DEVELOPMENT TRENDS OF THE DIGITAL ECONOMY: E-BUSINESS, E-COMMERCE

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Summary.

The introduction of digital technologies affects most socio-economic processes and activities in the economy, from agriculture to public services. Even though the world is currently only in the early stages of digital transformation, the digital economy is growing rapidly, especially in developing countries. Shortly, digital platforms will be able to replace the "invisible hand" of the market and turn it into digital. Some digital platforms have already reached global reach in some sectors of the economy. The growing value of data and artificial intelligence is reflected in the high capitalization of these enterprises. Their growing role has far-reaching consequences for the organization of economic activity and integration into the field of e-business. However, their importance and level of development in different countries differ significantly.
The main **purpose** of this article is an assessment of the level and trends of the digital economy in the world and the identification of homogeneous groups of states following the main trends in the development of its components from among the EU countries. **The methodology** of the conducted research is based on the use of general scientific research methods in the analysis of secondary sources and the application of statistical methods of correlation-regression and cluster analysis. Macroeconomic indicators and components of DESI (Digital Economy and Society Index) were used for the analysis. **Results.** Based on the analysis established that most developed countries have a medium level of digitalization of the business environment and a high level of digitalization of socially oriented public services, while countries with lower GDP focus their policies on building digital infrastructure and training qualified personnel. The study summarizes and analyzes current trends in digital technology, analyzes the level and dynamics of integration of digital technologies of the studied EU countries, the level of development of e-business and e-commerce. The conceptualization of mechanisms of creation of added value in the digital economy is offered and the possible consequences of digitalization of the economy of developing countries are generalized.
Keywords: *digitalization, e-business, e-commerce, EU countries, platforming, Internet of Things, artificial intelligence, robotics, value chain.*

1. Introduction

Due to the rapid evolution and increasing use of information and communication technologies, the world economy is rapidly transforming. Although the pace of digital transformation varies from country to country, they are all changing one way or another. Such trends have a significant impact on the implementation of the 2030 Agenda for Sustainable Development, creating new opportunities and challenges for developing countries.

One of the distinguishing features of recent years has been the accelerated growth of digital data aggregation via the Internet. This process is accompanied by the expansion of analytical processing of big data, the development of artificial intelligence, cloud computing, and the introduction of new business models (digital platforms). Given the rapid development of the Internet of Things (IoT), the increasing number of Internet users using digital services, and the increasing digitalization of value chains, the role of digital data and technology will continue to expand. Access to data and the ability to transform it using artificial intelligence is crucial to ensure the modern competitiveness of companies and countries as a whole.
The transformational impact of digitalization on the economic and social spheres is forcing governments, businesses, and citizens to adapt to new conditions, taking advantage of new opportunities and overcoming challenges. The ability of different stakeholders to adapt to digital transformations varies greatly depending on various factors and has a significant gap between developed and developing countries. The concept of the digital economy is often used to describe the changes that occur through the integration of digital technologies into traditional models of

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production and consumption. Although the geographical orientation of the digital economy, in general, has been focused on developed countries, the effects of its implementation are of global significance and are increasingly affecting the economies of developing countries. Thus, the analysis of the current state and trends of the digital economy is crucial for the convergence of developing countries towards the transformation of their economies based on the experience of developed countries.

The purpose of this article assesses the level and trends of the digital economy in the world and the identification of homogeneous groups of states by the main trends in the development of its components from among the EU countries. To achieve this goal, the following research objectives are formulated:

To conduct a theoretical analysis of trends in the development of the main components of the digital economy in the world;

Carry out a cluster analysis of EU member states on normalized indicators of DESI and GDP per capita;

Formulate the advantages and disadvantages of digitalization of the economy and identify possible directions for the development of digital technologies in developing countries, taking into account the experience of developed countries.

2. Methods

To conduct this study in the process of substantiation of theoretical and methodological bases of analysis of trends in the digital economy, e-business, e-commerce, and related digital technologies used general scientific methods of economic analysis: method of comparison - when assessing the level of development of the digital economy, e-business and trade of the studied countries of the EU and the world; methods of generalization, systematization, synthesis, the study of phenomena and processes in their development and relationships, comparisons, analogies, classification, grouping, etc. In the context of the development of the EU Digital Single Market since 2015, the object of the subject study is selected EU member states to monitor progress from political efforts and the possibility of differentiating the impact of GDP per capita on the digital economy of countries united by one political ideology. Assessing the digitalization of the economy and society is an important aspect that contributes to its stability, development, and efficiency. To achieve the goal of the study, namely to identify homogeneous groups of EU member states per the trends of digitalization of their economies, we used the method of cluster analysis, the method of k-means, which allows to analysis groups of elements according to certain general aspects [1].), although the idea of the method was first voiced by H. Steinhaus (1957 [2]). A standard algorithm for clustering by the k-means method was proposed by S. Lloyd (1957 [3]). The method is based on minimizing the sum of the squares of the distances between each observation and the center of its cluster, ie the function:

$$\sum_{i=1}^{N} d(x_i, m_j(x_i))^2 \ ,$$

where d is the metric, xi is the i-th data object, and mj (xi) is the center of the cluster to which the xi element is assigned in the j-th iteration.

