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Social and Economic Background of Digital Economy: Conditions for Transition

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Abstract:

The purpose of this article is to analyze indicators that characterize the level of digital sector development, and to develop measures to stimulate the digitalization process.

For the Russian Federation, indicators necessary for comparative analysis are those that enable the indentification of a gap in digital sector development between the Russian Federation and the leading European countries.

Keywords: *Digitalization, innovations, Russian Federation, digital economy.*

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1.Introduction

The twenty-first century movement towards advanced technology intelecommunication, information, and innovations brought up the concepts of digital technology and digital economy (Tsyganov and Apalkova, 2016). Digital economy is an economy based on digital technologies and the primary use of information technology hardware, software, applications and telecommunications in all areas of economy, including internal and external activities of organizations (Domazet and Lazić, 2017; Sutherland and Jarrahi, 2018). At the same time, digital economy refers to an economy based on professional and market knowledge, creativity, and an innovation society. Digital economy is a paradigm of global information society that is centered on technology platforms, such as the Internet, mobile or other electronic devices, used for producing, distributing, exchanging and consuming goods/services in global markets (Tsyganov and Apalkova, 2016; Balcerzak and Pietrzak, 2017).

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 harmonized relationship between the level of digital technology development and the time taken for introducing digital technologies into industrial and business spheres (Galichkina, 2014). In fact, 41% of enterprises in the European Community still do not seize on digital technologies, and only 2% harness every single property of new technologies. This is why European countries gear their policies and blaze development paths of key priority sectors towards the acceleration of digital business transformations, towards the practice of giving encouragement to use the latest digital technologies, and towards building of new business models.

New products and needs are generated now at the rapid pace,due to the speed and volume of information, thereby opening up significant opportunities for business creation and development. Digital technologies are currently the target of investment flows and global resources throwing, human and financial (World Investment Report, 2017). So far, European countries are forecasting staffing needs that may hit when digitalizing various sectors of economy.

The UK government calculated the necessity of doubling the number of university graduates with engineering and digital skills by 2020, up to 1.86 million people from the current amount. As roughly estimated, preparing a sufficient number of scientists, designers and engineers will take £2.5 billion investment. In Russia, the plan is to produce 60 thousand IT specialists by 2020, and 100 thousand specialists by 2025. In common use modern technologies came in countries with high level of GDP among the working population. In the Russian Federation, however, digital economy remains an area with untapped potential. At this point, a big picture necessities the highlighting of features and prerequisites of digital economy development, as well as analyzing of socio-economic factors that contribute to advanced technology development.

2. Literature Review

The digitalization of the economy is considered as a key driver of innovation, economic growth and societal change (Panfilova, 2008; Olber and Spengel, 2017; Mizintsevaa and Gerbina, 2018; Introduction of the Report of the Secretary-General, 2018). The digital economy has the following features that distinguish it from traditional economy: the irrelevance of geographical location, meaning it is no longer a competitive advantage, the key role played by platforms, the importance of network effects, and the use of big data (Valenduc and Vendramin, 2016). Digitization radically changes the very nature of products, the process of value creation and, above all, the competitive environment of firms. Based on the network-centric view, the firms may achieve competitive advantage by actively shaping the digital environment and by connecting firms within the digital environment (Koch and Windsperger, 2017; Chaplyha *et al.*, 2018).

Introduing and developing modern information and communication technologies (ICT) is one of the key factors in digital sector development (Banning, 2016; Domazet and Lazić, 2017). Only if significant,ICT investments can contribute to a strong economy based on knowledge and information technologies. Digital technologies that have been recently introduced like the Internet of Things (IoT) and Big Data have a strong potential, and can help develop the Product Service Systems (Accenture Strategy, 2016; Pagoropoulos *et al.*, 2017; Dorofeyev *et al.*, 2018).

The digital economy enabled the use of blockchain technology in financial transactions. Thistechnology is to ensure that contracts between economic agents are implemented at a high level (Mesropyan, 2016; Vovchenko *et al.*, 2017a; Dorofeyev *et al.*, 2018). Electronic currency serves as one of the essential infrastructure elements of digital economy (Pshenichnikov, 2017; Vovchenko *et al.*, 2017b).

