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THE IMPACT OF DIGITALIZATION ON ENSURING ECONOMIC GROWTH

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Abstract
Digitalization of the economy and society of countries creates new opportunities for sustainable socioeconomic development. The level and directions of the impact of digitalization on economic growth require assessment and determination of national differences that is the aim of the given study. The paper reveals the peculiarities of the international experience of tracking the impact of digitalization on economic growth and sustainable economic development. Based on the approbation of the authors' methodology, the study determines the quantitative measures and assesses the impact of digitalization on sustainable economic growth at the national level. The authors have developed forecast scenarios for the digital sector development to achieve the targets of economic growth contained in the development strategies of Ukraine until 2030.

Keywords: *Digital economy, digitalization, digital sector, economic growth, projections.*
JEL Codes: *F62, F63, O11, O33.*

Introduction

The intensive development of digitalization is accompanied by the transformation of the whole socioeconomic system and causes the growth of new economic opportunities. Research on the formation and development of the digital economy, stages, levels, and consequences of its implementation are popular. They are analysed and discussed during scientific debates and in publications. Definitions of basic theoretical positions and concepts of the digital economy are covered in the articles of V.I. Liashenko, O.S. Vyshnevskyi (Liashenko & Vyshnevskyi, 2018), V.P. Vyshnevskyi, S.I. Kniazev (Vyshnevskyi et al., 2020). Research papers of Bukht R., Heeks R. (Bukht & Heeks, 2018), Hulyi I.M. (Hulyi, 2019), Aptekman A. (Aptekman et al., n.d.), Koliadenko S.V. (Koliadenko, 2016), Khandii O.O. (Khandii & Shamileva, 2019), Morhachov I.V. (Morhachov et al.,2021) and other researchers reveal the problems of classification and determination of levels and stages of digitalization. Works of international expert centres (Huawei Global.,2018; Overview of the World …, n.d.) and scientists (Liashenko & Vyshnevskyi, 2018; Hulyi, 2019; Kovtoniuk, 2017; Golovenchik, 2019; Didenko, Skripnyuk & Kobyilinskiy, 2020) present

methodical approaches to assessing the level of digitalization and its impact on economic development.

The formation of strategies for the development of the digital economy, the determination and development of mechanisms for their implementation need to monitor digitalization directly at the national level, to develop methods for assessing the achieved level and analysing the possible consequences of its implementation. Being an objective process, digitalization not only provides accelerated economic growth but also improves its quality aspects. An objective assessment of its levels and scope determining the degree of its impact on economic growth ensures the timely development of mechanisms and measures to prevent possible risks and negative consequences of digital transformations.

Ukraine lacks a model and methodology for assessing the economic impact of ICT on any industry and sphere of life. Official statistics does not determine the size of the digital economy; does not calculate the share of the digital economy in the country's GDP. Only the digital economy in the narrow sense (information and computer services) is taken into consideration, which limits the ability to track its main trends. Given that the digital economy causes transformational changes in the functioning of the national economy and society, the relevance of the study of the quantitative impact of digitalization on sustainable economic growth is increasing.

The study aims to assess the impact of digitalization on sustainable economic development by the authors' methodology to determine the prospects for economic growth during the development of digitalization.

The study target is digitalization of the economy and society; *the study subject* is the impact of digitalization on sustainable economic development taking into account the national peculiarities of the country.

Research methods include

- statistical methods of analysis (analytical grouping of countries by the GCI ranking and GDP per capita in 2018, determination of special statistical indicators of the measures of relationship) used to determine the relationship between digitalization levels and macroeconomic indicators of economic growth;
- economic and statistical used to assess the sensitivity of the growth rate of the national economy of the studied countries to the growth rate of their digital economy during 2010-2016;
- expert assessments, generalization of research papers as well as the international practice of determining the relationship between digitalization and economic growth to determine and systematize the main directions of the impact of digitalization on sustainable economic development;
- economic and statistical, economic and mathematical modelling used to assess the impact of digitalization on sustainable economic growth during 2012-2020.

