

VIRTUALIZATION OF INTERNATIONAL TRADE UNDER THE CONDITIONS OF DIGITAL ECONOMY

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ABSTRACT

The study is devoted to the organizational and economic principles of virtualization of international trade in a digital economy. Analytical aspects of the impact of digital economy technologies on the virtualization of international trade on the basis of systematization of digitization scenarios and expert research of intergovernmental organizations and analytical agencies are analyzed. The main preconditions and challenges for the virtualization of international trade by levels: global, international, individual state, individual trading company, taking into account the independent motivation for change and the impact of public policy. Groups of business processes of international trading companies have been identified and are suitable for the introduction of technology for their transformation, which belong to the tools of the digital economy. The methodological bases of segmentation of companies in the context of their readiness for virtualization of processes in international trade on the basis of preliminary questionnaires of respondents are substantiated. The following types of international companies are established as: non-virtualized, partially virtualized, basic virtualized, companies with outsourcing of business process virtualization and virtualized companies. It is proved that the segmentation method is effective for determining the type of international companies for compliance with the parameter “trade virtualization” and their further ranking in order to make management decisions.

Keywords: *Virtualization; Digitalization; Digital Tools; International Trade; Business Process*

1. INTRODUCTION

Quarantine restrictions under COVID-19 have become an unprecedented catalyst for digital change in international trade. Among the main trends are the active development of virtual money (Webmoney), virtual currency (Bitcoin), virtual banking (Webbanking), e-commerce (E-commerce), which reflects the aspect of virtualization of the relationship between seller and buyer. Confirmation of this trend is the increase in the share of non-cash payments - from 50% in early 2020 to 65% in 2021, the use of Big Data to analyze customer behavior, integration into the workflow of artificial intelligence and cloud services, etc. [1].

The process of implementing the concept of digital economy in international trade, which has

become the ideology of the XXI century in developed countries, is quite complex, lengthy and controversial in developing countries. Quite often, managers in these countries do not always have a sufficient level of digital literacy and consider digital transformation as an incomprehensible and complex phenomenon, without seeing the place, role and benefits for their own strategy of international trade.

This aspect is exacerbated by the lack of clear and accessible information sources, services, platforms, applications or portals on digital transformation, which in turn slows down the speed of virtualization of business processes in the international trade segment for such companies. In turn, this also prevents the business of highly developed and developing countries from integrating with world trends, which makes it

difficult to enter and work in the international economic arena.

The virtualization of international trade based on the introduction of IT technologies accelerates the transition of trading companies engaged in foreign economic activity to the segment of the digital economy and ensures the acquisition of competitive advantages not only in the real trade of goods, but also in the field of providing virtual services that are associated with it. The importance of the contribution of IT technologies in the virtualization of international trade is realized through the simplification and improvement of the control system of the operational activities of international companies, the acceleration of interaction processes between customers and suppliers, sellers and buyers, employees of all services during the control of sales processes, logistics management and sales in general.

The identified problems and the role of IT technologies necessitate These problems necessitate the development of scientific and methodological approach to the study of virtualization of international trade at different levels, identifying groups of business processes of international trading companies that should be virtualized, segmenting companies in terms of their readiness to virtualize processes in international trade and identify tools for their digitization.

2. LITERATURE REVIEW

Socio-economic manifestations of virtualization, its content and features in the formation of the digital economy are reflected in many scientific concepts and modern theories. The most fundamental are the following research results: the concept of “decline of reality” [2], the theory of virtual class [3], the concept of virtualization of society [4], theoretical studies of virtual organization as a new form of business [5] and the concept of virtualization of economic activity [6].

The current problem of transformational processes in international trade under the influence of the digital economy, occurring in society over the past 7 years in the context of virtualization, many authors have considered in their research. One of the most relevant studies on this topic is the analysis of factors in the development of international trade in the context of globalization under the influence of digitalization [7], a study of the features of digitization of business processes of enterprises, including trading under virtualization

conditions [8], socio-economic aspects of the impact of the digital economy on international trade [9], network effects in international trade under the influence of digital technologies [10], the characteristics of international business in terms of digitalization of trade [11], the specifics of digital business management and e-commerce on a strategic basis [12], the study of an integrated information system for the management of international e-commerce [13].

However, given the rapid development and spread of information and communication technologies, as well as the resulting global trends in business process virtualization, the problems of transformation of international trade in the digital economy need further study, in particular in terms of identifying business process groups of international trading companies. tools of digital economy and substantiation of methodological bases of segmentation of companies in the context of their readiness for virtualization of processes in international trade.