Despite a rapid increase in business spending on capital and services in ICT, the New Digital Economy (mobile technology, the internet, and cloud) has not yet generated any visible improvement in productivity growth (Van Ark, 2016; Nelson *et al.*, 2017). However, one should note that digital economy is still in the middle of formation, so any effects on productivity will occur only with a developed 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). The advent of the digital economy and, implicitly, of competition in the online marketplace has triggered new challenges in terms of consumer protection approaches (Gazzola *et al.*, 2017; Vatamanescu *et al.*, 2017).

Issues concerning the limitation of GDP statistics in measuring the advancement of the digital economy became crucial. The digitalization of economy creates 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, certain developments, 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. When 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, physical labor is assumed to be replaced with 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 factors 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.

Questions arise when researchers try to measure the level of digital development, considering the lack of a common decision on which indicators to use. With the transformation processes going rapidly nowadays, indicators of digital development are to be tailored to target an individual country.

3. Methodology

For analysis, indicators were selected using the flexible general methodological approach based on a heuristic algorithm (Katretchko, 2000; Arkhangelskaya and Izotova, 2006; Izotova, 2006). Logical heuristic methods are universally applicable to various subject fields, types of users, managerial decisions being assessed, and strategic goals being achived. Indicators that were up with given criteria were selected from those varified for compliance, and then listed as indicators characterizing the level of digital sector development. Such indicators include those that are often used, do not require the involvement of experts, can be calculated without details, that give a general picture of digitalization, that allow identifying the weak points, assessing digitalization progress over time, and conducting a comparative analysis.

To assess the progress in digital economy in Russia, several relevant indicators were selected by the logical heuristic method:

ICT Development Index;
Global Innovation Index (GII);
Networked Readiness Index;
Share of Households with Internet;
High-Technology Exports (% of manufactured exports).

Analysis was performed on open data (The Organisation for Economic Co-operation and Development). Given the rapid pace of digitalization, analysis encompassed statistical dat for 2010-2017 (Van Ark *et al.,* 2016; Langley and Leyshon, 2017), and differences in similar indicatorsbetween European countries and Russia. Benchmarking is the process of comparing the products, services or processes of one organization with the products, services or processes of another organization (Benchmarking). 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 Microsoft Excel. Score growth rates were determined in the 2013-2017 Global Innovation Index, and in the 2010-2017 High-Technology Exports. Comparative analysis involved the 2017 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.

4. Results and Discussions

Ranking of countries by the level of innovation was performedusing the score growth rates in the GII (Table 1). The top positions are occupied by the Netherlands, Norway and Switzerland, while Russia lost more than 4 percent.In hindsight, this tendency reoccured. Imagine the pattern: Russia holds its position for a long period, with makingscore improvements or not, but then a crisis occurs, throwingthe country down several ranks (Measuring the Information Society Report, 2017). A crisis can open opportunities for development,but they remain unused, so the dropping-down-in-rank trend becomes the new norm. A few years later, this situation re-emerges: Russia falls several places in the ranking.

Table 1. *Global Innovation Index: score growth rates*

	2017/2016	2016/2015	2015/2014	2014/2013
Russian Federation	0.68%	-2.04%	0.41%	5.22%
Finland	-2.35%	-0.17%	-1.10%	1.95%
Germany	0.78%	1.47%	1.93%	0.34%
Norway	2.17%	-3.33%	-3.22%	-0.09%
Netherlands	8.70%	-5.37%	1.67%	-0.90%
Switzerland	2.13%	-2.96%	5.43%	-2.72%