Research results

International experience in tracking the impact of digitalization on economic growth and development. Every country carefully monitors the processes in the economy that determine its economic development and growth. The world's leading analytics companies acknowledge the digital economy to be a factor of global economic growth. Thus, according to the global McKinsey Institute, about 22% of China's GDP growth in 2025 will be provided by the Internet technology, and in the US, it can reach 10% due to the implementation of digital technology (Aptekman et al, n.d.; Golovenchik, 2019). According to expert estimates (Hulyi, 2019), the global GDP growth provided by the use of new digital technology will be from 0.4% to 0.9% annually from 2015 to 2025. The discrepancy in determining and assessing the impact of the digital economy is primarily due to the nature and the essence of the 'digital economy' as a category. Thus, its size by different assessments varies significantly from 4.5% to 15% of the global GDP during 2017-2018, with almost 40% of gross value added generated in the global ICT sector accounted for the United States and China. Countries

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showing significant progress in digitalization

These conclusions are confirmed by the analysis and assessment of the impact of digitalization on GDP change in some countries.

The impact of digitalization on economic growth is quite uneven. There are significant differences between countries in the ratio of digitalization and economic growth. Thus, when measuring the closeness of the relationship between GDP and the ranks of some countries in the Global Connectivity Index (GCI) ranking based on the correlation coefficient, its value of 0.2% does not meet the criteria of statistical reliability. Under these conditions, we can conclude that the relationship between the levels of digitalization and economic growth is absent (Huawei Global.., 2018). However, the determined degree of impact at the level of digitalization of homogeneous countries does not confirm the given conclusion as for the absence of the relationship.

also have higher rates of economic growth.

The assessment of the impact of digitalization on GDP change should be based on the grouping of countries into homogeneous groups, namely, starters, adopters, and frontrunners[1]. Based to the given grouping of countries according to the ratio between the countries' ranking on the GCI scale and GDP per capita, an analytical grouping is developed, which confirms not only the direct relationship but also the quantitative measure of the latter (Table 1).

[1] The presented qualitative grouping is used in the GCI calculation and research (Huawei Global., 2018).

Table 1. Analytical grouping of countries by GCI ranking and GDP per capita in 2018*

Groups of countries by GCI ranking	**Scale interval**	**Ranking average (x_i)**	**Average GDP per capita, USD (y_i)**	**Measure of relationship** $b_i = \frac{y_1 - y_{i-1}}{x_i - x_{i-1}}$, **USD**
Starters	25-34	29.5	3700.0	-
Adopters	35-55	45.0	16300.0	812.9
Frontrunners	56-85	70.5	54100.0	1482.4
On average	-	-	-	1229.3

** Developed by the authors based on the data on the grouping of countries by the ratio of the GCI ranking and GDP given in (Huawei Global., 2018).*

The indicators of the measure of the relationship (b_i) characterize GDP growth per unit of the ranking change and show that the higher ranking level provides greater efficiency of the return from digitalization. Thus, when the country moves to the second group, i.e., with the index growth from 25-34 to 35-55, each unit of the index growth is accompanied by an increase in GDP per capita by an average of 813 USD. At the same time, with the country's transition to the third group of frontrunners, i.e., with the growth of the digitalization index up to 56-85 points, GDP growth is 1482.4 USD. This index is 1229.3 dollars on average for all countries, i.e., each unit of the ranking growth is accompanied by an increase in GDP per capita by 1229.3 USD. These estimates confirm the existence of a direct accelerated relationship between the level of digitalization of the economy and macroeconomic indicators of economic growth.

The grouping of countries is directly dependent and based on the contrasted relevant indicators in 2019. The improvement of the country's position in the GCI ranking leads to an increase in nominal GDP per capita (Huawei Global., 2019).

According to the Global Connectivity Index (GCI) ranking Ukraine took the 50th place out of 79 countries with an index level of 41 in 2018, and in 2019 the index level was 44, i.e. it increased by 3 points. Given the gradation of the grouping scale (table 1), it belongs to adopters. Based on the determined direct dependence, a one-year growth of the (GCI) index by 3 points results in GDP growth per capita by 565.8 USD.

