

INFLUENCE OF THE DIGITAL ECONOMY ON THE INNOVATIVE DEVELOPMENT OF ENTERPRISES

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Abstract. The article considers the dependence of innovative development of the enterprise on the growth of the digital economy. The issue of digitalization coverage of the main activities of enterprises is revealed, noting that the digital economy is based on innovation with the use in production, promotion, sale, delivery of goods and services of Industry 4.0 technologies. The concept of digital infrastructure as technologies, products and services, hardware and software resources that provide the ability to connect, interact and operate modern digital technologies, use information and data in full. The positions of Ukraine in the world innovation and digital rankings are analyzed, indicating positive and negative tendencies of introduction of digitalization in the activity of enterprises. To determine Ukraine's position in the world innovation and digital rankings the following indices were used as a benchmark: Network Readiness Index; ICT Development Index; Global Innovation Index, Digital Economy and Society Index; Global Competitiveness Index. Ukraine's position in the Country-level digital competitiveness ranking is additionally analyzed. The three main components of the digital economy in the activities of enterprises are identified, namely the use of the Internet in the activities of enterprises, the use of Industry 4.0 technologies by Ukrainian enterprises, assessment of digital literacy of the Ukrainian population. The limit norm of replacement of constituent elements of digital economy in activity of the enterprise in an optimum point of its development is defined. According to the calculations, it was found that in the unsatisfactory state of one of the components of enterprise's digital development, the replacement of such an element is possible by replacing the two elements in the existing business models.

Keywords: digital economy, business models, innovation development, digitalization, digital infrastructure, Industry 4.0.

I. INTRODUCTION

The development of science and technology, the emergence of new technologies are increasingly blurring the boundaries between the real and virtual world. Today we can talk about business virtualization, increasing the number of virtual companies, platform companies. The COVID-19 pandemic has stimulated the change in business models of many companies that have tried to continue their operations by providing remote work, introducing new technologies for communicating with customers, or completely changing the

usual business processes (such as services). We can observe this, including in the field of education, where educational platforms and video conferencing tools have for some time replaced offline learning.

II. LITERATURE REVIEW

We are witnessing the development of the digital economy. There are many approaches to its definition. Scientists note that the main platform for the development of the digital economy is the Internet [1]; it is based on the sale of the same as in the traditional economy, goods and services over the Internet [2, p. 76]. In some cases, the digital economy is identified with activities in which the key factors (means) of production are digital data and their use, which can significantly increase efficiency / productivity in various economic activities [3, p. 14].

However, the variability of modern digital technologies suggests that the digital economy is an economy based on innovation with the use in the production, promotion, sale, delivery of goods and services of Industry 4.0 technology; uses modern digital technologies to obtain and process large amounts of information, obtaining on its basis a specific resource - knowledge in order to form competitive advantages or opportunities to influence consumer behavior; forms a new specific market, where either goods and services, ways of exchanging them, or means of payment are virtualized.

In our opinion, this definition more fully covers all technologies that shape the digital economy, as it is not limited to Internet sales, but also involves the digitalization of production. In this context, digitalization cannot be characterized by automation, the use of computer technology. Modern technologies allow not only to fully automate production, but also to ensure the formation of its virtual model (digital duplicates of warehouses, production lines); full autonomy (artificial intelligence and collective intelligence in warehousing), the ability to interact with humans (Internet of Things, Cobots), and even transform business processes (using 3D printing instead of delivering components).

Given that the economy is undergoing transformation in such manner traditional business processes are changing, we can say that the digital economy needs to be transformed, including infrastructure. Digital infrastructure is being formed - the basis of the sixth technological system.

In general, digital infrastructure is technologies, products and services, hardware and software resources that enable the connection, interaction and operation of modern digital technologies, the use of information and data in full. These include, in particular:

- Broadband Internet;
- Mobile and digital communication;
- Data centers, cloud services and SaaS;
- GPS;
- Software, hardware (servers, devices);
- Platforms (both corporate networks and digital ecosystems and platforms);
- Information security, data protection, encryption, user identification.

In our opinion, such specific components of the digital infrastructure as information education, digital literacy, digital governance ("digital" state) should be isolated.

The specificity of the infrastructure of digital transformation is primarily the constantly increasing the requirements for quality, reliability and speed of components of digital infrastructure due to rapid development of science, technology and, consequently, digital technologies. The absence of any of these components significantly limits the possibility of digitalization and virtually prevents digital transformation.