The study selected the European Union countries, which is based on indicators from the DESI Database, which summarize the relevant indicators of the effectiveness of digital technologies in Europe and track the evolution of EU member states in the field of digital competitiveness by country in terms of GDP per capita population in 2019. The indicators used, as well as their characteristics, are presented in Table 1. For our study, the Digital Economy and Society Index (DESI) was chosen, which is a synthetic indicator, the values of which are determined by the weighted average of five main indicators. Human capital (25%), Internet use (15%), Integration of digital technologies (20%), and Digital public services (15%)

Talbe 1: Input table for cluster analysis

EU member states	GDP (euro per capita)	Connectivity	Human Capital	Use of Internet	Integration of Digital Technology	Digital Public Services
Finland	37230	1479,29	1961,05	1145,12	1340,90	1304,92
Sweden	43920	1609,23	1793,10	1139,31	1242,69	1190,12
Denmark	49720	1645,51	1531,92	1127,30	1302,95	1306,95
Netherlands	41870	1508,07	1604,05	1128,05	1314,92	1214,41
Malta	21960	1467,96	1543,98	988,54	1098,07	1171,93
Ireland	60170	1142,28	1409,97	931,33	1486,41	1209,44
Estonia	15760	1296,40	1666,47	981,23	822,99	1340,01
United Kingdom	32910	1220,45	1575,11	1099,68	1083,77	1061,58
Belgium	35940	1300,69	1259,69	917,41	1317,39	1075,97
Luxembourg	83640	1583,72	1455,46	882,76	764,19	1106,12
Spain	25200	1519,86	1188,95	911,64	824,31	1309,13
Germany	35840	1484,89	1410,47	923,48	790,63	995,58
Austria	38170	1178,86	1418,25	810,30	811,52	1212,53
Lithuania	14010	1222,05	1095,77	859,82	989,38	1221,69
France	33270	1246,10	1185,77	795,89	840,95	1150,63
Slovenia	20700	1255,81	1208,72	775,71	818,93	1061,32
Czech Republic	18330	1122,03	1216,10	812,15	991,89	935,66
Latvia	12510	1544,03	875,52	809,76	566,11	1275,95
Portugal	18630	1348,02	944,13	721,32	817,44	1126,81
Croatia	12450	1028,82	1228,86	832,18	829,34	836,31
Hungary	13270	1494,68	1045,88	838,48	506.14	866,50
Slovakia	15860	1186,59	1045,17	800,47	651,41	834,18
Poland	13000	1283,58	931,79	744,59	524,85	1011,11
Cyprus	24530	961,44	895,07	817,17	689,69	1034,33
Italy	26910	1249,66	811,40	667,21	624,51	1012,18
Romania	9110	1404,63	828,95	538,41	498,54	726,13
Greece	17750	834,22	869,78	691,34	563,92	772.50
Bulgaria	6840	962,38	847,89	549,73	357,29	926,42

Source: formed by the author on the basis DESI 2020 [4], Eurostat [4]

Alternative research methods on this topic include hierarchical cluster analysis, based on Johnson S. (1967 [4]) and D'Andrade (1978 [5]). Zaharia & Bălăcescu (2020) [6] in their study conducted a grouping of EU member states according to DESI indicators, taking into account the level of education and the degree of satisfaction of the population of the studied countries in the dynamics (2014 and 2018) according to the methodology of hierarchical cluster analysis. According to the results of research (Zaharia & Bălăcescu, 2020), the general positive dynamics of the digital economy development is traced, but several significant differences in the indicators of the level of digitalization of the EU countries have been identified.

3. Literature review

Given that in the global dimension we are at the initial stage of digitalization of the economy, the very concept of the digital economy and some other related economic terms do not have generally accepted definitions. There is a large number of interpretations and interpretations of this term in various literature sources and analytical reports. This situation is due to the relative novelty of this topic and the lack of sufficient understanding of the phenomena of the digital economy, and the high speed of technological progress. That is, the time required to harmonize and standardize certain definitions lags behind the speed of technological change. Since the first mention in the mid-90s of the last century, the definition of the digital economy has changed significantly, due to the rapid development of technologies and their integration into various socio-economic spheres (Barefoot et al., [7]).

In the late 1990s, studies of the digital economy were mainly related to the development of the Internet and its impact on economic indicators and phenomena, so the concept of "Internet economy" (Brynjolfsson and Kahin, 2002[8] ; Tapscott, 1996 [9]). With the expansion of the possibilities and areas of implementation of Internet technologies since the mid-2000s, scientists have shifted the focus of their research to the conditions under which the Internet economy can develop and grow. The evolution of the definition and concept of the digital economy has been based on research on various policies to support the introduction of digital technologies, on the one hand, and the growing use of information and communication and digital technologies in business, on the other (OECD, 2012 [10] and 2014 [11]). With the improvement of the quality and volume of Internet connection in developing countries and the expansion of the range of digital products and services, the subject of digital economy research is a detailed analysis of the level of digitalization in developing countries (UNCTAD, 2017 [12]; World Bank, 2016 [13]).