These conclusions are confirmed by elasticity coefficients, which are calculated by the ratio of the average annual growth rates of national economies during 2010-2016 and the digital economy (Table 2). The presented calculations for all countries, on the set of which the coefficients are determined, show that there is a direct relationship between the indicators, i.e., the growth of the digital economy leads to the growth of the overall economy. The average value of the elasticity coefficient at the level of 0.6 indicates that each percent of the growth of the digital economy provides the growth of the national economy by 0.6 percent on average in the countries (The G20).

Table 2. The impact of the digital economy on economic development in the G-20*

Countries	**Average annual growth rates during 2010-2016**		**Elasticity coefficient, %**
	GDP per capita, %	**ICT development index, %**	
Great Britain	2.1	12.6	0.17
Republic of Korea	3.0	8.0	0.375
China	7.7	6.9	1.12
India	6.9	5.6	1.23
Japan	1.1	5.6	0.2
USA	2.1	5.4	0.39

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Mexico	2.9	4.2	0.69
Germany	1.7	4.0	0.43
Australia	2.7	3.7	0.73
Canada	2.1	3.6	0.58
Italy	-0.3	3.5	-0.09
France	1.0	3.4	0.29
Argentina	0.9	3.3	0.27
Russia	1.3	2.8	0.52
South Africa	1.9	2.5	0.76
Brazil	0.4	2.5	0.16
Turkey	6.5	2.3	2.8
Indonesia	5.4	1.5	3.6
On average	2.7	4.5	0.6
Ukraine during 2013-2019**	0.336	2.42	0.14

**Calculated by the authors based on the initial data on the average growth rate given in (Huly, 2019).*
***Calculated by the authors based on the original data given in (Pysarenko et al., 2019).*

However, there is a significant unevenness in this relationship, which has developed across some countries. Thus, in four countries that have developed most intensively over seven years (Indonesia, Turkey, China, and India), there is even ultraelasticity, i.e., economic growth is ahead of the corresponding indicators of the digital economy. In particular, in Indonesia $K_{el.} = 3.6$ shows that each percent of the growth of the digital economy causes growth of the overall economy by 3.6 %. Quite a low level of elasticity is observed in Brazil ($K_{el.} = 0.16$), and Great Britain ($K_{el.} = 0.17$). The exception is Italy, which has developed an inverse relationship over the years with $K_{el.} = -0.09$. Going beyond a detailed analysis of the reasons for this relationship and its differentiation by country, we can say that digitalization is indeed an effective factor in economic growth, and its impact is quite uneven depending on its level.

The successful experience of Sweden, South Korea, Estonia, Ireland, and Israel shows that the impact of the country's integrated digitalization is about 20% of GDP growth over five years.

Determining the impact of digitalization on economic development at the national level. According to the results of targeted research and expert assessments, generalization of research papers, as well as the international practice of determining the relationship between digitalization and economic growth, we have determined and systematized the main directions of the impact of digitalization on sustainable economic development and economic growth. The most important are

- expanding the productive potential of national economies;
- change in demand for factors of production, a transformation of the whole structure of the national economy to ensure modern R&D;
- modification of all sectors of the economy with digitalization, which provides a high rate of contribution of the capital to value added;
- increasing the investment attractiveness and investment efficiency of the national economy by increasing the return on investment;
- the spread of the digital economy, which serves as a tool for increasing productivity and competitiveness;
- increasing the competitiveness of business by facilitating access to global markets for resources, goods, and services;

- digital transformation of the industry focused on creating integrated connections between machines and people provides additional opportunities for economic growth;
- significant transformations of the labour market, training system, creation of information workplaces and digital assets;
- creating conditions for sustainable development of individual regions during the transition to new technological and economic systems;
- comprehensive cooperation of economic entities based on the end-to-end digital processes and the development of digital assets;
- digital transformation of markets for goods and services, financial and labour markets.

To determine the impact of digitalization on sustainable economic growth, various methods can be used, namely, methods of economic and statistical, economic and mathematical modelling, statistical methods, expert assessments.