3. THE THEORETICAL AND METHODOLOGICAL BASIS

During the formation of the organizational and economic foundations of the virtualization of international trade in the conditions of the digital economy, such threats to validity as the degree of objectivity of the research were minimized - by studying the analytical aspects of the impact of digital economy technologies on the virtualization of international trade and their measurement (3.1); minimization of the error of the selected tools - through the systematization of the organizational and economic foundations of the virtualization of international trade in the conditions of digital transformations (3.2), which ensured the reliability of the definition of the main prerequisites and challenges for the virtualization of international trade at the levels: world, international, individual state, individual trading company, taking into account independent motivations for changes and influence of state policy; worked out minimization of the error of the selected tools (3.1 and 3.2) on the basis of justifications of the methodological foundations of the segmentation of companies in terms of their readiness for virtualization of business processes in international trade and their further ranking in order to develop recommendations for action.

3.1. Analytical aspects of the impact of digital economy technologies on the virtualization of international trade and their measurement

There are many difficulties in assessing the scale of the impact of digital economy technologies on the virtualization of international trade and the digital economy itself, the value it creates, and the benefits it derives. First, there is no generally accepted definition of the digital economy. Second, there is a lack of reliable statistics on its key components and aspects, especially in developing countries. Although a number of initiatives are already being implemented to remedy this situation, they are still insufficient, and they are barely keeping pace with the rapid development of the digital economy [14].

In this regard, the International Monetary Fund (International Monetary Fund, 2017) has recently initiated discussions in government, academia and business with methods of measuring the digital economy. Currently, the size of the digital economy is estimated at between 4.5% and 15.5% of world GDP. The United States and China account for almost 40% of the value added created in the global information and communication technology sector. The number of people employed

in this sector in the world increased from 34 million in 2010 up to 39 million people in 2015, with the largest percentage (38%) employed in the field of computer services. During the same period, the share of the ICT sector in total employment increased from 1.8% to 2%.

The World Bank recognizes the lack of adequate macroeconomic statistics that can fully assess the benefits of digital and digital technologies or cross-border transactions [15]. According to him, the introduction of digital technologies leads to the blurring of geographical and physical borders and opens new prospects for economic, social and cultural development, as well as to the growth of regional and global competitiveness based on the virtualization of business processes.

Considering the impact of digital technologies on GDP growth in the EU until 2025. The World Bank Group notes that the penetration of fixed broadband Internet access adds + 1.7% to GDP, increased international capacity (+ 0.66% to GDP) and the spread of e-commerce (+ 0.88% to GDP) (Table 1).

Table 1: Scenarios for GDP growth in Europe due to digitalization (including trade virtualization), %

Scenario	The growth of international Internet bandwidth	Increasing penetration of fixed broadband Internet	Trade virtualization
Country scenario	0.55	0.80	0.44
Scenario based on digital agenda	0.66	1.7	0.88
Growth (absolute figure)	0.11	0.9	0.44

Source: [17]

For example, the European Commission estimates that building the EU's digital single market for virtual trade can bring up to € 415 billion a year to the EU economy, create new jobs and build a knowledge-based society [17].

Globally, cross-border data flows increased 45-fold between 2005 and 2014, reaching \$ 2.8 trillion, and the impact of this process on world GDP growth, according to the Newsletter: Key Barriers to Digital Trade [18], was higher than the impact of world trade in goods.

Experts from the analytical agency Gartner [19] assessed the commercial value of trade virtualization in companies representing various industries (Fig. 1). The global value of the business,

derived from artificial intelligence, was \$ 1.2 trillion. in 2018, which is 70% more than in 2017. Until 2022 the global value of artificial intelligence in international trade will reach almost \$ 4 trillion.

Gartner experts believe that artificial intelligence in international trade will be part of the digital transformation strategy and a priority for investment for almost a third of companies. The industries whose representatives predict the maximum effect from investments in technology include: IT, technology and telecommunications (59%), commercial and professional services (43%), as well as consumer services and the financial services sector (32%) [19].