Over the past few years, the debate has shifted again, focusing more on the dissemination of digital technologies, services, products, and skills in different economies. This process is often referred to as digitalization, which is defined as the transformation of a business through the introduction of digital technologies, products, and services (Brennen and Kreiss, 2014 [14]).

The study by Malecki & Moriset (2007) emphasizes that digital goods and services contribute to faster change in different sectors, not limited to high-tech sectors, as previously thought (Malecki and Moriset, 2007 [15]). Reflecting these changes, the reports of international organizations and analytical studies reveal the essence of "digitalization" and "digital transformation", i.e. how digital technologies change traditional sectors to further study various intersectoral trends in digitalization (OECD, 2016 [16] and 2017 [17] ; UNCTAD, 2017). These studies are particularly relevant for developing countries, as the digital economy is actively transforming traditional sectors such as agriculture, tourism, transport, and more. Researchers have concluded that the most important economic changes may well be due to the digitalization of traditional sectors of the economy, rather than the emergence of new sectors with digital support.

Important for the development of the digital economy and awareness of the consequences of its active penetration into the economy is the study of investment and public policy in the field of digital technologies and infrastructure. Equally important is the assessment of the development of the digital economy through its components. For example, the UNCTAD report (2017) notes that the development of the digital economy may be associated with the increased use of advanced technologies such as robotics, artificial intelligence, the Internet of Things (IoT), cloud computing, big data analysis, and three-dimensional (3D) printing. Besides, compatible systems and digital platforms are important elements of the digital economy.

There is an opinion of certain scientists (Brynjolfsson & Kahin 2000 [18], Bahl 2016 [19]) that the digitalization of the economy is a major driver of economic growth and has significant regional implications for business, employment, and society as a whole. This trend is especially true in developing countries, Dahlman et al. (2016 [20]) believe that digitalization in this case will accelerate economic growth, increase return on capital and productivity, reduce transaction costs and facilitate access to world markets. According to the WEF (2015 [21]), the digital economy is growing by 15-25% per year in emerging markets. To this date, some positive economic effects of digitalization can already be observed: global income convergence through wage increases in the digital sector (Beerepoot & Lambregts 2015 [22]); creating new, unique local markets for digital startups in developing countries (Quinones et al. 2015 [23]); global digital platforms that can be an effective alternative to corrupt markets and inefficient labor market institutions (Lehdonvirta 2016 [24]). However, along with the positive developments, there are several

challenges and obstacles to the digitalization of developing economies, primarily due to the low level of digital skills and technology (Dahlman et al. 2016). Also, Murphy & Carmody (2015 [25]) emphasize the existence of a potential risk of negative consequences from the development of digital technologies due to limited resources, capabilities, institutional support, etc.; Foster & Heeks (2010 [26]) note the specific volatility of digital enterprises in developing countries; while Martin (2016 [27]) warns of the possibility of marginalization of workers in developing countries. Some researchers note that in addition to the positive effects, the digitalization of the economy in developing countries can lead to undesirable consequences, especially concerning information security and confidentiality (Manyika et al. 2013 [28]) and so-called premature deindustrialization in developing countries (Dahlman et al. 2016, Rodrik 2016 [29]).

The development of the digital economy is closely linked to the introduction of digital and information technologies in related fields, such as software-oriented technologies such as blockchain, data analysis, and artificial intelligence. The introduction of the latest technologies varies from user-oriented devices (computers and smartphones) to 3D printers, wireless devices, and specialized hardware of machines and equipment, such as the Internet of Things (IoT), automation, robotics, and cloud computing. The Internet of Things (IoT) is also widely used, including in energy meters, to mark RFID goods for production, in animal husbandry, in logistics (Vostriakova, 2021 [30]), for monitoring of soil and weather conditions in agriculture, in renewable energy (Lezhniuk, 2020 [31]). Rapid progress in the combination of these technologies contributes to capacity growth and a significant reduction in data storage, processing, and transmission costs. A detailed description and analysis of some recent trends and prospects for the development of these technologies are grouped in Table 1.