The authors' methodology for assessing the impact of the digital economy on sustainable economic growth includes the following approaches:

1. Determining the impact of digitalization on sustainable economic growth based on the elasticity coefficients of GDP growth depending on the change in GVA of the digital sector without taking into account the time lag of the impact of digitalization on changes in economic growth and taking into account a one-year lag.
2. Determining the impact of digitalization on economic growth based on econometric models, in particular, regression models of the relationship without and with taking into account the lag of the impact of digitalization on the change in economic growth.

Table 3 presents the results of calculations according to the first approach.

Table 3. Change in GDP, GVA by types of activity of the digital sector and the elasticity coefficients during 2012-2020

Year	GDP at actual prices		GVA by types of economic activity (TEA) of the digital sector (DS) at actual prices		Elasticity coefficients of change in GDP depending on the change in TEA of DS ($K_{el.GDP./GVA}$)	
	Bln UAH	in % to the previous year	Bln UAH	in % to the previous year	in the given period	with a one-year lag
	1	2	3	4	5	6
2012	1404.67	108.04	43.2	112.5	0.643	-
2013	1465.2	104.3	50.73	117.4	0.25	0.344
2014	1586.92	108.3	55.24	108.9	0.93	0.48
2015	1988.5	125.3	60.24	109.1	2.78	2.8
2016	2385.4	120.0	82.96	137.7	0.53	2.2
2017	2983.9	125.1	106.7	128.6	0.88	0.67
2018	3560.6	119.4	129.7	121.6	0.9	0.68
2019	3978.4	111.7	151.1	116.5	0.71	0.54
2020	4194.1	105.4	208.43	137.9	0.142	0.33
On average during 2012-2020.	-	114.65	-	121.74	0.674	-
On average during 2013-2020 taking into account the delay lag	-	116.2	-	119.6	-	0.827

According to the above calculations, we can confirm the hypothesis of the need to take into account the delay lag of the impact of digitalization on economic growth. The average annual elasticity coefficient with the lag is 0.827, which is 0.153 c.p. (coefficient

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points) higher than without the delay. On average, during 2013-2020, each percent of the annual increase in GVA (gross value added) of the DS (digital sector) is accompanied by GDP growth of 0.827% the following year. The values of the elasticity coefficients confirm the existence of a direct relationship between economic growth and the output of goods and services in the digital sector of the economy. However, it should be noted that the strength of this relationship is quite uneven during some periods (Table 3). If the elasticity of GDP growth was increasing significantly by 2016, then there was a reverse trend during 2017-2020. Within these three years, the coefficient of elasticity has halved.

Thus, a fairly high level of elasticity or ultraelasticity is developed in 2015. In our opinion, this is mainly due to the mismatch in the time of price changes, as output figures are given in actual prices because of objective reasons. At the same time, the significant decrease in the elasticity coefficient in 2020 was mainly related to the slowdown in economic growth, because of the effects of the lockdown in 2020 due to the COVID-19 pandemic. Despite some uneven fluctuations in the elasticity coefficients, their change corresponds to the patterns of change in economic growth and GVA of DS, which confirms the hypothesis of the existence and objectivity of a direct relationship between them.

The second approach to determining the impact of digitalization on the economic growth of the authors' methodology is based on the development of econometric models, in particular regression models of the relationship. With two initial hypotheses without and with taking into account the delay lag of the impact of digitalization on the change in economic growth, we have calculated two power regression models, the parameters of which measure the relationship between GDP and the output of goods and services in the digital sector (Novikova et al, 2021).

The determined power models that meet the criteria of statistical reliability and accuracy are as follows:

- without taking into account the delay lag:

$$\bar{y}_x = 65,2 \cdot x^{0,81}; (1)$$

$$\eta^2_{y/x} = 0,95; F_p = 65,4;$$

$$F_{0,05}\begin{Bmatrix} V_1 = 1 \\ V_2 = 6 \end{Bmatrix} = 5,99; F_p \rangle F_\alpha$$

- taking into account the delay lag:

$$\bar{y}_x = 61,3 \cdot x^{0,86}; (2)$$

$$\eta^2_{y/x} = 0,91; F_p = 42,8;$$

$$F_{0,05}\begin{Bmatrix} V_1 = 1 \\ V_2 = 5 \end{Bmatrix} = 6,61; F_p \rangle F_\alpha$$

where y is actual GDP for the considered research period;

y_x is theoretical (estimated) values of GDP;

x – GVA of DS.