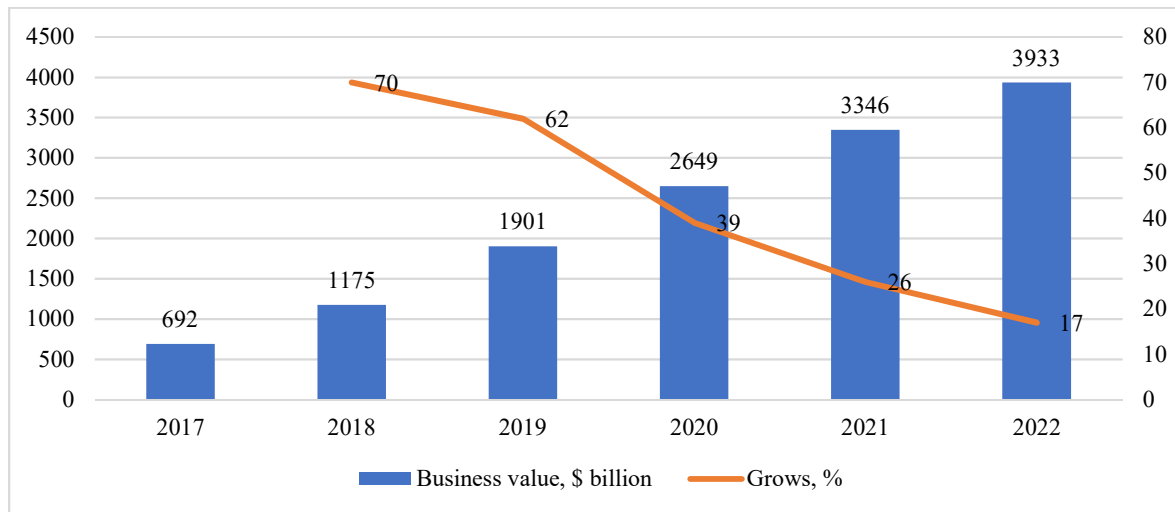


Figure 1: Forecast of total profits of companies obtained through the use of artificial intelligence in international trade
Source: [19]

Thus, the growth of the digital economy will contribute to the emergence of many new economic opportunities in the virtualization of international trade. It is predicted that digital data can be used to solve many social problems, can improve economic and social performance, develop innovation and increase productivity. Digital platforms simplify the implementation of payment transactions for the purchase of goods, the formation of communication networks and the exchange of information about the customer base, the system of cumulative discounts, the grounds for returning the goods and more. From the point of view of trading companies, the transformation of all areas and markets under the influence of digitalization can improve the quality of goods and services while reducing costs. In addition, digitalization transforms the value chain in international trade in various ways,

At the same time, today there is a gap between the processes of virtualization of international trade in developed and developing countries, which is formed on the basis of acquired or absent experience in the development of breakthrough technologies that change business. According to investment bank analysts, as of the beginning of 2018, only 4% of industries have passed the so-called stage of “disruption” [20], ie affected by breakthrough technologies and virtualized their activities on the basis of digital business models and became fundamentally new type - digital; 96% of industries have yet to do so.

Thus, the studied analytical aspects of the impact of digital economy technologies on the virtualization of international trade based on the

systematization of digitization scenarios and expert studies of intergovernmental organizations and analytical agencies indicate the need to determine the basic prerequisites for virtualization of international trade by levels: global, international taking into account the independent motivation for change and the impact of public policy.

3.2. Systematization of organizational and economic bases of virtualization of international trade in the conditions of digital transformations

The G20 Digital Economy Development and Cooperation Initiative shows [21] that the digital economy is a driving force for accelerating global economic development, increasing production productivity, creating new markets and industries. It also opens up new opportunities for inclusive and sustainable growth. However, the acceleration of economic development is achieved by those countries and economic associations that systematically build the foundations and mechanisms of leadership in the digital economy.

In the conditions of formation of the virtualized society in various branches of economy the huge amount of various data is created and accumulates. In international trade, the flow of information needed to manage a company is constantly growing. If in the past the most important factor of competitiveness and value creation for enterprises was the state of cost and quality management of products (services), today and in the future, along with the physical product, data from digital marketing and smart analytics are becoming increasingly valuable.

In order to move to sound business process management in international trade, optimize the use

of labor and increase the efficiency of doing business by companies in the field of export-import operations, it is necessary to move to the broadest possible implementation of the Concept of the Fourth Industrial Revolution (Industry 4.0), making the most of its opportunities in terms of digitalization of the economy [22]. Prerequisites

and challenges for the digital transformation of international trading companies by levels: global, international, individual state, individual trading company, taking into account the independent motivation for change and influence of public policy, are given in Table 2.