Talbe 1: Trends in the development of digital technologies

Name	The essence and prospects of development	Leaders of implementation
Blockchain technology	According to the forecast of the value of Gartner business chains, after the first phase of growth in 2018-2021, in 2022-2026, investment flows are projected to increase, and new successful models to be created, which is expected to increase them by more than 3 trillion. dollars USA. worldwide (WTO, 2018 [32]).	The USA, China (ACS, 2018 [33]).
Three-dimensional printing	Further development of three-dimensional (3D) printing has the potential to disrupt production processes, stimulating international trade in design rather than finished products. Developing countries will have to jump over traditional production processes.	USA, China, Japan, Germany, Great Britain
Internet of Things (IoT)	In 2018, more "things" (8.6 billion) were connected to the Internet than people (5.7 billion), and the number of IoT connections is projected to grow by 17% per year and exceed 22 billion by 2024 (Ericsson, 2018 [34])	USA, China, Japan, Germany, Republic of Korea, France, and Great Britain
5G networks	5G networks can process approximately 1000 times more data than modern systems (Afolabi et al., 2018 [35]). In 2019, 72 mobile operators tested 5G, it is expected (Deloitte, 2019 [36]), that larger-scale implementation will begin only in 2025.	USA, Europe, and Asia-Pacific.
Cloud computing	Cloud computing is transforming traditional business models by reducing the need for its own IT professionals, offering flexibility to scale and consistently deploy and maintain programs (UNCTAD, 2013 [37]).	North America, Asia-Pacific, Western Europe
Automation and robotics	According to the International Federation of Robotics (2018 [38]), global sales of industrial robots doubled between 2013 and 2017. This trend will continue, and sales are expected to increase from 381,300 units in 2017 to 630,000 units by 2021.	China, Japan, the Republic of Korea, the United States, and Germany
Artificial intelligence (AI) and data analysis	General-purpose AI technologies have the potential to increase the global economy by about $ 13 trillion by 2030, which will contribute an additional 1.2 percent to annual GDP growth (ITU, 2018 [39]).	China, USA, and Japan (WIPO, 2019 [40])

* Source: formed by the author based on the processed literature

Despite the significant opportunities and threats to the development of the digital economy in developing countries, most research focuses on high-income countries. The implications for low- and middle-income countries at the state level, in the business environment, and at the level of social development, as well as the dependence of digitalization on GDP per capita is not sufficiently studied, which determines the relevance of our study.

4. Results.

Although today there is no single generally accepted definition of the concept of the digital economy, we have identified the main related digital technologies that have a

direct impact on the digitalization of the economy and trends in its development. It is necessary to emphasize the growing importance of blockchain technologies, three-dimensional printing, the Internet of Things, the development of 5G networks, cloud computing, automation and robotics, the development of artificial intelligence. Understanding the further trends in the development of these technologies is important for analyzing the possible consequences of digitalization of the economy and creating added value in supply chains. The results of the analysis of literature sources and analytical reports predict a significant increase in the introduction of digital technologies in various socio-economic spheres of developed countries. Even though the concept of digitalization of the economy a few years ago applied only to developed countries, today there is a significant positive effect of the introduction of digital technologies in the economic and social spheres of developing countries.

To this date, some blockchain technologies are already used in developing countries, such as land use, transport, health, and education (UNECA, 2017 [41]). Besides, several 3D printing companies can already be found in some developing countries. But the capacity of the 3D printing market remains quite concentrated. The five leading countries in this field account for approximately 70% of the total number of enterprises. The top seven countries account for almost 75% of global IoT spending, with the top two accounting for 50 percent of global spending (Figure 1). However, if you compare the costs and access to the latest technologies, it turns out that the highest level of access is not the leaders of the cost rating, and Japan and the United Kingdom.

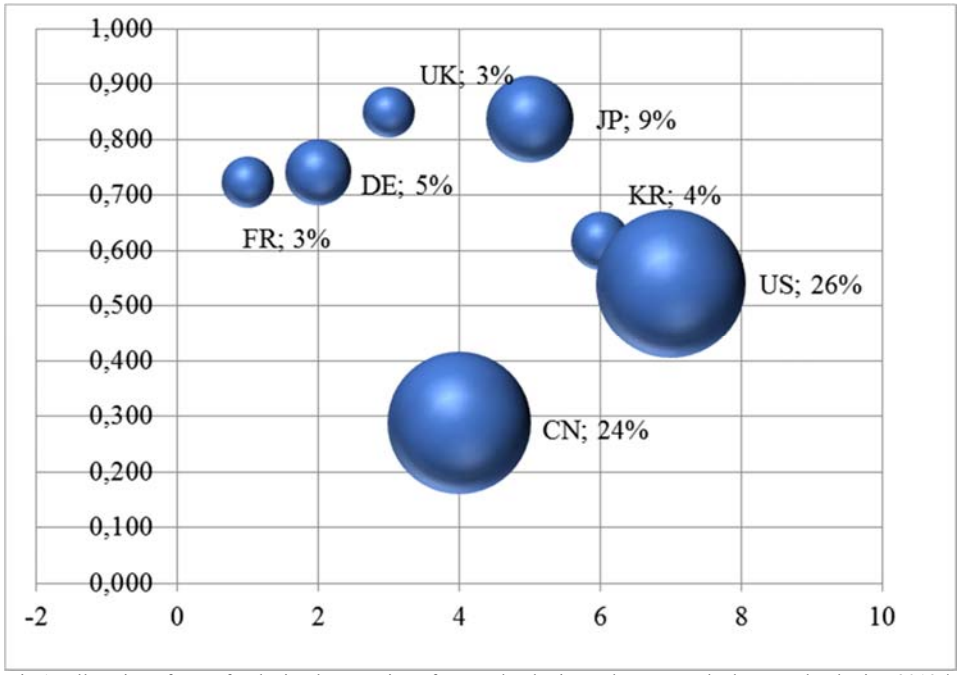

Fig 1. Allocation of costs for the implementation of IoT technologies and access to the latest technologies, 2019 *
* Source: IDC (2019), DESI (2020).