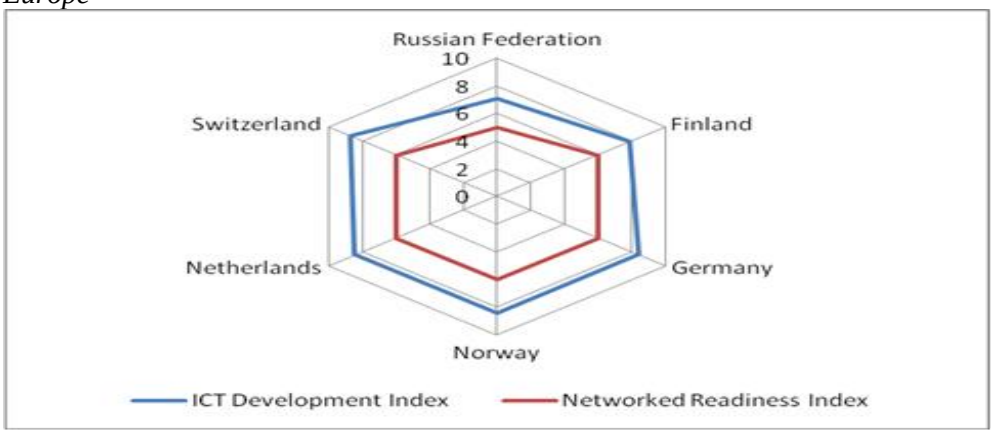
According to the ranking of countries by high-tech exports,Russia lags in the production of products with high R&D intensity, such as aerospace products, computers, pharmaceuticals, scientific instruments, and electrical machinery. Russian exports are mainly raw materials. In 2017, metallurgical and chemical industries together with minerals accounted for 64.8 percent of exports, and that were intermediate goods from low technology, while the share of high-tech exports in total Russian exports was only 10.7%.

***Table 2**. High-Technology Exports (% of manufactured exports): score growth rates*

	2017/ 2016	2016/ 2015	2015/ 2014	2014/ 2013	2013/ 2012	2012/ 2011	2011/ 2010
Russian Federation	-22.46	20.00	15.00	19.05	5.00	-22.46	20.00
Finland	-3.45	10.13	9.72	-15.29	-8.60	-3.45	10.13
Germany	1,20	4,38	-0,62	0,63	6,67	1,20	4,38
Norway	-5,85	-0,97	8,38	1,60	1,62	-5,85	-0,97
Netherlands	-7,77	-3,02	-2,45	2,00	1,01	-7,77	-3,02
Switzerland	1,12	1,52	-0,38	2,71	3,61	1,12	1,52

Figure 1 shows the scores of Russia and Europe in the ICT Development Index and the Networked Readiness Index. In 2017, 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, which top spots were occupied by Finland, Singapore, Norway, Netherlands and Switzerland in 2016, when Russia ranked 2 positions behind.

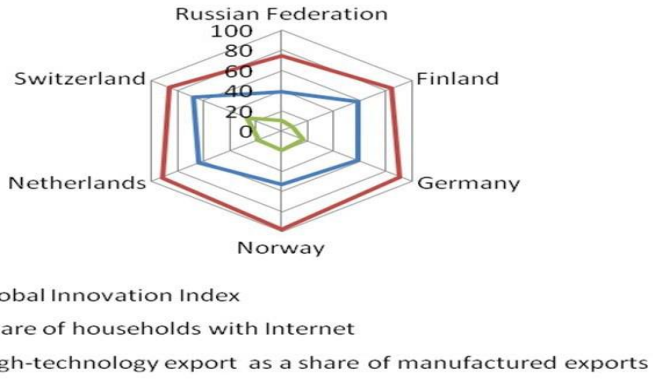
***Figure 1**. ICT Development Index and Networked Readiness Index: Russia vs Europe*



In the Share of Households with Internet, European countries reached a level of 80% and higher. In 2017, the percenatage 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 UK also reported rather high figures. In listed countries, the proportion of households with Internet was over 90 percent, so was the rate of broadband Internet penetration. The Russian Federation reported 74.8 percent of connections tops (Figure 2). This figure indicates the presence of an infrastructure suitable 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 formal economy. The digital realm can generate new jobs across the country. However, Russia is lagging behind in certain apects of digitalization.