Table 2: The main prerequisites and challenges for the virtualization of international trade by level

Prerequisites	Challenges	Effects
World level		
Big Data, Business Intelligence and Artificial Intelligence Technology	You need to be aware of the prospects of using Big Data, Business Intelligence and artificial intelligence to optimize business processes in companies. The need for a high level of digital literacy	Increasing profits, current real-time analytics, improving the efficiency of operating and marketing activities
ERP, CRM systems		
BPM systems		
Digital marketing		
Unmanned vehicles (including drones); miniaturization of equipment, robotics, 3D printing		
International level		
Digital Single Market Strategy	Barriers to entering foreign markets due to ignorance of available digital tools.	Development of digital infrastructure, increasing the quality of goods / services, expanding access to foreign markets
The level of an individual state		
Digital Transformation Action Plan adopted by the government of an individual state	Penetration of digital transformation in all sectors of the economy	Emergence of new business models and corresponding digital infrastructure, growth of competition, expansion of access to foreign markets
The level of an individual trading company (independent motivation for change)		
Independent local initiation of digital transformation in companies (without appropriate infrastructure in the state)	The need for digital business transformation (including the field of trade virtualization)	Rapid growth of performance indicators of companies using digital tools, their implementation by competitors
The level of an individual trading company (the impact of government policy on change)		
Initiation of digital transformation in companies at the initiative of the state (the corresponding infrastructure in the state is created)	The need for digital business transformation (including the field of trade virtualization)	Emergence of new business models and adaptation to the created digital infrastructure

Source: generated by the authors by levels on the basis [1, 23, 24, 25]

The digital transformation of trading companies in developing countries creates the preconditions for empowering management and staff to work better, faster and more efficiently. Improving data handling (access, collection, consolidation, analytics, etc.) in this case will contribute to a successful digital transformation. Digital data is the basis of trade, so it is necessary to work in an open data system and use them to build the potential of international trade. In order to effectively manage data and use it to increase the volume of export-import transactions, it is necessary to take care of the digital literacy of its employees. This approach demonstrates the cyclical relationship of digital development of a trading company with the development of digital skills of its management and staff.

In general, the virtualization of international trade not only ensures the acquisition of competitive positions in the market, but also solves a threefold strategic task: first, establishing closer relationships with suppliers and customers (customer service sector, increased sales); secondly, increasing the level of own operational efficiency (sector of effective operational activity of the company); third, increasing the competitiveness of products sold (consolidation of certain sectors of the business model).

All these tasks are impossible without the integration of information systems and technologies in the field of international trade. Accordingly, there is a problem of rupture in groups of business processes, which are digitized or not. We have identified groups of business processes of

international trading companies, in which it is advisable to implement digital technologies for their transformation.

In the Table 3 groups of business processes of trading companies and their corresponding digital tools (systems, products), the

implementation of which will help to avoid development gaps between companies in developed countries that have already implemented them and companies in developing countries and have not implemented them.

Table 3: Business process groups of trading companies and digital technologies of their transformation

№	Groups of business processes	Digital technologies
Work with contractors		
1	Interaction with suppliers	SCM (Supply Chain Management) systems
2	Interaction with customers (consumers)	CRM (Customer Relationships Management) systems
Operational activity		
3	Resource management	Enterprise Resources Planning (ERP) systems
4	Business process management	BPM systems (Business Process Management)
5	Management of the analytical component	Big Data, Data mining, Google Analytics, etc.
6	Providing modern technology to the company's employees to efficiently perform daily work	Electronic document management, dashboards for evaluation of key indicators
Sales activities		
7	Product management	Product Lifecycle Management; Product Data Management; GIS-technologies
8	Marketing activities	Internet marketing; SEO and SMM; chatbots
9	Changing a product or service using technology.	Virtual or augmented reality in the presentation of goods; reproduction of goods thanks to 3D printing
10	Logistics	Unmanned vehicles (including drone logistics); miniaturization of equipment, robotics

Source: supplemented by authors based on [1, 24]

Thus, the introduction of digital technologies in certain groups of business processes of trading companies can be caused by the preconditions for virtualization of international trading companies at different levels: from the level of an individual organization and its independent motivation to the global level under the influence of globalization processes. Such results of the research will require substantiation of methodological bases of segmentation of companies in terms of their readiness to virtualize business processes in international trade and their further ranking in order to develop recommendations for action.

4. METHODOLOGICAL BASES OF SEGMENTATION OF COMPANIES IN TERMS OF THEIR READINESS FOR VIRTUALIZATION OF BUSINESS PROCESSES IN INTERNATIONAL TRADE

Currently, there is a method of assessing the quality of business processes in international trade based on the achievement of strategic indicators and parameters, where the key identifier is efficiency [25], including and on process-based virtualization of processes and digitalization of

processes. This methodological approach should be used to identify the achievement of strategic imperatives in the virtualization of international trade, but the tools of the digital economy and its targeted application will be limited in the study.

The technique is more complex to use clustering of structures based on their digital maturity [24], but at the core of its application it requires a study of complete homogeneity of the study sample. For example, the basis is digital maturity as the amount of mastered digital resources in companies. At the same time, the method of clustering is impossible to study the virtualization of business processes in international trade, because in trade there is segmentation by type of goods, there is a combination of trade with after-sales service, there is a specificity not only sales in digital format. using virtual payment systems.