According to current trends in digital transformation infrastructure, the following requirements can be formed: availability of high-quality and high-speed Internet for individuals and businesses, presence of Internet business, high speed data processing (and high speed and uninterrupted Internet) and high digital literacy.

In general, one of the significant shortcomings of the digital transformation is the widening of the digital divide between developed and developing countries. The more actively new digital technologies are introduced, the greater the gap. Ukraine is one of the developing countries (according to the new IMF classification - Emerging and Developing Europe). However, it also has a well-developed IT sector and IT outsourcing, but a number of problems can be identified by comparing the characteristics of key elements of the digital infrastructure.

The availability of appropriate digital infrastructure is the characteristic that determines the possibility, intensity and speed of digital transformation and sustainability of the digital economy.

III. METHODS

First of all, it is necessary to analyze Ukraine's position in the world innovation and digital rankings. According to the Ukraine 2030E project, the following guidelines have been proposed:

- Network Readiness Index – 10;

- ICT Development Index – 10;
- Global Innovation Index – 10;
- Digital Economy and Society Index – 5;
- Global Competitiveness Index – 10 [4].

These benchmarks are very optimistic, as today Ukraine's position is much worse, and in some rankings the country is absent at all - yes, the Digital Economy and Society Index is calculated only for EU member states. According to the Network Readiness Index, in 2020 Ukraine ranked 64th, improving its rating by 3 points compared to 2019. The methodology of this rating was updated in 2019, but if we compare Ukraine's position in 2016 in the Global Information Technology Report (Network Readiness Index is part of it) - 64 positions - we can say that there is no positive dynamics. [5].

In the ICT Development Index ranking, Ukraine took 79th place in 2017, deteriorating its position by 1 point [6].

In the Global Innovation Index in 2020, Ukraine ranked 45th (an improvement of 2 points compared to 2019; 11 points compared to 2016).

According to the Global Competitiveness Index in 2019, Ukraine ranked 85th [7], with a decrease of 6 positions compared to 2015-2016 (from 79 positions) [8].

Country-level digital competitiveness ranking - the assessment of digital competitiveness is 48.81 out of 100 possible points (57 position out of 62) [9].

The Digital Intelligence Index, which evaluates digital evolution as a function of the current state of digitization and the rate of digitization over time, is quite indicative [10]. According to this rating, countries are divided into 4 groups: economies that stand out; breakthrough economies; slowing economies; economies at risk. Ukraine is one of the breakthrough economies - the current level of digitalization is low, but the dynamics are positive and there is rapid development. The closest countries in this ranking are Argentina, Rwanda, Ghana.

The Digital Intelligence Index assesses the digital infrastructure in 4 key groups: Supply Conditions (includes Access Infrastructure, Transaction Infrastructure, Fulfillment Infrastructure), Demand Conditions (includes Human Condition, Device and Broadband Uptake, Digital Inclusion, Digital Payment Uptake), Institutional Environment (includes assessment of Institutional Effectiveness and Trust, Institutions and the Business Environment, Institutions and the Digital Ecosystem), Innovation and Change (includes assessment of Inputs, Processes, Outputs) [10].

Given that the ranking includes 90 countries, these analysts are quite indicative. The maximum score is 100, so calculating the average value of the evaluation of indicators for each component, you can visualize the position of Ukraine, both relative to the average and in comparison with other countries.

In terms of Supply Conditions, Ukraine is not a leader, moreover - only Fulfillment Infrastructure is almost equal to the average value (Fig. 1)

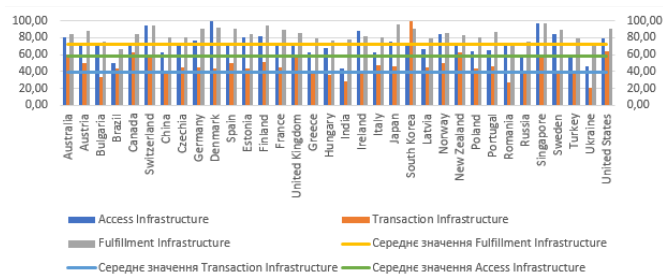


Figure 1 - Country estimates for Supply Conditions
Systematized by the author on the basis of [10]

According to Demand Conditions, Ukraine's position is much better (Fig. 2) - the assessment is close to the average values (except for Digital Payment Uptake, which indicates problems with digital payments, settlements).