The Digital Economy and Society Index (DESI) is used to evaluate technological development of the European Union, and its performance in the integration of innovations (Digital Economy and Society Index, 2017). This stands on the following pillars: Connectivity, Human Capital, Use of Internet, Integration of Digital Technology, and Digital Public Services. Because Russia is not a member of the EU, its DESI value is not included in official editions (The Global Information Technology Report, 2016; Digital Economy and Society Index, 2017). Numerous propositions were made by scientists and practitioners to improve information support and statistical reporting by tying them to changes that occur within the information society. At this day, a loophole in this dimension keeps digitalization and innovation development out of assessment, so that the control over associated risks, as well as the fair assessmentof possibilities associated with development and competitiveness, becomes challenging.

This paper is an attemp to illuminate the social and economic background, and to allocate conditions for a transition to digital economy. These issues were raised in (Slavin, 2015; Yudina, 2016). The background for digital development in Russia is

made up from a high potential in the industry that is engaged in the education of digital economic specialists, as well as from original organizational and technological solutions that were offered to create an effective infrastructure of the digital economy (Van Gorp and Batura, 2015; Żelazny and Pietrucha, 2017). Researchers expand this list by addying the trend of offering new in the market (Maheret *et al.,* 2017; Balcerzak and Pietrzak, 2017),enhanced use of 3D printers, eco-friendly smart house building (Grömling, 2016; Panshin, 2016; Scantlbury *et al.*, 2017), and other important aspects that give a boost to digitalization.

5. Conclusions

Advanced countries of the world regard the integration of digital technologies as one of the main factors affecting the innovation-driven development and strengthening of competitive advantages. The Russian Federation, however, is lagging behind in ICT development. At the present moment,the country is only developing the strategies aimed at creating one's own digital market and mining its potential.

The analysis of indicators characterizing the level of digital development in Russia and Europe brought to the surface the fact of underrun. In the Share of Households with Internet, Russia shows nearly 75 percent, indicating the presence of an infrastructure suitable for digital technologies, but still this value is lower than in European countries,down by more than 10 percent. Russia performed in the ICT Development Index, as well as in the Networked Readiness Index, so that made it way to the top ten. The growth rate in High-Technology Exports indicated the lag of Russia in the production of products with high R&D intensity.

Russia blazes its path to digital economy, digital society through the national market, and what is most critical,through the use of ICT and digital technologies. The Russian government throws efforts towards the provision of Internet access, towards infrastructure development. In the institutional environment, its role is rather supporting, meaning the support via the state policy, legislation, and the provision of resources. The consumer demand for digital technology is fairly high. Still, a regulatory framework must be formed to create a dynamic business sphere within which enterprises and households could use digital technologies. To this end, things required to ensure the growth of robust competition, the creation of innovation solutions, and reduction of costs, are the R&D investment, all-round support and integration of new technologies.

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References:

Accenture Strategy. 2016. Circular Advantage: Business Models and Technologies.

Ahmad, N., Schreyer, P. 2016. Are GDP and Productivity Measures up to the Challenges of the Digital Economy? International Productivity Monitor, 30, 4.

Arkhangelskaya, L.Yu., Izotova, T.G. 2006. Developing and applying methods of selecting indicators for assessing the effectiveness of business entities. Proceedings of the Higher Educational Institutions, Izvestia vuzov "Geodesy and aerophotosurveying", 3, 158-168.

Balcerzak, P.A., Pietrzak, B.M. 2017. Digital Economy in Visegrad Countries. Multiple-criteria Decision Analysis at Regional Level in The Years 2012 and 2015. Journal of Competitiveness, 9(2), 5-18.

Balcerzak, A.P., Pietrzak, M.B. 2017. Digital economy in Polish regions. Proposal of measurement via TOPSIS with generalized distance measure GDM. The 11th Professor Aleksander Zelias International Conference on Modelling and Forecasting of Socio-Economic Phenomena. Conference Proceedings (Cracow: Foundation of the Cracow University of Economics), 21-28.

