DIGITALIZATION IN ECONOMY AND INNOVATION: THE EFFECT ON SOCIAL AND ECONOMIC PROCESSES

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Abstract: Digital technology has significantly changed the speed of operation in the economy. The Internet and digital devices are a driver of economic growth. This article analyzesthe Russian digital economy and society in the context of comparison with EU countries and draws conclusions regardingfuture development trends. Based on secondary data from the European Commission, this studytackles five components of the Digital Economy and Society Index.It includesICT Development Index, Global Innovation Index (GII), Networked Readiness Index, Share-Households with Internet, and High-Technology Exports. A cross-country analysis reveals significant differences between Russia and the EU countries in terms of Internet accessand Digital Economy,and their impact on GDP and social processes that take place in the country. Findings show that Russia holds a position among the top ten countries inICT Development Index and Network Readiness Index. The growth rate of high-tech exports indicatesthe lag of Russia behind other countries in the ranking.According to the ranking of countries by high-tech exports, Russia lags in the production of products with high R&D intensity, such as aerospace products, computers, pharmaceuticals, scientific instruments and electrical machinery. Russia holds a strong position in National Cyber Security (63.64%), as well as in the Share of Households with Internet.

Keywords: digitalization,innovations, Russian Federation,digital economy

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Introduction

Growth of Information and Communications Technology (ICT) use has increased significantly over the past three decades (Castellacci and Tveito, 2018; Nagy, 2019). Digital economy refers to a system of institutional categories (concepts) that comprises high-level achievements and progressive technologies, primarily digital,

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and serves to increase the effectiveness of social production (Johnson, 2019; Pradhan et al., 2019; Peshkova and Samarina, 2018).At the same time, digital economy refers to an economy based on professional and market knowledge, creativity and an innovation society (Balcerzak and Pietrzak, 2017; Quinton et al., 2018).

The EU member states are on the move towards a digital economy. Nevertheless, there is a significant development gap between different countries, which is the lack of harmonizedrelationship between the level of digital technology development and the time taken for introducing digital technologies into industrial and business spheres (Galichkina, 2014). Europe's policy to build a faster and better digital economy can thus be said to mix mercantilism, competition policy, and the Digital Single Market reform strategy. It is revealing that current initiatives are so focused on perceived barriers to digital growth from either direct digital policy or the (superior) performance of foreign companies (Bauer and Erixon, 2016). EU's most pressing structural impediment for digital businesses to develop and reach scale is regulatory heterogeneity in non-digital industries.

Intelligent products, connectivity and big data analytics are expected to be disruptive for companies' business strategies and operational execution (Ardolino et al., 2017). When it comes to digital technology, industrial companiesbecome active investors (World Investment Report, 2018).The British–Dutchconglomerate Unilever Plc grew revenues by investing in fast-growing opportunities and start-ups, including digital tools and platforms. The most recent entry, Tencent, has transformed into a very active investment holding conglomerate with a recent special focus on financing Asian tech start-ups. In the past year alone, it more than trebled its international assets, entering the Top 100 global multinational enterprise ranking for the first time. The semiconductor company Broadcom acquired competitors continuously over the past five years until last year's hostile bid for United States chipmaker Qualcomm (World Investment Report, 2018).

The digital transformation of EU business and society presents enormous growth potential for Europe. European industry can build on its strengths in advanced digital technologies and its strong presence in traditional sectors to seize the range of opportunities that technologies such as the Internet of Things, big data, advanced manufacturing, robotics, 3D printing, blockchain technologies and artificial intelligence offer (Crabtree et al., 2016; Karnitis and Karnitis, 2017). Despite the progress, the economy and society of Europe need to make the most of digital. 47% of the EU population is not properly digitally skilled, yet in the near future, 90% of jobs will require some level of digital skills (Boban, 2016). In common use modern technologies came in countries witha high level of GDP among the working population. At this point, the article analyzesthe Russian digital economy and society in the context of comparison with EU countries and draws conclusions regardingfuture development trends.