According to IDC (2018) estimates, by 2025, the average person will interact with IoT devices almost 4,900 times a day, or the equivalent of one interaction every 18 seconds. Such a rapid increase in the use of IoT will lead to further expansion of digital data. Fifth-generation (5G) wireless technologies are projected to be critical to the further development of IoT by increasing its bandwidth. Significant investment in 5G infrastructure is needed to maximize the benefits of IoT for developing countries.

Increasing the capacity of Internet networks has significantly improved the quality of cloud computing and reduced storage costs. Some free cloud services provide some application tools useful for micro, small and medium enterprises (SMEs). This is especially important for countries where the cost of licensed software is high enough that it can hinder the development of applications and the provision of quality services. The market for cloud services is also highly concentrated. According to Synergy Research Group (2019 [42]), the share of the top five providers: Amazon Web Services (AWS), Microsoft, Google, IBM, and Alibaba exceeds 75%, only AWS accounts for more than a third of this market.

Given the widespread introduction of automation and robotics technologies into production, there are concerns that such technologies could negatively affect employment and limit the opportunities for developing countries to implement export-oriented production and possibly further industrialization.

Further development of artificial intelligence, including machine learning, is ensured by increasing the amount of digital data and improved the computing power of the computer. Further active introduction of artificial intelligence technologies may widen the gap between developed and developing countries.

Digital transformation of business opens new opportunities and stimulates the development of new and reliable technologies, turns it into e-business. Figure 2 presents the dynamics of the level of integration of digital technologies in the economic activity of EU enterprises for the period 2017-2019.

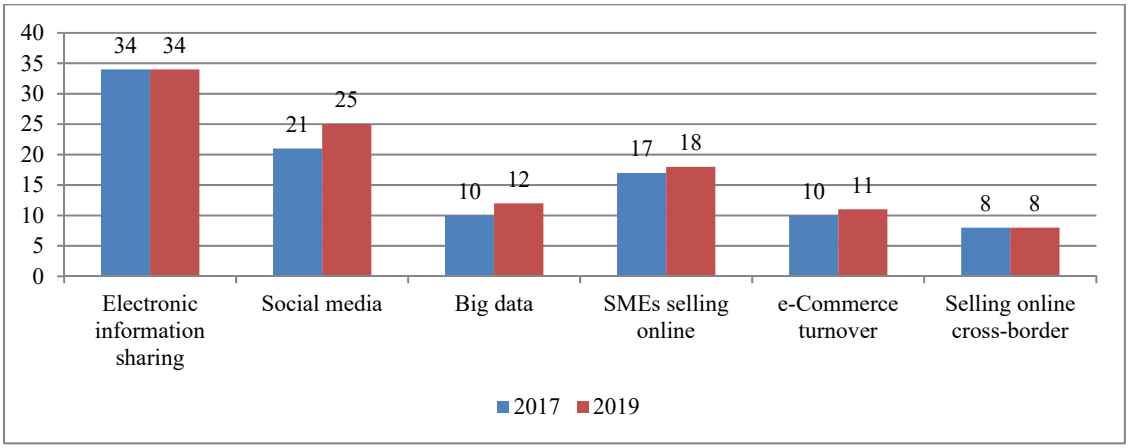

Fig. 2. Integration of digital technologies into economic activity of EU enterprises, % *
* Source: formed by the author based on DESI 2020

According to the level of e-business development and e-commerce development (Fig. 3), the most developed EU countries include Ireland, Finland, Belgium, the Netherlands, Denmark and Sweden, which scored more than 55 points (out of 100). DESI 2020. The least digitized in business and e-commerce are the EU countries such as Bulgaria, Romania, Hungary, Poland, Greece and Latvia, which scored less than 35 points, well below the EU average of 43 points.

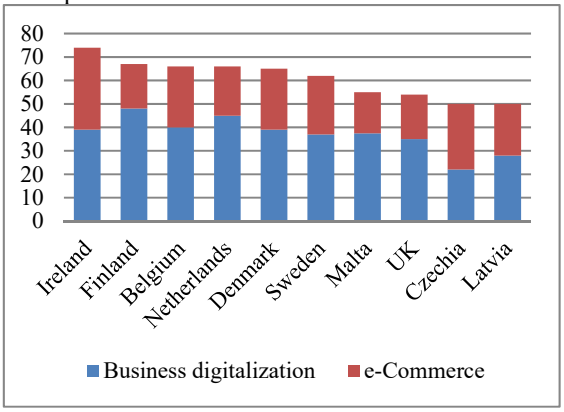

Fig. 3. Top 10 EU countries in terms of the level of integration of digital technologies in e-business and e-commerce in 2019 according to DESI *
* Source: formed by the author based on DESI, 2020

The transformational impact of the digitalization of the economy becomes even more apparent given the growing importance of several large technology companies and digital platforms that have developed significantly over the past decade. A comparison of the percentage ratio by sector of the 20 largest companies in the world by market capitalization shows a sharp change in the structure of e-business (Fig. 4). If in 2009 the share of the oil and gas sector was about 35%, and the technology sector and digital services were 16%, by 2018 the picture has changed significantly: the capitalization of technology companies in the top 20 increased to 56%, and financial companies - to 27 %, while the oil and gas sector decreased to 7%.