Banning, M.E. 2016. Shared entanglements – Web 2.0, info-liberalism & digital sharing. Information, Communication and Society, 19(4), 489-503.

Chaplyha, V., Beley, O., Chaplyha, V. 2018. Development of the management system of Ukraine's enterprises in the conditions of the digital economy. Zeszyty Naukowe Politechniki Poznańskiej. Organizacja i Zarządzanie, 76, 37-55.

Cockayne, D.G. 2016. Sharing and neoliberal discourse: The economic function of sharing in the digital on-demand economy. Geoforum. Journal of Physical, Human, and Regional Geosciences, 77, 73-82.

Digital Economy and Society Index. 2017. https://ec.europa.eu/digital-single-market/en/desi

Domazet, I., Lazić, M. 2017. Information and communication technologies as a driver of the digital economy. Glasnik Srpskog geografskog društva, 11-19.

Dorofeyev, M., Ksov, M., Ponkratov, V., Masterov, A., Karaev, A., Vasyunina, M. 2018. Trends and Prospects for the Development of Blockchain and Cryptocurrencies in the Digital Economy. European Research Studies Journal, 21(3), 429-445.

Galichkina, M.A. 2014. The main features and ways of expanding the interaction between higher education, government and business. Vestnik universiteta, 14, 120-124.

Gazzola, P., Colombo, G., Pezzetti, R., Nicolescu, L. 2017. Consumer empowerment in the digital economy: Availing sustainable purchasing decisions. Sustainability, 9(5), 693.

Gorelova, E. 2016. Russian Companies Cannot Benefit From Digital Technologies. Vedomosti, 4122.

Grömling, M. 2016. The Digital Revolution -New Challenges for National Accounting? World Economics, 1-13.

Introduction of the Report of the Secretary-General: Building Digital Competencies to benefit from existing and emerging technologies, with a special focus on gender and youth dimensions, Shamika N. Sirimanne Director, Division on Technology and Logistics. 2018. UNCTAD Head of the CSTD Secretariat.

Izotova, T.G. 2006. Indicators for assessing the effectiveness of business entities: selection methodolgy development. Proceedings of the Higher Educational Institutions. Izvestia vuzov "Geodesy and aerophotosurveying, 2, 162-166.

Katretchko, S.L. 2000. Between Logic and Heuristic. Logic and Philosophy of Logic, https://www.bu.edu/wcp/Papers/Logi/LogiKatr.htm

Koch, T., Windsperger, J. 2017. Seeing through the network: Competitive advantage in the digital economy. Journal of Organization Design, 6(1), 6.

Langley, P., Leyshon, A. 2017. Platform capitalism: The intermediation and capitalisation of digital economic circulation. Finance and Society, 3(1).

Maher, M., Reynolds, P., Muysert, P., Wandschneider, F. 2017. Resetting Competition Policy Frameworks for the Digital Ecosystem. http://www.gsma.com/publicpolicy/wp-content/uploads/2016/10/GSMA_Resetting-Competition_Report_Oct-2016_60pp_WEBv2.pdf.

Measuring the Information Society Report. 2017. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf

Mesropyan, M. 2016. The Central Bank will Enjoy the Taste of the Blockchain. Vedomosti, http://www.vedomosti.ru/finance/articles/2016/07/04/647759-tsb-rasprobuet-blockchain.

Mizintsevaa, M.F., Gerbina, T.V. 2018. Knowledge Management: A Tool for Implementing the Digital Economy. Scientific and Technical Information Processing, 45(1).

Nelson, S.B., Jarrahi, M.H., Thomson, L. 2017. Mobility of knowledge work and affordances of digital technologies. International Journal of Information Management, 37(2), 54-62.

Olbert, M., Spengel, C. 2017. International taxation in the digital economy: challenge accepted. World tax journal, 9(1), 3-46.

Pagoropoulos, A., Pigosso, D.C., McAloone, T.C. 2017. The emergent role of digital technologies in the Circular Economy: A review. Procedia CIRP, 64, 19-24.