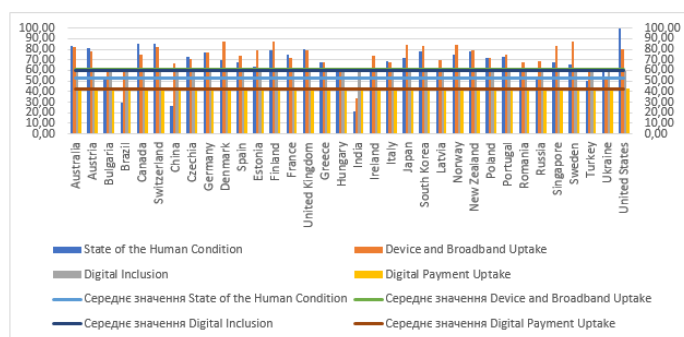


Figure 2 - Country estimates by Demand Conditions
Systematized by the author on the basis of [10]

Assessments of the Institutional Environment component for Ukraine are very negative (Fig. 3). They are not only lower than average, but also differ negatively among developing countries.

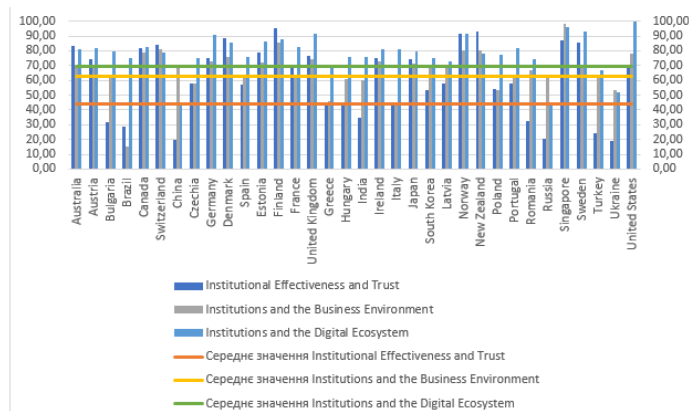


Figure 3 - Institutional Environment Assessments
Systematized by the author on the basis of [10]

For the Innovation and Change component, the situation does not look similarly optimistic (Fig. 4).

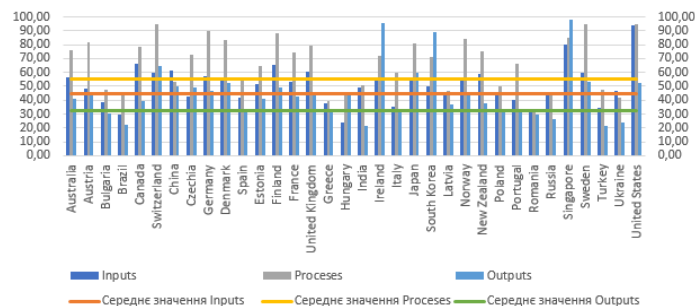


Figure 4 - Country Innovation Scores
Systematized by the author on the basis of [10]

Given that the average score is quite dependent on a large number of developing countries and belong to the group of economies at risk, we can say that Ukraine's lag behind the average scores is a negative trend in order to avoid a digital divide over time. digital infrastructure should be actively developed.

The undisputed basis of the digital economy is the Internet. Therefore, the evaluation of such parameters as network access, availability of coverage, its quality is of paramount importance. Today in Ukraine there are territories where there is no mobile communication. It is noteworthy that while many countries are implementing 5G, Ukraine is only aiming to achieve 90% of 4G coverage. Ookla has created a 5G coverage map. As of May 2021, the most commercially available devices are in Western Europe and the United States. In total, there are more than 26,000 commercially available devices in the world (Fig. 5) (11). At the same time, the global COVID-19 pandemic did not reduce the pace of 5G implementation.



Figure 5 - Map of 5G coverage in the world

As of March 1, 2021, 22,731 cities and villages in Ukraine already have a 4G mobile network. 5109 settlements still need to be connected [12].

It should be noted that according to the map of coverage of the territory of Ukraine by mobile (mobile) services, the 4G network does not have very good coverage in the whole territory. Most of the territory is covered by the LTE-900 standard (Fig. 6, a)), the least - LTE2600 (Fig. 6, c)) [13].

The biggest problem with coverage is in rural areas, as in most cases the deployment of 4G network there is not economically feasible - the cost of the access point is very high.