Based on the analysis of methodological developments of the World Bank and a number of analytical companies, it is established that the analysis and, accordingly, assessment of companies' readiness to virtualize business processes in international trade is also not carried out, as there are currently no clear guidelines.

Based on these considerations, we organized online surveys of respondents for this

purpose. The main activity of 100% of the selected respondents is trade in goods on international markets.

The survey was conducted on the basis of a posted electronic questionnaire with a list of digital technologies in the field of trade, which are implemented, partially implemented or not implemented by the surveyed company. In the form of an electronic request to the e-mail of the respondent received a request to fill out a questionnaire with further processing of answers on the basis of the resource GoogleForms. This allowed us to reach a larger audience in a shorter period of time and with less human resources.

A total of 65 respondents took part in the survey, the answer was received from 61 respondents, which is 93.85% of the sample size and indicates the importance of the study. As positive aspects of carrying out such questionnaires it is possible to note: convenience of expression of opinions; partial or complete anonymity of the results; the possibility of passing the survey in any way and time convenient for the respondent; no need to communicate with employees of the organization conducting the survey, etc.

The data of the survey were processed using such data analysis tasks as segmentation using information technology data analysis based on indices and metrics. During which it was carried out:

Calculation of segmentation quality metrics. As a metric of data segmentation quality in this study, the Silhouette index was used:

$$Sil_i = \frac{b_i - a_i}{\max(a_i, b_i)} a_i b_i \quad (1)$$

where a_i – the average distance from the i -th element of the segment to all other elements of the same segment; b_i – the average distance from the i -th element of the segment to all other elements of the nearest neighboring segment.

Obviously, $-1 \leq I$, with values close to -1 indicate poor segmentation quality, and close to 1 – high quality segmentation. It is also worth noting that the Silhouette index makes sense when the number of segments is greater than 2 but less than the number of points in the data set Sil_i .

The algorithm was run on a given data set to be divided into segments in the range from two to ten in order to practically find the optimal number of segments, in which the data in the resulting subsets will have enough common features and will be sufficiently different from other segments.

During the program call of the agglomerative segmentation algorithm, the number of segments (s), metrics between points and between segments are specified, and the `fit_predict` method is applied. The output was expected to receive the names of companies that fell into a segment and a list of segment labels for a given list: `model = AgglomerativeSegmenting (n_segments = s, affinity = "precomputed", linkage = "complete"); labels = model.fit_predict (gower_distances)`. As a result of the algorithm, a stable segmentation with a satisfactory quality metric for each case: $Sil_i > 0$.

The optimal number of segments was determined by five, because with such a breakdown it was possible to select all the necessary parameters of readiness for the virtualization of business processes in international trade:

Segment I. Non-virtualized companies - 25 participants (no experience in using digital tools);

Segment II. Partially virtualized companies - 22 participants (use all or part of the electronic document flow or switch to it);

Segment III. Basic virtualized companies - 3 participants (use fully or partially electronic document management, process analytics in digital format, marketing is based on the SMM model, use part of the search engine optimization SEO);

Segment IV. Companies with outsourcing of business process virtualization - 8 participants (use the services of freelance professionals or apply for services to specialized companies);

Segment V. Virtualized companies - 3 participants (all business processes or more than 80% are virtualized).

Thus, the optimal number of segments, chosen theoretically, is confirmed by the analysis of practical results. The quality metric of such segmentation $Sil_i = 0.19$ is satisfactory and clearly depends on the amount of data. The results of segmentation meet the requirements and allow to sufficiently outline the individual segments and problems of their participants.

5. EXPERIMENTAL STAGE AND THE ANALYSIS OF RESULTS

Comparative analysis of the obtained segments according to the main characteristics is structured in Table. 4. Percentage values indicate the share of respondents in each segment who answered a certain question in the same way. The number of respondents who answered the same questions in the same way varies from 50% to 100%. To highlight the characteristics of the

formed segments in the table highlighted values greater than 80% as the most important.