Panfilova, E.E. 2008. The global information and economic community as an objective environment for the 21-century industrial organization to operate. Management in Russia and Abroad, 2, 50-55.

Panshin, B. 2016. Digital economy: features and development trends. The Science and Innovations, 3 (157).

Petrenko, S.A., Makoveichuk, K.A., Chetyrbok, P.V., Petrenko, A.S. 2017. About readiness for digital economy. In Control in Technical Systems (CTS)2017 (IEEE II International Conference on, IEEE), 96-99.

Pshenichnikov, W.W. 2017. Electronic money as a factor in the development of the digital economy. St. Petersburg State Polytechnical University Journal, Economics, (1).

Scantlbury, S., Ross, J., Bauriedel, V. 2017. Designing Digital Organizations, BCG, http://www.bcg. com/ru-ru/about/bcg-review/design-of-digital-organizations.aspx.

Semjachkov, K.A. 2017. Digital economy and its role in the management of modern socio-economic relations. Modern Management Technology, 8 (80).

Slavin, B.B. 2015. Interrelation of the stages of development of information technology and economics. Inf. O-vo., 6, 4–13.

Sutherland, W., Jarrahi, M.H. 2018. The sharing economy and digital platforms: A review and research agenda. International Journal of Information Management, 43, 328–341.

The Global Information Technology Report, 2016, Innovating in the Digital Economy http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

The Organisation for Economic Co-operation and Development (OECD) http://www.oecd.org/

The Presidential Decree from May 9, 2017 no. 203 on the Strategy for the Information Society Development in the Russian Federation for 2017-2030, 2017, http://www.kremlin.ru/acts/bank/41919.

Tsyganov, S., Apalkova, V. 2016. Digital Economy: a new paradigm of global information society. Economic Review, 45(3).

Valenduc, G., Vendramin, P. 2016. Work in the digital economy: sorting the old from the new (No. UCL-Université Catholique de Louvain) (Brussels: European Trade Union Institute.)

Van Ark, B. 2016. The productivity paradox of the new digital economy. International Productivity Monitor, 31(3).

Van Ark, B., Erumban, A., Corrado, C., Levanon, G. 2016. Navigating the New Digital Economy: Driving Digital Growth and Productivity from Installation to Deployment. Conference Board, Incorporated.

Van Gorp, N., Batura, O. 2015. Challenges for Competition Policy in a Digitalised Economy http://www.europarl.europa.eu/RegData/etudes/STUD/2015/542235/IPOL_STU(2015)542235_EN.pdf

Vatamanescu, E.M., Nistoreanu, B.G., Mitan, A. 2017, Competition and consumer behavior in the context of the digital economy. Amfiteatru Economic, 19(45), 354.

Vovchenko, N.G., Andreeva, A.V., Orobinskiy, A.S., Filippov, Y.M. 2017a. Competitive Advantages of Financial Transactions on the Basis of the Blockchain Technology in Digital Economy. European Research Studies, 20(3B), 193-207.

Vovchenko, G.N., Tishchenko, N.E., Epifanova, V.T., Gontmacher, B.M. 2017b. Electronic Currency: the Potential Risks to National Security and Methods to Minimize Them. European Research Studies Journal, 20(1), 36-48.

Watanabe, C., Tou, Y., Neittaanmäki, P. 2018. A new paradox of the digital economy - Structural sources of the limitation of GDP statistics. Technology in Society, 55, 9-23.

Watanabe, C., Naveed, K., Tou, Y., Neittaanmäki, P. 2018. Measuring GDP in the digital economy: Increasing dependence on uncaptured GDP, Technological Forecasting and Social Change, 137, 226-240.

World Investment Report. 2017. Investment and Digital Economy, https://unctad.org/en/PublicationChapters/wir2017_KeyMessage_en.pdf

Żelazny, R., Pietrucha, J. 2017, Measuring innovation and institution: the creative economy index. Equilibrium. Quarterly Journal of Economics and Economic Policy, 12(1), 43-62.

Yudina, T.N. 2016. Comprehension of Digital Economy. Theoretical Economics, 3, 12 .