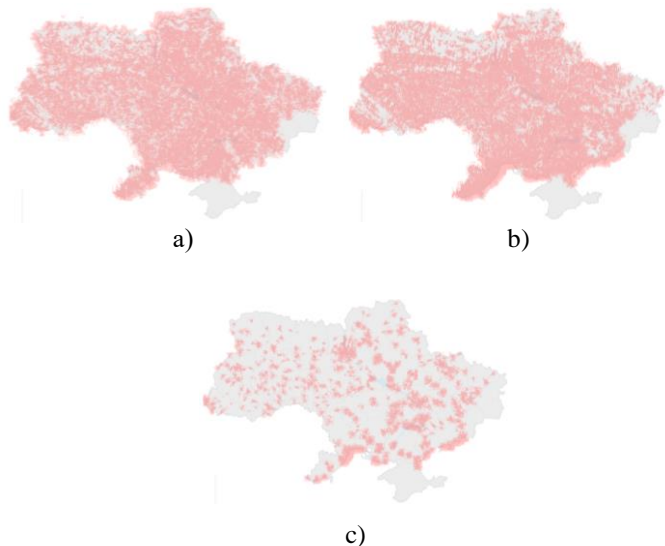


Figure 6 - Map of 4G coverage of Ukraine according to the standard LTE-900 (a), LTE-1800 (b), LTE-2600 (c)

IV. RESULTS

As for business, as of 2018, 86.4% of enterprises had access to the Internet (14), but its areas of use are quite traditional (Table 1).

Table 1 - Statistics on the use of the Internet in Ukraine by enterprises, %

Direction of use of the Internet	2018	2019
Number of enterprises that had access to the Internet	88,0	86,4
Including used network for		
sending or receiving e-mails	86,9	85,4
making phone calls via Internet / VoIP or video conferencing	27,8	28,5
obtaining information about goods and services	78,2	77,1
use instant messaging and bulletin board	43,0	42,7
obtaining information from public authorities	71,2	70,4
carrying out banking operations	85,5	84,3
access to other financial services	35,8	35,8
Number of businesses that had a website	35,6	35,2
Number of companies that used social media		
social networks	25,0	25,7
blogs or microblogs of the enterprise	7,0	7,2
Number of businesses that have used social media for		
presentation of the enterprise or advertising of its work (goods, services)	22,9	23,5
receiving customer feedback or providing answers	16,8	17,3
attracting customers to development or innovation	10,6	10,9
cooperation with business partners or other organizations	17,1	17,5
hiring workers	12,8	13,3
Number of enterprises that purchased goods or services via the Internet	19,5	20,1
Number of enterprises that received orders via the Internet for the sale of goods or services (excluding orders, received by e-mail)	5,0	4,8

Compiled by the author according to the State Statistics Committee

We can say that the Internet in most cases is used for messaging (including obtaining information from public authorities), banking. But online presence is low - only about a third of businesses have their own website, social media use only a quarter, in most cases - to advertise goods and services. As of 2019, only 19% of businesses traded online, but the pandemic has undoubtedly changed these statistics - many companies have urgently needed to create websites with the ability to place orders (both directly on the site and via e-mail and phone calls) due to quarantine restrictions.

However, it should be noted that enterprises with less than 10 employees are excluded from the statistics, while in Ukraine micro-enterprises account for 82.3% of small enterprises (as of 2019), and many of them are sole proprietors who operate on social networks.

Speaking of technologies closer to Industry 4.0, it can be noted that their use in Ukraine is very weak (Table 2).

Table 2 - Use of Industry 4.0 technologies by Ukrainian enterprises, %

Technology and direction of use	2018	2019
Cloud computing		
office software	4,3	4,8
enterprise database hosting	3,4	4,0
file storage service	3,6	4,2
financial or accounting applications	5,3	5,9
customer relationship management programs	2,5	2,9
computer power for the operation of enterprise software	3,1	3,5
Big Data		
data obtained from smart devices or sensors	5,9	5,7
geolocation data obtained from portable devices	3,4	3,7
data generated from social media	3,3	3,3
other sources	6,0	5,6

Compiled by the author according to the State Statistics Committee

Cloud computing, SaaS are very cost-effective (as it is cheaper than deploying your own servers, purchasing software, licenses, etc.) and mobility, as they are available from any device in any point of the world, which allows uninterrupted control and monitoring of business. But their use, as seen above, is limited.