Table 4: Comparative characteristics of the segments formed on the basis of the survey of respondents

Question	Segment I		Segment II		Segment III		Segment IV		Segment V	
	Does not work	61,25%	No	90%	Yes	100%	Yes	60%	Yes	100%
Use electronic document management	No	61,25%	Yes/No	50% each	Yes	100%	Yes	100%	Yes	100%
Own site, positioning on electronic trading platforms or	No	82,25%	No	50% each	Yes	100%	Yes	100%	Yes	100%
Ability to accept orders to purchase goods through the site	No	89,25%	Not optimized	50% each	No / specialist	75%	Partially optimized	60%	Optimized by a specialist	100%
SEO-site and the availability of connection of payment systems for online shopping	No	83,75%	So	80%	Yes, in part	50% each	Yes	80%	Yes	100%
SMM in social networks in an international format	No	50%	Partially conducted	60%	Yes, with the separation of additional job responsibilities for employees	100%	Yes, it is done outsourced company or freelancer	60%	Optimized by a specialist	100%
Filling the site and pages on Facebook, Instagram or other social networks with an employee of the company, including two-way communication	No	93,75%	No	60%	No, without getting the result in	50% each	Yes, a good result	100%	Yes, a good result	100%
Using a site analytics, electronic document management, etc.	No	50%	No	90%	Yes	100%	Yes	100%	Yes	100%
Specialized ERP / CRM system	No	100%	Yes	90%	No	100%	No	100%	Yes	100%
Specialized applications (including mobile applications)										
	Characteristic features of segments									

Source: calculated and structured by the authors

A sufficient degree of differences between segments and a sufficient degree of similarity of elements within the segment (80-100%) allows you to clearly identify the following groups and rank them according to the level of use of digital

technologies and tools in business. Table 5 shows the ranking of types of companies according to the parameter of readiness for virtualization of business processes in international trade.

Table 5: Ranking Of Company Segments According To The Parameter Of Readiness For Virtualization Of Business Processes In International Trade

Segment I	Segment II	Segment III	Segment IV	Segment V
Characteristics of segments				
Not virtualized companies	Partially virtualized companies	Basically virtualized companies	Companies with business process virtualization outsourcing	Virtualized companies
Detail of segments				
Lack of experience with any digital tools and advertising; lack of companies in the Internet environment.	Limited use of digital tools, use of social media advertising, primitive digital analytics	Use basic digital tools; effective functioning of the site, the presence of an employee for the development of international trade online	Use outsourcing of business process virtualization, attract the services of professionals and successfully develop the digital segment.	They use almost all advanced digital technologies and electronic document management
IT literacy				
Absent	Low level	Average level	Sufficient level	High level

Source: ranked by authors

Thus, the proposed method makes it possible to determine the level of readiness for virtualization of business processes in international trade and the availability of digital literacy for the implementation of digital technologies in business practice in order to ensure its development. Ranking of company segments by this parameter will allow management to form a clear strategy aimed at achieving digital development and, at the same time, build a digital culture in the organization so that all actions are aimed at meeting the omnichannel needs of the client and adapted to the digital transformation of the country. with which export-import operations will be carried out.

The approach proposed by the authors is qualitatively new because:

1) unlike the existing approach to assessing the quality of business processes in international trade based on the achievement of strategic performance indicators [25], where the indicator of business process virtualization based on the implementation of IT technologies is not taken into account, the authors justified and determined its the role and impact on the efficiency of international companies;

2). the adaptation of modern methods of analysis of the development of companies with the possibility of assessing the aspect of virtualization of business processes based on the application of fuzzy logic [26] and in research related to the management of companies regarding their

sustainable development based on digitalization processes is ensured [27] in accordance with the specifics of international trade;

3) for the first time, the existing method of clustering structures based on their digital maturity was adapted [24] not to determine the scope of mastering digital resources in companies on the basis of clustering, but to segment the results of the implementation of virtualization of business projects in companies engaged in international trade on on the basis of an online survey conducted independently by the authors, with the selection of the target audience of the study - companies engaged in international trade and its services;

4) the author's position for the first time emphasized the need for IT-literacy regarding the virtualization of business processes in international trade and the implementation of digital technologies in business practice.

6. CONCLUSION

Thus, the organizational and economic principles of virtualization of international trade in the digital economy are formed under the influence of growing regional and global competitiveness based on the virtualization of business processes, leading to blurring of geographical and physical borders between developed and developing countries.

Analytical aspects of the impact of digital economy technologies on the virtualization of international trade based on the systematization of digitization scenarios and expert studies of intergovernmental organizations and analytical agencies indicate the impact of digital technologies on GDP growth in the EU and the world. Improving economic and social indicators, developing innovation and increasing productivity.

The main prerequisites and challenges for the virtualization of international trade by levels: global, international, individual state, individual trading company, taking into account the independent motivation for change and the impact of public policy are based on such challenges for management companies and governments as expanding opportunities to use Big Data, Business Intelligence and artificial intelligence to optimize business processes and business models; low or no digital literacy of staff; ignorance of most medium and small businesses with modern tools and opportunities for digital transformation; barriers to entering foreign markets; the need for digital business informatization.