The parameter at the factor feature in power models, i.e. a_1, is the theoretical elasticity coefficient. Their values fully correspond to average empirical indicators and confirm the existence of a direct relationship between the growth of GVA of the DS and GDP. Thus, according to equation (2) a_1 = 0.86, each percent increase in GVA of the DS in the current year causes GDP growth of 0.86% in the next one.

The approbation of the authors' methodology confirms the hypothesis of a direct relationship between the development of the digital sector and macroeconomic development in Ukraine in 2012-2020. Digitalization is indeed a significant factor in sustainable economic growth and development of the overall national economy.

Digitalization is the driver of economic growth at a higher level of efficiency in the use of production resources, in particular, the cost of living labour (Table 4). Thus, the average annual growth rate of labour productivity is 130.2% in the digital sector and is 119.5% in the overall economy.

The labour productivity growth rate in the DS has been growing annually over the same rate in the overall economy. If the level of labour productivity in the DS was 1.5 times higher than in the economy in 2013, then it increased up to 2.8 in 2020.

Table 4. The ratio of labour productivity in TEA of the DS and in the overall economy of Ukraine during 2013-2020

Year	Labour productivity				The share of the digital sector, %		Ratio coefficients of labour productivity $k_w=\frac{W_{GVA}}{W_{GDP}}$
	GDP (at actual prices) per employee		GVA of DS (at actual prices) per employee		by GDP ($d_{GVA/GDP}$)	by number of employees ($d_{empl.GVA/GDP}$)	
	thousand UAH	in % to the previous year	thousand UAH	in % to the previous year			
2013	75.9	-	115.7	-	3.45	2.26	1.524
2014	87.8	115.7	140.8	121.7	3.48	2.17	1.604
2015	120.9	137.7	185.6	131.8	3.03	1.97	1.535
2016	146.6	121.3	268.0	144.4	3.48	1.9	1.828
2017	184.7	126.0	350.2	130.7	3.58	1.88	1.896
2018	217.6	117.8	429.5	122.6	3.64	1.85	1.974
2019	240	110.3	501.0	116.6	3.8	1.82	2.087
2020	263.5	109.8	734.7	146.7	4.97	1.78	2.788
On average during 2013-2020.	-	119.5	-	130.2	-	-	-

As a result of the higher efficiency of living labour costs in the digital sector, the output share in this sector in the GDP structure is much higher than a similar indicator of employment in general in the economy of Ukraine. Since 2016, the gap between them has been increasing every year. The above calculations prove that outpacing rates of labour productivity in the DS has led to a significant increase in the share of the digital sector in the GDP structure.

The main factors of the increase in the output share in the DS in GDP during 2013-2020 are a significant increase in the excess of labour productivity by types of activity of the digital sector. Provided that the influence of the employment factor is eliminated, which increased in 2013 due to the high level of the labour productivity, the growth of the share of the digital sector in terms of the output over the past 8 years should have been 83.0%. However, it provides only a 44.0% increase in the share of the DS in terms of the output, which is almost twice less than possible, due to the decrease in the share of employees (by 21.2%) with the combined influence of factors of excess labour productivity.

Prospects for the development of the digital economy in ensuring economic growth. The impact of digitalization is determined by the value added. Digitalization creates new opportunities for each sector of the economy or sphere of life at the macro-level or a specific product or service at the micro-level. At the macro-level, this value added is the corresponding part of GDP growth (percentage of GDP). It is this cumulative share that is the digital economy as a part of the traditional analogue economy.

Conceptual, strategic, programme, and project (expert) documents contain directions of the development of digitalization of economy and society. This is the 'The concept of the development of the digital economy and society of Ukraine' (Cabinet of Ministries.., 2018), National Economic Strategy until 2030 (Cabinet of Ministries.., 2021), where the digital economy is identified as one of the main vectors of development of

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the Ukrainian economy over the next ten years. It presents an audit of the development of the digital economy, determines strategic goals, development goals, and the main strategic directions, which include

- the development of digital infrastructure;
- the development of digital skills;
- the development of the information and communication technology sector;
- digitalization of spheres of life and sectors of the economy (Cabinet of Ministries.., 2021).