Literature Review

In conditions of digitalization of the economy, it is impossible to achieve success in business;youalways have information about personal prospects and opportunities, the quality and condition of the target markets, and the position of competitors on them (Panfilova, 2008; Vertakova et al., 2019).

The adoption of digital technologies becomes a unique industrial policy goal,andthe failure to pick up this challenge could have wide-ranging economicconsequences (Gruber, 2017). The digital economy is comprised of markets based on digital technologies that facilitate the trade of goods and services through e-commerce. The expansion of the digital sector has been a key driver of economic growth in recent years, and the shift towards a digital world has had effects on society that extend far beyond the digital technology context alone (Balcerzak and Pietrzak, 2017). The five main attributes of the digital economy: Digitized and Tracked, Connected, Shared, Personalized and Direct (Richter et al., 2017).

The digitalisation of day-to-day activities has dramatically increased the amount of data available.It creates extremely large and complex data sets,commonly referred to as "Big Data". Big Data could also potentially be used for internal risk management and outside monitoring of financial services and institutions and thus make supervision more efficient (Adamczewski, 2016; Chauhan et al., 2016; Dorofeyev et al., 2018).

Innovative applications of digital technology for financial services, or Fintech, are being used to alter the interface between financial consumers and service providers and are helping to improve communication with consumers and increase their engagement (Keller and Hott, 2015). Electronic currencyserves as one of the essential infrastructure elements of the digital economy (Pshenichnikov, 2017; Vovchenkoet al., 2017).

Note that the digital economy is still in the middle of formation, soany effects on productivity will occur only withdeveloped digital technology. Productivity in industrialized countries now confronts an apparent decline raising the question of apossible productivity paradox in the digital economy (Gorelova, 2016; Watanabe et al., 2018). Conceived around new technologies, the FinTech companies are typically highly flexible, adept at the swift incorporation of change and tend to have a low-cost structure. In most cases, they also exhibit sharply redefined business models, which are highly disruptive to traditional paradigms (Cuesta et al., 2015; Rayna and Striukova, 2016).

Issues concerning the limitation of GDP statistics in measuring the advancement of the digital economy became crucial. The digitalization of economycreates challenges for measuring international transactions and assets, as well as the scope of works and services (Ahmad and Schreyer, 2016; Cockayne, 2016).Another

postulated aspect is the concept of uncaptured GDP (Watanabe et al., 2018). To address the limitation of using GDP statistics in the digital economy, certaindevelopments, associated with the presentation and transformation of GDP accounting approaches,were made.

The digital economy is analyzed in four criteria (Semjachkov, 2017): *employment sector,penetration rate,technology*, and the *value factor*. Whena decline in the proportion of people employed in the production sector occurs at the same time with the increase in the proportion of people employed in the services sector,and physical laboris assumed to be replacedwith its mental form. Given the rapid growth in the number of trade workers, lawyers, etc. (those who fall under one category, mental labor), such data, as they are,are not a characteristic to the level of digital sector development. *Penetration rate* refers to data networks that connect different places and therefore, may have an impact on the global economic space formation. Data networks are a thing specific to modern society. Large amounts of data and the speed of their transfer are those elements that speak for the transition to a digital economy. The *value factor*is a condition related to the growth of economic value of data creation, transfer, processing, and storage. If such a growing trend is more evident in the economic realm than in agriculture and in production, then a transition is assumed. Moreover, such settings make data an object of economic relations. The emergence of *new technologies*is first to indicate a change in the economic systems, not to mention their reputation as the drivers of economic development.