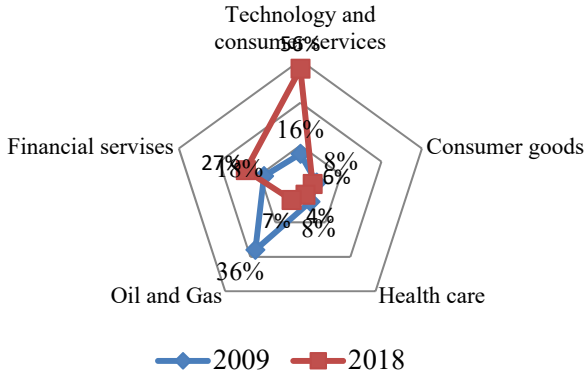

Fig. 4. Share of the world's 20 largest companies by market capitalization by sector, 2009 vs. 2018
Source: formed by the author based on PwC, 2018 [43]

The world's best digital business practices are geographically concentrated in the United States and Asia, with about 70 of the world's most valuable digital platforms.

Regarding the studied EU countries, according to the clustering, the countries are divided into seven digital clusters (Table 2). The clusters used data from the DESI Database indicators, which summarize the relevant indicators of the effectiveness of digital technology in Europe and track the evolution of EU member states in the field of digital competitiveness by country in comparison with GDP per capita in 2019:

Network coverage level;
Human capital;
Use of the Internet;
Integration of digital technologies;
Digital government services;
GDP per capita.

Table 2: The results of cluster analysis

Clusters	Countries	Characteristic
I	Sweden, Netherlands, United Kingdom, Germany, Croatia, Slovakia	The average level of GDP, average coverage, high level of human capital and Internet use, the average level of digital technology implementation, low level of digitalization of public services
II	Denmark Spain Latvia Hungary Poland	GDP below average, high level of coverage, low level of human capital and introduction of digital technologies, but sufficient, above-average level of Internet use and digitalization of public services
III	Lithuania Slovenia Portugal	The level of GDP is closer to the average level, sufficient coverage, one of the lowest values of human capital and Internet use, but a fairly high level of digital technology and the highest level of digitalization of public services.
IV	Luxembourg Italy Romania	Countries with the highest levels of GDP and coverage, low levels of human capital and Internet use, and relatively low levels of digital technology adoption in business and the public sector.
V	France Cyprus Bulgaria	High level of GDP, low level of coverage, the average level of human capital, use of the Internet, and digitalization of business, but rather a high level of digitalization of the public sector.
VI	Finland Malta Estonia	The lowest level of GDP, the average level of coverage and implementation of digital technologies in the business environment and the public sector, a high level of human capital, the use of the Internet.
VII	Ireland Belgium Czech Republic Greece	GDP is above average, the lowest level of coverage, but the highest level of digital technology, the average level of human capital, the use of the Internet, and the digitalization of public services

* Source: generated by the author

Interpretation of clusters can be carried out according to the schedule of average values of signs (fig. 5) which is constructed according to the standardized data of researched indicators on 28 EU countries.

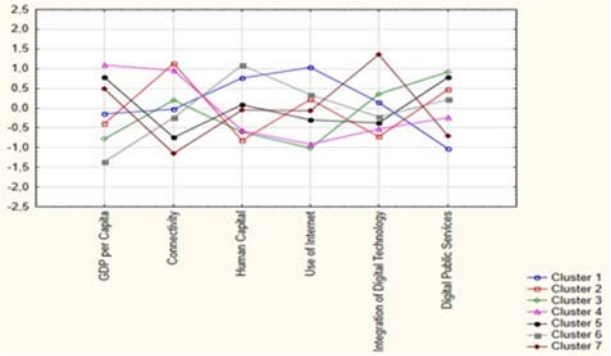

Fig. 5. Graphical representation of average values of variables for clusters * Source: generated by the author

According to the results of cluster analysis, it is impossible to trace a direct relationship between the level of GDP per capita and the level of digitalization of the economic and social sphere. We obtained the same indicators based on the results of the correlation-regression analysis. The constructed model has a linear relationship, but has no statistically significant indicators and explains only 40% of the variations. However, according to the correlation analysis of the studied indicators (Fig. 6), there is a significant relationship between the level of Internet users and the level of human capital development (r = 0.89); the level of human capital development and the introduction of digital technologies (r = 0.76), the level of Internet use and the introduction of digital government services (r = 0.64) and the introduction of digital technologies (r = 0.81).