According to experts (Digital Agenda of Ukraine), the share of the digital economy in the country's GDP will increase from 3% (2021) to 65% by 2030 (Table 5) (Ukrainian Institute.., n.d.).

Table 5. Assessment of the impact of digitalization on the Ukrainian economy

Indicators	2021E	2022E	2025E	2027E	2030E
Internal market (ICT consumption), billion USD	2.0	2.5	6.0	10.0	16.0
The share of the digital economy in GDP, % (according to the target scenario)	3.0	5	15.0	28.0	65.0
Impact on GDP, growth rate	0.5	1	4.5	7.5	14.0

**Source: Estimates and calculations of experts of the 'Digital Agenda of Ukraine' based on the World Economic Information Technology Report (DEF); 'Digital Agenda of Ukraine'. High-Tech Office Ukraine. Public Union 'Digital Transformation Institute'.*

According to the estimates given in the national strategy (Cabinet of Ministries.., 2021; Digital economy.., 2021) digitalization will become the main tool for achieving Ukraine's strategic goals. At the same time, the annual GDP growth due to the digitalization of the economy will be at least 4%. Inflation in the framework of inflation targeting policy will remain at 5% according to the NBU (National Bank.., n.d.) (Table 6).

The measures of the relationship between GDP growth and the size of the digital sector determined in the paper taking into account the projected level of inflation, provide an opportunity to measure the pace of development of the digital sector to achieve the targets of the national economy according to different assessment options.

Table 6. Projections of TEA of the DS to achieve the targets of economic growth (in prices comparable to 2020)

Indicators	**In 2025**				**In 2030**			
	GDP at the expense of DE		**TEA of DS**		**GDP at the expense of DE**		**TEA of DS**	
	billion UAH	**in % compared to 2020**	**billion UAH**	**in % compared to 2020**	**billion UAH**	**in % compared to 2020**	**billion UAH**	**in % compared to 2020**
First option, $K_{el.GDP/TEA\ DS}$ = 0.67	5102.8	121.7	283.8	136.2	6208.3	148.0	377.3	181.0
Second option, $K_{el.GDP/TEA\ DS}$ = 0.827	5102.8	121.7	263.1	126.2	6208.3	148.0	330.2	158.4
Third option, $K_{el.GDP/TEA\ DS}^{2018-2020}$ =0.45	5102.8	121.7	308.9	148.2	6208.3	148.0	430.8	206.7

As an initial hypothesis, we have chosen three elasticity coefficients as a measure of the relationship between GDP growth and GVA providing variability of projections, namely

- the first option is the empirical average coefficient:

$K_{el.GDP/TEA\ DS}$ = 0.67;

- the second option is the elasticity coefficient taking into account the delay lag: $K_{el.GDP/TEA\ DS} = a_1$ =0.827;

- the third option is based on the average elasticity coefficient during the last three years (2018-2020): $K_{el.GDP/TEA\ DS}^{2018-2020}$ =0.45.

Targets for the development of the national economy are indicators given in the national economic strategy up to 2030 (Digital economy.., 2021) and the Concept 'Digital Economy and Information and Computer Technology' (Cabinet of Ministries.., 2018). That is, the annual GDP growth due to the digitalization of the economy will be at least 4%. Inflation under the inflation targeting policy will remain 5.0%. The rate of change in real GDP is an average of 4% per year in early 2025 according to the projections of the NBU (Ukrainian Institute.., n.d.).

According to Table 6, GVA of the digital sector should increase by 36.2% by 2025. In 2030, this increase should be 81% to ensure GDP growth due to digitalization of the economy by 4% annually at the elasticity coefficient of 0.67. At the same time, at a sufficiently low level of elasticity that has developed over the past three years, the digital sector output will have to double at least to meet the set targets. This is under conditions that indicators are given in prices comparable to 2020.