Although digitalization is a rapidly developing sphere of national interest and has its advantages, scientists differ over this policy direction. Mostafa et al. (2019) believe reducing human intervention and making everything connected increase the efficiency and save time, hence save money. Implementing IoT in industry can lead to economic and social transformation; a 10% rise in the number of connected machines and objects can lead to an annual increase of 0.7% in GDP. Grabara et al. (2014) illustrated the role and impact of information systems on transportation activities in the economy, such as improving the efficiency of the transportation process, better drivers' utilization, more efficient information exchange, and better financial results. Technology adoption is always a difficult task for Small and Medium-sized Enterprises due to lack of resources and other market issues (Haseeb, 2019). The author identifies the role of Industry 4.0 to promote sustainable business performance in Small and Medium-sized Enterprises. As indicated, the elements of Industry 4.0, such as big data, Internet of Things and smart factory have a positive role in promoting information technology (IT) implementation, which contributes to sustainable business performance. Despite the positive trend of digital economy and IT implementation, there is also a range of risks and costs that unduly affect the livelihoods of digital workers (Graham, 2017).The pace of digital economic development raises many questions. In Russia, economic transformations occur and develop fast,but criteria reflecting the quality

of these transformations should be adapted to that in countries with positive digitalization.

Methods

For analysis, indicators were selected through the statistical analysis of reports (The Organisation for Economic Co-operation and Development).The data was processed using the score growth rates over the years. Indicators that were up with given criteria were selected from those verified for compliance and then listedas indicators characterizing the level of digital sector development. Such indicators include those thatare often used, do not require the involvement of experts, can be calculated without details, thosegive a general picture of digitalization, those allow identifying the weak points, assessing digitalizationprogress over time, and conducting a comparative analysis.

To analyze the level of digitalization level in Russia, this study addresses five main indexes: ICT Development Index, Global Innovation Index (GII), Networked Readiness Index, High-Technology Exports (% of manufactured exports).

To identify differences in similar indicators between European countries and Russia,data from available benchmarking statistics are analyzed. The goal of this process is to seek improvements in the aspects that are being compared. The analysis resulted in two isolates, in spheres, where Russiais successfully advancing on digital development and spheres that need a boost.

Statistical analysis was performed using the Statistaca 10, and the graphs were created in Origin 9.0. Score growth rates were determined in the 2014-2018 Global Innovation Index, and the 2011-2018 High-Technology Exports. The comparative analysis involved the 2018 data on the Share of Households with Internet, the Global Innovation Index, and the High-Technology Exports (% of manufactured exports) in Russia and European countries.

Results and Discussions

Ranking of countries by the level of innovation was performedusing the score growth rates in the GII (Table 1). Leaders from the year of 2017 remain at top positions. However, Netherlands overstepped Sweden, while Russia lost more than 2percent. In hindsight, this tendencyreoccurred. Imagine the pattern: Russia holds its position for a long period, with makingscoreimprovements or not, but then a crisis occurs, throwingthe country down several ranks (Measuring the Information Society Report, 2018). A crisis can open opportunities for development,but they remain unused, so the dropping-down-in-rank trend becomes the new norm.

Table 1. Global Innovation Index: score growth rates

	2017/2018	2017/2016	2016/2015	2015/2014
Russian Federation	0.58%	0.68%	-2.04%	0.41%
Finland	0.76%	-2.35%	-0.17%	-1.10%

Germany	0.83%	0.78%	1.47%	1.93%
Norway	-0.99%	2.17%	-3.33%	-3.22%
Netherlands	1.001%	8.70%	-5.37%	1.67%
Switzerland	0.98%	2.13%	-2.96%	5.43%

According to the ranking of countries by high-tech exports,Russia lags in the production ofproducts with high R&D intensity, such as aerospace products, computers, pharmaceuticals, scientific instruments, and electrical machinery (Mostafa et al., 2019). Russian exports are mainly raw materials. In 2018, metallurgical and chemical industries together with minerals accounted for 66.8 percent of exports, and thosewere intermediate goods from low technology, while the share of high-tech exports in total Russian exports was only 10.7%.
Figure 1 shows the scores of Russia and Europe in the ICT Development Index and the Networked Readiness Index. In 2018, Russia dropped to 45th place in ICT Development Index. Despite the set to information society development (Petrenko et al., 2017; The Presidential Decree, 2017), Russia is still catching up with the advanced countries in the Networked Readiness Index (41st position) (The Global Information Technology Report, 2016) and in the IDI, wheretop spots were occupied by Finland, Singapore, Norway, Netherlands and Switzerland in 2016, when Russia ranked 2 positions behind.