It is established that such groups of business processes of international trading companies as interaction with suppliers and customers (consumers); resource management, business processes, analytical component (data analysis); providing modern technologies to the company's employees to efficiently perform daily work; product management (control, storage and provision of necessary information); marketing activities; the search for effective sales channels for a particular consumer are appropriate for the introduction of technology for their transformation, which belong to the tools of the digital economy.

According to the authors, it is advisable to include in the methodological foundations of the segmentation of companies the parameter of virtualization of processes in international trade on the basis of a preliminary survey of respondents with further segmentation based on the results of their survey and ranking according to common criteria. The author's position is determined by the results of the conducted research, where it was proven that the segmentation method is effective for establishing the type of international companies in accordance with the "trade virtualization" parameter to the conditions of the digital economy, taking into account the subject's IT literacy. Determining a company to meet this criterion allows you to effectively implement the digital transformation in the company's own strategy for international trade and thus accelerate the

virtualization of business processes in the international trade segment for such companies and minimize the complexity of exit and integration with global trends in the international economic arena the digital economy.

Therefore, the positive result of the conducted research is the formation of an improved approach to the segmentation of companies in terms of their readiness for the virtualization of business processes in international trade based on their types and with the possibility of further ranking in the course of making management decisions in the conditions of the development of the digital economy. The proposed approach is a methodological development that was formed on the basis of a survey of respondents exclusively employed in the field of international trade and related services, which makes it impossible to apply this approach without adaptation to the assessment of readiness for virtualization of processes in the activities of logistics companies, customs and brokers in the field of customs clearance of goods, which serve the activities of international trading companies, given the need to expand the sample of respondents and take into account the specifics of their activities.

7. FURTHER WORKS

In future works, we will explore possible methods of virtualization of international trade through digitalization of customs work based on the approach developed in this article to determine the level of readiness for virtualization of business processes in international trade and the presence of digital literacy for the implementation of digital technologies in practice in order to determine the parameters of omnichannel interaction customs and trading companies under the conditions of the development of the digital economy.

REFERENCES:

- [1]. I. Dumanska, L. Hrytsyna, O. Kharun. O. Matviets, "E-commerce and M-commerce as Global Trends of International Trade Caused by the Covid-19 Pandemic", *WSEAS Transactions on Environment and Development*, No 17, 2021, pp. 386-397, DOI: 10.37394/232015.2021.17.38
- [2]. J. Baudrillard, "Simuljakry i simuljacija" [Simulacra and simulation], Tula, Tul'skij poligrafist Publ., 2013, 204 p. (In Russian). Available at: http://www.gumer.info/bogoslov_