	GDP per Capita	*Connectivity*	*Human Capital*	*Use of Internet*	*Integration of Digital*	*Digital Public Services*
GDP per Capita	1					
Connectivity	0,391165285	1				
Human Capital	0,568859971	0,460291176	1			
Use of Internet	0,524914939	0,523807977	0,887077928	1		
Integration of Digital Technology	0,573920526	0,31016908	0,76361798	0,805415744	1	
Digital Public Services	0,410929847	0,497780538	0,581677279	0,637043218	0,568642	1

Fig. 6. Results of correlation analysis of indicators of digitalization of business and social sphere of the EU, 2019*
* Source: author's calculations

In line with global trends in the digitalization of the economies of developed countries, its impact on value-added in developing countries should focus on three specific trends: platforming, e-commerce, and digitalization of value chains (Fig. 7).

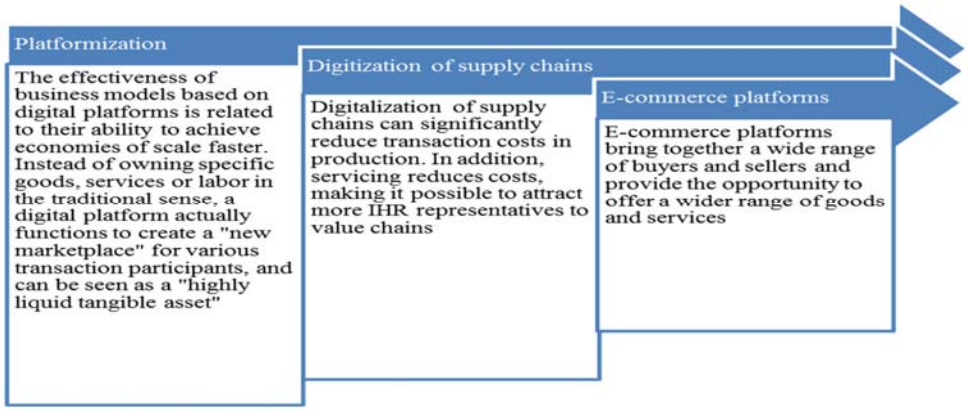

Fig. 7. Conceptualization of mechanisms for creating added value in the digital economy *
* Source: generated by the author

The growth of the share of e-business in developing countries will contribute to the formation of a significant number of economic benefits and opportunities. Besides, the introduction of digital technologies is quite effective in solving many social problems and providing public services. Also, the significant socio-economic effect of the introduction of digital technologies will promote active innovative development and increase the productivity of business processes. In addition to the positive effects, it is necessary to keep in mind the negative aspects of

digitalization, which must be successfully balanced when implementing the strategy of digitalization of the economy at the state level. The possible consequences of the digitalization of the economy are grouped in Fig. 8.

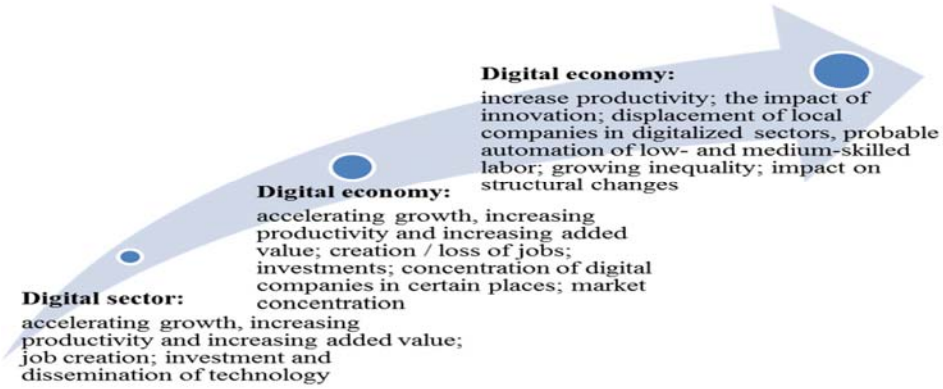

Fig. 8. Possible consequences of digitalization of the economy *

* Source: generated by the author based on [44]

5. Disscussion

According to the assessment of the dynamics of integration of digital technologies in the economic activity of enterprises in the EU in 2017-2019, there is an increase in such indicators as social media, big data, e-commerce, and online sales of enterprises. The EU countries such as Ireland, Finland, Belgium, the Netherlands, Denmark, and Sweden, which scored more than 55 points (out of 100) according to DESI 2019 indicators, are among the most developed in terms of business digitalization and e-commerce development. The positive impact of the use of social media on economic growth is also evidenced by a study by Khajeheian (2013 [45]). The weak impact of the Internet and digital technologies on the development of individual economies is due to the low level of Internet penetration, lack of special skills needed to use the Internet (Haftu, 2019 [46]), or the lack of local digital content (Holden and van. Klyton, 2016 [47]).