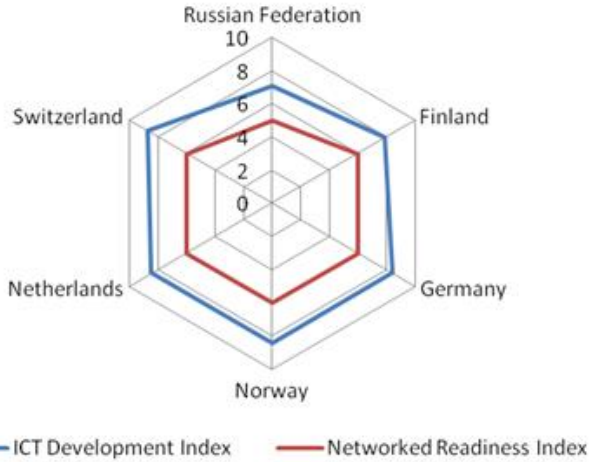

Figure 1. ICT Development Index and Networked Readiness Index: Russia vs Europe

In the Share of Households with Internet, European countries reached a level of 80% and higher. In 2018, the percentage of those with Internet access across the EU averaged 87 percent. The Netherlands took the leading position in the Internet penetration among the EU countries,but Luxembourg, Denmark, Sweden, Finland, and the UKalso reported rather high figures. In listed countries, the proportion of households with Internet was over 90 percent, so it was the rate of broadband Internet penetration. The Russian Federation reported 74.8 percent of connections

tops. This figureindicates the presence ofinfrastructuresuitable for digital technologies.

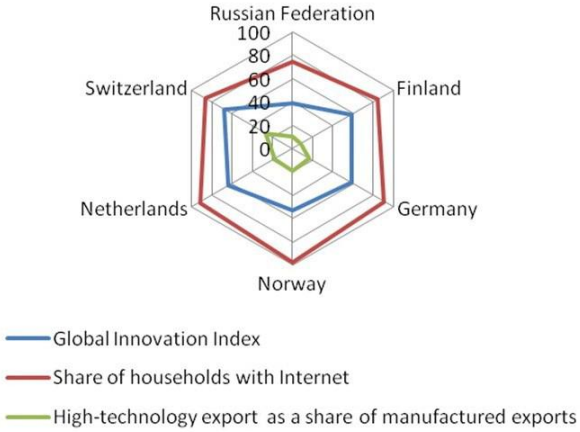

Figure 2. The Share of Households with Internet, Global Innovation Index, High-Technology Exports: Russia vs Europe

Thus, broadband penetration across Russia will enable the use of digital services in many spheres. This allows stores, salons and services to conduct cashless payments, reduces the cost of printing money, and contributes to the formal economy. The digital realm can generate new jobs across the country. However, Russia is lagging in certain aspects of digitalization.

Russia holds a strong position in National Cyber Security (63.64%). The leading countries are France, with 83%, and Germany,with 83.12%.Russia moved ahead of the CIS countries, specifically Kazakhstan and Uzbekistan. The index has been developed in 5 steps: 1) Identification of fundamental cyber threats at the national level 2) Identification of national level cyber security measures and capacities 3) Selection of important and measurable aspects 4) Development of cybersecurity indicators 5) Grouping of cybersecurity indicators.

This paper is an attempt to illuminate the socio-economicbackground and to allocate conditions for a transition tothe digital economy. These issueswere also raised by Slavin (2015) and Yudina (2016). Russia has a very high potential for developing the digital economy. The country plans to utilize new technologies, including blockchain, in areas directly related to the quality of life: management, information infrastructure, research and development, human resources and education, information security, smart city technology, and digital healthcare (Veresha, 2016; Zhironkin et al., 2017, Betelin, 2018). Researchers expand this list by adding the trend of offering new in the market (Maher et al., 2017;),enhanced use of 3D printers, eco-friendly smart house building (Grömling, 2016; Panshin, 2016; Scantlbury et al., 2017), andother important aspects that give a boost to digitalization.

