy involves a reduction in government funding for research and development, and businesses investing money only in projects with quick returns. In this case, Ukrainian specialists will continue to serve foreign companies, providing them with information and consulting services, but without the possibility of developing their own technologies. The government and businesses will not have enough funds to finance developments and research. This will lead to a significant weakening of the national innovation system, an increase in dependence on raw materials and an inevitable lag behind global leaders.

The scenario that will be implemented depends on the active role of the state. It is the state that should become the initiator of innovative changes. If a strategy for ensuring innovation security based on the development of the digital economy is not developed and implemented, there is a high probability that a conservative scenario will be implemented.

CONCLUSIONS

Post-war economic recovery in Ukraine should be based on the implementation of advanced digital technologies. The development of a digital economy is extremely important for the recovery, growth, and ensuring an adequate level of economic security. Undoubtedly, the development of a digital economy is a complex process influenced by many factors and conditions. To assess the likelihood of developments, a scenario approach should be used. The scenario approach is one of the ways of analyzing a problem, which involves considering various possible variants of events. Scenarios allow us to evaluate how to influence processes that lead to acceptable and unacceptable results. The use of scenarios reveals diverse options for the development of events, taking into account the current state of the economy. The scenario approach will ensure the successful development of the digital economy without chaos and recklessness.

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