Despite the fact that digital transformation is primarily characterized by the use of large amounts of information for its further analysis and accumulation of knowledge, which becomes a productive factor and can be used not only to form the most relevant proposals for consumers, but also to influence demand. Information from social media is especially important because it reflects the tastes, areas of interest of the consumer - from products, goods and services to the places he visits. But, as you can see, this opportunity is very little used by domestic enterprises.

Due to the fact that the Internet coverage network in Ukraine is imperfect, and companies use little geolocation data and data from smart devices and sensors - we can talk about the limited development of important technology for digital transformation - the Internet of Things.

The Internet of Things in Ukraine is being implemented by mobile operators:

- Cisco IoT Control Center (Cisco Jasper) Kyivstar;

- Vodafone IoT solution;
- NB-IoT and LoRaWAN lifecell.

Their field of application is somewhat similar to the well-known M2M (for example, automatic transmission of meter data), but allows not only to transmit information, but also to accumulate it, analyze, ie use the analysis of "big data" and even artificial intelligence.

Digital literacy and digital security are important elements of the digital transformation infrastructure.

The educational infrastructure is not yet ready for digital transformation. The President of Ukraine stated that a university will be established in Ukraine to train cybersecurity specialists. In recent years, despite the negative statistics on cybercrime (Fig. 7), the level of cybersecurity has increased significantly (Table 3).

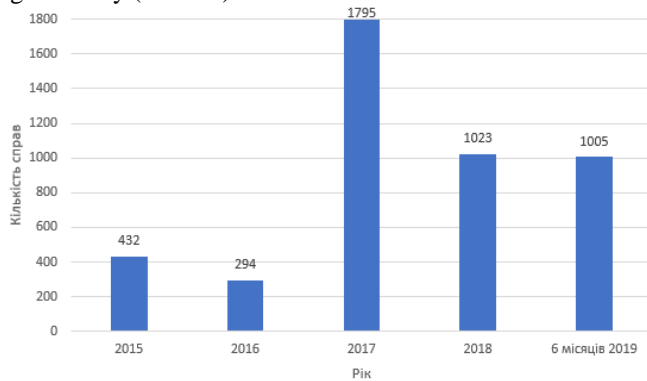


Figure 7 - The number of open cases under Art. 361 CCU
Source [15]

The level of cybersecurity in the country reflects the National Cyber security Index (until 2020, the Global Cybersecurity Index).

Table 3 - Positions of Ukraine and neighboring countries in the National Cyber security Index

	2017	2018	Зміна 2018/2017	2020	Зміна 2020/2018	Випередження/відставання кібербезпеки та цифрового розвитку, дані 2020 року
Україна	58	54	+ 4	25	+ 29	+ 10,73
Польща	33	29	+ 4	6	+ 25	+ 20,42
Австрія	30	28	+ 2	26	+ 2	- 9,84
Росія	10	26	- 16	29	- 3	- 2,55
Білорусія	39	69	- 30	54	+ 15	- 22,25
Молдова	72	53	+ 19	57	- 4	- 10,17

* "+" - cybersecurity is ahead of the level of digital development; "-" - cybersecurity lags behind the level of digital development

Source [17], [18], [19]

A feature of the National Cyber Security Index of 2020 is that the rating not only reflects the rating on the level of cybersecurity, but also shows the lag or advance of

cybersecurity and digital development. From this position, we can assess the dynamics of Ukraine as positive.

Regarding digital literacy, in 2020 an e-service of public services was launched in Ukraine, within the framework of which the platform Action.Digital education was launched, where educational services for digital skills are available. The platform also launched a digital literacy test (Digital Literacy). According to the results of the first 50,000 tests, statistics were generated, which showed that in general the level of computer literacy is average and high, but the individual components of the overall assessment differ greatly (Table 4).

Table 4 - Results of the digital literacy test on the Action platform

Indicator	High level (C1, C2)	Intermediate level (B1, B2)
Basics of computer literacy	Almost 77%	More than 22%
Digital problem solving and lifelong learning	Almost 56%	43%
Security in the digital environment	More than 40%	Almost 58%
Information literacy and data skills	About 37%	62%
Communication and interaction in the digital society	Almost 29%	69%
Creating digital content	27%	63%

Compiled by the author on the basis of [20]

The implementation of this application has increased the number of services available in digital format. In general, the state of e-government in Ukraine has improved in recent years, as evidenced by the positions in the global ranking of E-Government Survey: according to the E-Government Development Index in 2016 Ukraine ranked 62nd position [21], in 2018 - 82nd position [22], in 2020 - 69 positions [23], for 2 years of improvement +13 positions.