Taking into account the forecast assessment of changes in inflation (conditionally the change in prices of GVA of the DS and GDP deflator is at the level of inflation), GVA of the DS at current prices should reach 362.2 billion UAH in 2025 according to the first option, that is, to grow by almost 74.1% and 614.6 billion UAH in 2030. The growth will be 194.9%. Similarly, one can determine the required GVA of the DS for other options of the elasticity coefficients.

These calculations make it possible to determine the projections of the required GVA of the digital sector to achieve the targets of change in key indicators of economic growth.

Provided that $K_{el.GDP/TEA\ DS}$ = 0.67, the annual growth rate of GVA of the DS in actual prices should be at 11.2% in 2021-2030.

Provided that the elasticity of GDP growth by GVA of the DS will remain as it has been within the last three years, then GVA of the DS should reach 394.2 billion UAH in 2025 to ensure annual 4% GDP growth planned in the strategies, and UAH 701.7 billion in 2030 to ensure annual growth rate of 12.9-13.0%.

Based on the example of the above calculations according to the developed methodology of determining the impact of digitalization on economic growth, it is possible and necessary to determine or adjust the required output of goods and services in the digital sector; to justify economic, organizational, and institutional mechanisms for achieving them; to design and detail specific programmes for the development and implementation of digitalization of the economy.

According to the above assessment, the authors have determined that the impact of digitalization on the economy is primarily related to ensuring the growth of labour productivity in Ukraine, which will achieve at least 4% of additional GDP growth per year. Digitalization will permeate all sectors of the economy and create new segments and even industries. Most importantly, it will allow enterprises, industry and business to grow efficiently and quickly.

Currently, the digital transformation of the real sector of the economy is quite low. Ukraine invests four times less in R&D than the neighbouring EU countries. Labour productivity in Ukraine is three times lower than in Poland and Hungary, and the development of Industry 4.0 is not one of the priorities of the Ukrainian economy.

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The existing infrastructure does not create favourable conditions for the development of the digital economy. The potential of economic sectors based on digital transformations is practically not unleashed. There are no incentives for digitalization and modernization of the economy.

However, despite the main factors and barriers to the digital transformation of the economy, digitalization should become the main driver of economic development in the country according to the presented calculations.

Achieving strategic goals will ensure the digitalization of the economy and other spheres of life and will accelerate economic growth, increase labour productivity and competencies of citizens, expand access to the labour market and e-commerce, digital harmonization with other countries, and inclusion in global production chains.

Conclusions

The article substantiates the relationship between the level of digitalization of the economy in the country and the parameters of its economic development. Thus, the higher level of the country's digitalization results in a stronger impact on sustainable economic growth. Determining the impact of digitalization on economic development taking into account national peculiarities requires the development of national methods, which are based on the data of identification of economic activities and the availability of reliable and comparable information about the level of their development.

Approbation of the proposed methodology for assessing the impact of digitalization on sustainable economic growth in Ukraine has confirmed the hypothesis of a direct impact of digitalization on economic development. Each percent growth in the digital sector output is accompanied by GDP growth of 0.827%. That is, over the past eight years, the implementation of digitalization in Ukraine has really been a factor in economic growth.

The developed methodology for assessing the impact of digitalization of the economy on economic growth provides an opportunity to design forecast scenarios for the development of the digital sector in achieving the targets of the national economy. Forecasting and declaring quantitative parameters of GDP growth due to digitalization of the economy in strategic and programme documents requires simultaneous consideration of changes and quantitative calculations in all areas of the economy causing this growth, thus ensuring balanced digital and economic development.

References

Aptekman, A., Kalabin, V., Klintsov, V. et al. (n.d.). Digital Russia: a new reality (research results from McKinsey & Company). - http://www.mckinsey.com [2021.11.02]

Bukht, R., Heeks, R. (2018). Defining, Conceptualizing and Measuring the Digital Economy // *International Organizations Research Journal*, Vol. 13. No. 2: 143-172. DOI: 10.17323 / 1996-7845-2018-02-07.