Conclusions

Findings demonstrate improvement in innovation development in Russia. However, the country still lags behind developed European countries. The growth rate in High-Technology Exports indicate the lag of Russia in the production of products with high R&D intensity. In the field of legislation of the Russian Federation, it is ranked first among the CIS countries, ahead of Kazakhstan and Uzbekistan. In the overall ranking, Europe isthe leader in the implementation of cybersecurity standards, as well as measures to combat cybercrime and spam.Today, innovations, research and development form the core of political ambitions in most developed and developing countries. Global spending on R&D continues to grow,and the experts expect the portion of business in R&D spending to increase.This study identifies the main directions of digital economy development in Russia, its strengths and weaknesses. As evidenced, the country occupies a high position in the National Cyber Security ranking. These findings can be applied to createa strategic plan for innovation development in Russia. The limitation is that the analysis uses data only from the reports of the Organization for Economic Co-operation and Development; plans for the future study involveanindependent analysis of innovation development in Russia, in particular in the field of digital economy.

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DIGITALIZACJA W GOSPODARCE I INNOWACJACH: WPŁYW NA PROCESY SPOŁECZNE I EKONOMICZNE

Streszczenie: Technologia cyfrowa znacząco zmieniła szybkość działania w gospodarce. Internet i urządzenia cyfrowe są motorem wzrostu gospodarczego. Artykuł analizuje rosyjską gospodarkę cyfrową i społeczeństwo w porównania z krajami UE i wskazuje wnioski dotyczące przyszłych trendów rozwojowych. W oparciu o dane wtórne Komisji Europejskiej analizuje pięć komponentów indeksu gospodarki cyfrowej i społeczeństwa. Obejmuje wskaźnik rozwoju technologii ITT, wskaźnik globalnej innowacyjności (GII), wskaźnik gotowości sieciowej, gospodarstwa domowe z dostępem do Internetu oraz eksport technologii. Analiza międzynarodowa ujawnia znaczne różnice między Rosją a krajami UE w zakresie dostępu do Internetu i gospodarki cyfrowej oraz ich wpływu na PKB i procesy społeczne, które mają miejsce w kraju. Wyniki pokazują, że Rosja zajmuje pozycję w pierwszej dziesiątce krajów w przypadku Indeksu rozwoju w ICT i wskaźnika gotowości sieci. Tempo wzrostu eksportu zaawansowanych technologii wskazuje na opóźnienie Rosji w stosunku do innych krajów. Według rankingu krajów eksportu zaawansowanych technologii Rosja pozostaje w tyle w produkcji produktów o wysokiej intensywności B + R, takich jak produkty lotnicze, komputery, farmaceutyki, przyrządy naukowe i maszyny elektryczne. Rosja ma silną pozycję w przypadku cyfrowego bezpieczeństwa narodowego (63,64%), a także w udziale gospodarstw domowych z Internetem.

Słowa kluczowe: digitalizacja, innowacje, Federacja Rosyjska, gospodarka cyfrowa

经济与创新中的数字化：对社会经济过程的影响

摘要:数字技术显着改变了经济运行的速度。互联网和数字设备是经济增长的推动力。本文在与欧盟国家比较的背景下分析俄罗斯数字经济和社会，并对未来发展趋势作出结论。根据欧盟委员会的二手数据，该研究包括数字经济和社会指数的五个组成部分。它包括ITT发展指数，全球创新指数（GII），网络就绪指数，互联网共享家庭和高科技出口。跨国分析揭示了俄罗斯与欧盟国家在互联网接入和数字经济方面的显着差异，以及它们对国内GDP和社会进程的影响。调查结果显示，俄罗斯在国际发展指数和网络就绪指数中排名前十位。高科技出口的增长率表明俄罗斯在排名中落后于其他国家。根据高科技出口国家的排名，俄罗斯在研发强度高的产品生产方面滞后，如航空航天产品，计算机等。制药，科学仪器和电机。俄罗斯在国家网络安全（63.64％）以及拥有互联网的家庭户数中占据强势地位。

关键词:数字化，创新，俄罗斯联邦，数字经济。