To model and determine the impact of the digital economy on the innovative development of enterprises used calculations to determine the marginal rate of replacement of elements at the optimal point. The data in tables 1-4 allow calculations based on the Cobb-Douglas function:

$$X = F(K, L) = 3 K^{2/3} L^{1/3}.$$

At the same time, F is an indicator that reflects the level of digital literacy of the population of Ukraine. It has 5 generalized elements: f1 basics of computer literacy; f2 digital problem solving and lifelong learning; f3 security in the digital environment and information literacy and data skills, f4 communication and interaction in the digital society, f5 creation of digital content.

Indicator K takes into account the use of Industry 4.0 technologies by Ukrainian enterprises, and consists of 10 elements, namely: k1 - office software, k2 - enterprise database hosting, k3 - file storage service, k4 - financial or accounting applications, k5 - programs to manage customer relationships, k6 - computer power for the operation of enterprise software; k7 - data obtained from smart devices or sensors; k8 - geolocation data obtained from portable devices; k9 -data generated from social media; k10 - other sources (big data).

One of the largest indicators is L, which is formed of 15 blocks of 10 elements, which is a total of 150 elements. The most widely used indicator L, which reflects the use of modern means of the Internet in the activities of enterprises consists of blocks: the number of enterprises that had access to the Internet; number of companies that had a website; the number of companies that used social media; the number of enterprises that purchased goods or services via the Internet; the number of enterprises that received orders via the Internet for the sale of goods or services (excluding orders received by e-mail).

Since $F(0, L) = F(K, 0) = 0$, the optimal value of $K^* > 0$, $L^* > 0$, so the conditions take the following form:

$$\frac{\partial F}{\partial K} = \lambda w_K,$$

$$\frac{\partial F}{\partial L} = \lambda w_L,$$

or in our case

$$\frac{2}{3} \frac{F(K^*, L^*)}{K^*} = \lambda w_K,$$

$$\frac{1}{3} \frac{F(K^*, L^*)}{L^*} = \lambda w_L,$$

Dividing the first equation by the second, we obtain

$$\frac{2L^*}{K^*} = \frac{w_K}{w_L}$$

Substituting this relationship to the condition
 $w_K K^* + w_L L^* = 150$

we find

$$K^* = \frac{2}{3} \frac{150}{w_K} = 20, \quad L^* = 5.$$

The solution can be illustrated geometrically. In fig. Figure 8 shows isocosts (fixed cost lines for $C = 50, 100, 150$) and isoquants (fixed output lines for $X = 25.2; 37.8$).

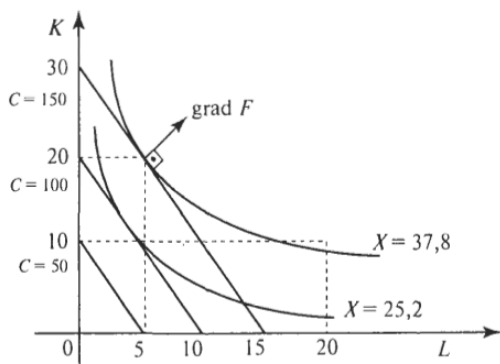


Figure 8 - Graphic representation of the maximum number of elements of influence

Isocosts have the following equations:

$$5K + 10L = C = \text{const.}$$

Isoquants have the following equations:

$$3K^{2/3}L^{1/3} = X = \text{const.}$$

At the optimal point $K^* = 20$, $L^* = 5$ isoquant $X^* = 37.8$ and isocost $C = 150$, which pass through this point intersect, because according to the normal to these curves, which are given by gradients $(\frac{\partial F}{\partial K}, \frac{\partial F}{\partial L})$, (w_K, w_L) , collinear.

Replacement rate at the optimal point:

$$S_K = \frac{\partial F / \partial L}{\partial F / \partial K} = \frac{1 - \alpha K^*}{\alpha L^*} = \frac{1}{2} \frac{20}{5} = 2.$$

That is, one element can be replaced by two other elements of innovative development of the enterprise.