- Buks/Philos/bodr_sim/ (Accessed 23 October 2022).
- [3]. A. Kroker, M.A. Weinstein, "Data Trash: The Theory of the Virtual Class", Montreal, New World Perspectives Publ., 1994, 177 p. Available at: <http://www.thing.net/~rdom/ucsd/posthuman/DATATRASH.pdf> (Accessed 23 October 2022).
- [4]. D.V. Ivanov, "Virtualizacija obshhestva" [Virtualization of society], Saint Petersburg, "Peterburgskoe Vostokovedenie" Publ., 2000, 96 p. (In Russian). Available at: http://www.lib.ru/POLITOLOG/ivanov_d_v.txt (Accessed 23 October 2022).
- [5]. M. Warner, M. Witzel, "Virtual'nye organizacii. Novaja forma vedenija biznesa v XXI veke" [Managing in virtual organizations], Moscow, Dobraja kniga Publ., 2005, 296 p. (In Russian). Available at: <http://bwbooks.net/index.php?id1=4&category=biznes&author=uorner-m&book=2005> (Accessed 23 October 2022).
- [6]. R. Latham, S. Sassen, "Digital Formations: IT and New Architectures in the Global Realm", Princeton, Princeton University Press Publ., 2005, 384 p. Available at: <http://sociology.sunimc.net/htmledit/uploadfile/system/20101228/20101228154545821.pdf> (Accessed 23 October 2022).
- [7]. V. Babenko, Z. Kulczyk, I. Perevosova, O. Syniavska, and O. Davydova, "Factors of the development of international e-commerce under the conditions of globalization", SHS Web of Conferences 65, 04016, 2019. DOI: <https://doi.org/10.1051/shsconf/20196504016>
- [8]. K. Kraus, N. Kraus, O. Manzhura, "Digitalization of Business Processes of Enterprises of the Ecosystem of Industry 4.0: Virtual-Real Aspect of Economic Growth Reserves", *WSEAS Transactions on Business and Economics*, No 18, 2021, pp. 569-580
- [9]. A. Balasescu, T. Seguin, "Another economy: towards a cultural dialectics between energy and society". *Innovation*, No 31(3), 2018, pp. 251-77.
- [10]. J. Curtis, "The future of economic geopolitics: network effects in international trade", 2019. Available at: <https://sites.duke.edu/djepapers/files/2019/07/joshuacurtis-dje.pdf> (Accessed 23 October 2022).
- [11]. J. Mullner, I. Filatotchev, "The changing face of international business in the information age", *Progress in International Business Research*, No 13, 2018, pp. 91-121.
- [12]. D. Chaffey, "Digital business and e-commerce management: strategy, implementation, and practice", Philadelphia: Trans-Atlantic Publications, 2015, pp. 217.
- [13]. Y. Luan, Z. Zhang, "Research on e-commerce integrated management information system of cross-border enterprises based on collaborative information middleware", *Information Systems and e-Business Management*, No 18(4), 2020, pp. 527-43.
- [14]. OECD, Digital Economy Outlook 2017. Available at: <http://dx.doi.org/10.1787/9789264276284-en> (Accessed 23 October 2022).
- [15]. International Monetary Fund. Measuring the Digital Economy 2017. The 5th IMF Statistical Forum Session II: Framing the Conceptual Issue Discussion by Vitor Gaspar, Director, Fiscal Affairs Department, IMF. Available at: <https://www.imf.org/en/News/Articles/2017/1/16/sp111617-measuring-the-digital-economy> (Accessed 23 October 2022).
- [16]. World Bank, 2017. World Development Report 2016 "Digital Dividends". Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/23347/210671RuSum.pdf>. (Accessed 23 October 2022).
- [17]. World Bank, 2020. The Digital Agenda of the Eurasian Economic Union until 2025: Perspectives and Recommendations. Available at: <http://documents.worldbank.org/curated/pt/413921522436739705/pdf/EAEU-Overview-Full-RUS-Final.pdf> (Accessed 23 October 2022).
- [18]. Mckinsey Digital, 2020. Digital Insights. Available at: <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights> (Accessed 23 October 2022).
- [19]. Gartner, 2018, "Gartner Says Global Artificial Intelligence Business Value to Reach \$1.2 Trillion in 2018". Available at: <https://www.gartner.com/en/newsroom/press-releases/2018-04-25-gartner-says-global-artificial-intelligence-business-value-to-reach-1-point-2-trillion-in-2018> (Accessed 23 October 2022).
- [20]. TQMsystems, 2020, "What is disarmament and why business needs it". Available at: <https://tqm.com.ua/likbez/article/disrapshn-praktika-podriiva-bisnesa> (Accessed 23

- October 2022).
- [21]. G20, 2016. Digital Economy Development and Cooperation Initiative. Available at: <http://www.g20.utoronto.ca/2016/g20-digital-economy-development-and-cooperation.pdf> (Accessed 23 October 2022).
- [22]. K. Schwab, “The Fourth Industrial Revolution. What It Means and How to Respond”, Foreign Affairs, 2018. Available at: <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution> (Accessed 23 October 2022).
- [23]. I. Dumanska, D. Vasykivskiy, I. Zhurba, Y. Pukhalska, O. Matviets, A. Goncharuk, “Dronology and 3D Printing as a Catalyst for International Trade in Industry 4.0”, *WSEAS Transactions on Environment and Development*, No 17, 2021, pp. 740-757, DOI: 10.37394/232015.2021.17.71
- [24]. I. Strutynska, H. Kozbur, L. Dmytrotsa, I. Bodnarchuk, O. Hlado, “Small and Medium Business Structures Clustering Method Based on Their Digital Maturity. Problems of Infocommunications”, Science and Technology (PIC S&T) : materials of the International Scientific-Practical Conference (Kyiv, Ukraine, 8–11 October 2019), Kyiv : Borys Grinchenko Kyiv University, 2019, pp. 278–282.
- [25]. I. Dumanska, “Quality Assessment of Business Strategy in International Trade: Indicators and Parameters”, *Baltic Journal of Economic Studies*, No 7(2), 2021, 57-64, DOI: 10.30525/2256-0742/2021-7-2-57-64.
- [26]. M. Voynarenko, V. Dzhedzhula, V. Hurochkina, I. Yepifanova, O. Menchynska, “Applying Fuzzy Logic to Modeling Economic Emergence”, *WSEAS Transactions on Business and Economics*, No 18, 2021, pp. 424-433.
- [27]. T.V. Mamatova, I.A. Chykarenko, E.G. Moroz, I.Y. Yepifanova, N.V. Kudlaieva, “Management of enterprises and organizations under the conditions of sustainable development”, *International Journal of Management*, No 11(4), 2020, pp. 151–159.