The literature often emphasizes the impact of digitalization of the economy on the level of GDP(Solomon & van Klyton 2020 [48]), and vice versa - emphasize the dependence of the level of GDP per capita, which demonstrates the level of development of the country, with the level of digitalization. Data from the Organization for Economic Co-operation and Development (OECD) indicate that business productivity is growing by 5-10% year on year due to the use of information and communication technologies (OECD, 2016). The correlation-regression analysis showed a linear relationship between the level of GDP per capita and the factors influencing the level of digitalization of the economy, but this relationship explains only 40% of the variations, which is quite low. However, there is a fairly strong relationship between the level of Internet users and the level of human capital development (r = 0.89); the level of human capital development and the introduction of digital technologies (r = 0.76), the level of Internet use and the introduction of digital government services (r = 0.64) and the introduction of digital technologies (r = 0.81). Similar results were obtained by other researchers (Evangelista et al., 2014 [49]). They were able to predict an increase in the individual use index by 1% to increase GDP growth by about 0.25% on average. Individual use of ICT promotes growth because it promotes human capital development, reduces the cost of purchasing goods and services, and increases labor and capital productivity. This is also in line with the findings of Wamboye et al. (2015 [50]).

The cluster analysis of the studied EU countries provided an opportunity to form 7 clusters. Countries with high GDP per capita do not always show a high level of digital technology development. Thus, clusters 4, 5, and 7 belong to countries with a high level of care per capita, but only the last cluster, which includes Ireland, Belgium, Czechia, Greece, shows a high level of digital technology implementation in the business environment, while clusters 4 and 5, Luxembourg, Italy, Romania and France, Cyprus, Bulgaria accordingly, have high rates of implementation of digital technologies in the field of public services. This trend indicates the need for significant investment in the digitalization process, the promotion of innovation in the virtual environment, and public policies aimed at promoting digital and technological education. (Balacescu, 2019 [51]). The group of clusters of countries with a low level of GDP per capita (2 - Denmark, Spain, Latvia, Hungary, Poland; 3 - Lithuania, Slovenia, Portugal and 6 - Finland, Malta, Estonia) is characterized by the social orientation of digital technologies (digitization of public services) and high

growth rates of network coverage, which can be explained by the rapid growth of infrastructure capacity for the integration of digital technologies in the economic and social spheres. The precondition for success in the digitalization of the social sphere of some countries of the sixth cluster, in particular Estonia, was the ecosystem of institutional, legal, and technological changes and the introduction of several public electronic services (Vassil, 2016).[52]). The first and largest cluster, which includes 6 countries (Sweden, Netherlands, United Kingdom, Germany, Croatia, Slovakia) has an average value of GDP per capita, a high level of human capital, but the lowest level of digitalization of the public sector. Based on the analysis, it can be concluded that most developed EU countries have an average level of digitalization of the business environment and a high level of digitalization of socially oriented public services and is weakly correlated with the level of GDP per capita.

6. Conclusion

Digital transformation of the economy is a constant and consistent process that concerns not only the development of IT sectors but also the digitalization of other related economic sectors, which in turn stimulates the introduction of innovative technologies and provides a strong impetus to all socio-economic spheres further development at the international level.

Current trends in the digital economy are dictated by several countries and a relatively small number of companies, they are primarily concerned with the further development and improvement of digital technologies such as blockchain, three-dimensional printing, Internet of Things, 5G networks, cloud computing, automation and robotics, artificial intelligence and data analysis and their implementation in various sectors of the economy. Based on this study, a conceptual framework for the development and implementation of mechanisms for creating added value in the digital economy, which include platforming, digitalization of supply chains, and the development of e-commerce platforms.

Digital platforming of the economy makes it possible to simplify operations, reduce transaction costs through the formation of communication networks and information exchange at the national level. While at the enterprise level there is a transformation of all areas and markets under the influence of digital technologies, which in turn will improve the quality and range of goods and services while reducing costs. The greatest benefits from the introduction of digital technologies can be obtained through their introduction at the level of value chains, opening new opportunities to increase value-added, reduce transaction costs, and other, deeper structural changes.

The main advantages of digitalization of the economy are the ability to automatically control large-scale economic and production systems (or individual components) and have virtually unlimited opportunities for expansion without loss of efficiency, and sometimes additional economic benefits due to the effect of scale, which improves economic management at the micro and macro levels. However, despite the potential benefits of digitizing the economies of developing countries, it should be noted that under the current regulatory environment and the trajectory of the digital economy, it will be extremely difficult to ensure that it is sustainable.

The total dominance of global digital platforms, which can monopolize the creation, storage, and management of data, resulting in the creation of added value, is likely to further exacerbate inequalities in the global economy, both between countries and at the national level. The practical significance of the obtained results is to provide theoretical and analytical tools for political leaders of developing countries to identify ways to remove barriers to and maximize the opportunities provided by the transition to a digital economy based on the experience of developed countries.

To eliminate the negative effects of digitalization, it is necessary to think outside the box and focus on finding alternative models of digital economy development to obtain more balanced results and a fair distribution of benefits from big data and artificial intelligence. This question opens up prospects for further research: the study of the preconditions for creating competitive advantages through e-commerce and the digital economy; development of measures to improve the physical and technological digital infrastructure and improve models for implementing the experience of developed countries in the digital policy of developing countries.

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