CONCLUSION

The use of modern technologies in Industry 4.0, which are the main elements of the digital economy, significantly stimulates the innovative development of enterprises. The main components of the assessment of business digitalization are digital literacy of the population, the use of modern digital infrastructure and the transformation of business processes. The article uses an analysis of Ukraine's position in global innovation and digital rankings to assess the impact of the digital economy on the innovative development of enterprises, which reflected a negative trend in most of them. Today, Ukraine's position is much worse, and in some rankings the country is absent. Other important elements of impact assessment are the degree of Internet use in the enterprises' activities, the use of Industry 4.0 technologies and digital literacy of the population as a whole. In modeling and outlining the impact of the digital economy on the innovative development of enterprises, it was determined that for the optimal value of innovative development of enterprises it is important to consider at least five groups of elements of the digital economy. However, the replacement of any one element by an additional one, means that two additional elements would need to be considered. Thus, the impact of the digital economy on the innovative development of enterprises is reflected in the changing business models of enterprise management.

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REFERENCES

1. Pyshchulina O. Digital economy: trends, risks and social determinants. Razumkov Center. Kyiv. 2020. 264 p.
2. Zavitiy O. Digital economy - the economy of the virtual world. And the international scientific-practical conference "Digital Economy: Trends and Prospects". 2019. S. 76-77.
3. Karcheva GT, Ogorodnya DV, Openko VA Digital economy and its impact on the development of national and international economy // Financial space. 2017. №. 3. pp. 13-23.

4. Fishchuk V., Matyushko V., Chervnev E. Ukraine 2030E - a country with a developed digital economy. URL: <https://strategy.uifuture.org/kraina-z-rozvinutoyu-cifrovoyu-ekonomikoyu.html#summary>. (application date 30.01.2021)
5. Network Readiness Index 2021. URL: <https://networkreadinessindex.org/>. (access date 21.07.2021)
6. ICT Development Index 2017. URL: <https://www.itu.int/net4/ITU-D/idi/2017/> (access date 14.06.2021)
7. The Global Competitiveness Report 2019. URL: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf (accessed 26.06.2021)
8. The Global Competitiveness Index 2015-2016. URL: <https://widgets.weforum.org/global-competitiveness-report-2015/index.html> (accessed 17.07.2021)
9. Country-level digital competitiveness rankings worldwide as of 2021. URL: <https://www.statista.com/statistics/1042743/worldwide-digital-competitiveness-rankings-by-country/> (accessed 28.07.2021)
10. Digital Intelligence Index. URL: <https://digitalintelligence.fletcher.tufts.edu/trajectory> (accessed 21.07.2021)
11. OOKLA 5G MAP. URL: <https://www.speedtest.net/ookla-5g-map> (accessed 21.06.2021)
12. Law of Ukraine On Amendments to the Tax Code of Ukraine (on establishing a moratorium on indexation of rental rates for the use of radio frequency resources of Ukraine for the type of radio "cellular radio"). 08/06/2020
13. Map of online mobile coverage of Ukraine. URL: <http://dev.ucrf.gov.ua:2085/> (access date 30.01.2021).
14. Website of the State Statistics Service of Ukraine. URL: <http://www.ukrstat.gov.ua/> (addition date 22.06.2021).
15. The number of cybercrimes in Ukraine has doubled in the last five years. URL: <https://opendatabot.ua/analytics/374-hackers> (access date 02.07.2021).
16. Official site of the National cyber security index. URL: <https://ncsi.ega.ee/ncsi-index/?order=rank> (accessed 08.08.2021).
17. Global Cybersecurity Index (GCI) 2017. URL: https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI01-2017-R1-PDF-E.pdf date of application 18.07.2021).
18. Global Cybersecurity Index (GCI) 2018. URL: https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI01-2018-PDF-E.pdf (access date) 18.07.2021).
19. G. Eason, B. Noble, and I. N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," *Phil. Trans. Roy. Soc. London*, vol. A247, pp. 529–551, April 1955.
20. J. Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 3rd ed., Vol. 2. Oxford: Clarendon, 1892, pp.68–73.
21. I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in *Magnetism*, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
22. K. Elissa, "Title of paper if known," unpublished.
23. R. Nicole, "Title of paper with only first word capitalized," *J. Name Stand. Abbreviation*.
24. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," *IEEE Transl. J. Magn. Japan*, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
25. M. Young, *The Technical Writer's Handbook*. Mill Valley, CA: University Science, 1989.
26. The concept of APPAU "National Industry Strategy 4.0"
27. Order of the Cabinet of Ministers of January 17, 2018 №67-r "On approval of the Concept of development of the digital economy and society of Ukraine for 2018-2020 and approval of the action plan for its implementation"