Cabinet of Ministries of Ukraine (2018). Order «On approval of the Concept of development of the digital economy and society of Ukraine for 2018-2020 and approval of the action plan for its implementation», №67-r. - https://zakon.rada.gov.ua/laws/show/67-2018-%D1%80#Text [2021.11.14]

Cabinet of Ministries of Ukraine (2021). Resolution «On approval of the National Economic Strategy for the period up to 2030», № 179. - www.kmu.gov.ua/npas/pro-zatverdzhennya-nacionalnoyi-eko-a179 [2021.11.12]

Didenko, N., Skripnyuk, D., Kobyilinskiy, V. (2020). Assessment of the development of the digital economy on the example of the European Union // *WORLD (Modernization. Innovation. Development)*. Vol. 11. No. 2: 196-215, www.doi.org/10.18184/2079-4665.2020.11.2.196-215

Digital economy and information and computer technologies (2021). -www.kmu.gov.ua [2021.11.04]

Golovenchik, G. (2019). Digitalization of the Belarusian economy in modern conditions of digitalization. Publishing house. - Minsk.

Huawei Global Connectivity Index-2018 (GCI) (2018): 16-20. - www.huawei.com/minisite/russie/gci2018rus/materials/ gci2018.pdf [2021.11.04]

Huawei: Global Connectivity Index-2019 (2019). - https://delo.ua/business/huawei-globalnyj-indeks-setevogo-vzaimodejstvi-362129/ [2021.11.15]

Hulyi, I. (2019). Assessment of the impact of digital technologies on the growth of added value in the activities of transport organizations // *Bulletin of scientific research results*. Issue 3: 89-101.

Khandii, O., Shamileva, L. (2019). The impact of digital transformations on the economy and the workplace: socio-economic risks and consequences // *Economic Bulletin of Donbass*. № 3 (57): 181-187.

Koliadenko, S. (2016). Digital economy: prerequisites and stages of formation in Ukraine and the world // *Management: current issues of science and practice*. № 6: 105-110.

Kovtoniuk, K. (2017). Digitization of the world economy as a factor of economic growth // *Scientific Bulletin of Kherson University*. Economic Sciences Series. Vyp. 27. Ch. 1: 29-33.

Liashenko, V., Vyshnevskyi, O. (2018). Digital modernization of the economy as an opportunity for breakthrough development. - Institute of Industrial Economics of the National Academy of Sciences of Ukraine. Kyiv.

Morhachov, I., Ovcharenko, I., Ivchenko, Y., Buchniev, M., Tkachenko, N. & Derzhak, N., (2021). Creation of Investment Funds in Ukraine by Individuals as a Criterion for Sustainable Development of the Country's Economy // *European Journal of Sustainable Development*. 10(4): 271-280. DOI:10.14207 / ejsd.2021.v10n4p271

National Bank of Ukraine, Strategy of the National Bank of Ukraine until 2025. - https://bank.gov.ua/en/news/all/strategiya-natsionalniy-bank-do-2025-roku-fokus-na-aktivizatsiyu-ekonomichnogo-zrostannya-ta-tsifrovizatsiyu [2021.11.15]

Novikova, O., Shamileva, L., Shastun, A. (2021). Digital and economic development under the current conditions: scientifi c and methodical providing an assessment of the interaction // *Polityczne, społeczne i ekonomiczne aspekty pandemii covid-19 w europie środkoweji wschodniej*. Warszawa: Wydawnicza ASPRA-JR. pp. 119-130.

Overview of the World Bank Group. - www.documents1.worldbank. org / curated / en / 413921522436739705 / pdf / EAEU-Overview-Full-RUS-Final.pdf / [2021.11.10]

Pysarenko, T., Kvasha, T. et al. (2019). The state of innovation and activity in the field of technology transfer in Ukraine in 2018: an analytical reference. – Kyiv: UkrINTEI.

Ukrainian Institute for the Future, Ukraine 2030E is a country with a developed digital economyю - https://kray.biz.ua/editor3/8843/ [2021.11.10]

Vyshnevskyi, V., Harkushenko, O., Kniazev, S., Lypnytskyi, D., Chekina, V. (2020). Digitalization of the economy of Ukraine: transformational potential, ed. Vyshnevsky V and Kniazev S. – Kyiv: NAS of Ukraine, Institute of Industrial Economics, Akademperiodika.