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MARKETING QUALITY MANAGEMENT IN INDUSTRY 4.0 IN TRANSBORDER MARKETS

Abstract: *The purpose of this paper is to study the problem of product quality management of Industry 4.0 in transborder markets. Humanity lives in the age of the end of the Third, digital, revolution, which started in the second half of the 20th century. Its specific features include the development of Information and Communication Technology and automatization and robotization of the production processes. The specific features of Industry 4.0 are fully automatized productions, at which the management of all processes is conducted in real-time and in view of the changing external conditions. Cyberphysical systems can be used to create virtual copies of the real-world objects, manage physical processes, and make decentralized decisions.*

Keywords: *Digital transformation; Digitalization; E-commerce; Industry 4.0; International economic relations; International trade; Quality of marketing; Transborder markets; Transborder movement of capital.*

1. Introduction

Our time could be characterized as the Fourth Industrial Revolution, or Industry 4.0. In the present context, the concept of Industry 4.0 has become widespread in the world. The transitioning to the concept of Industry 4.0 shows that such business processes as the supply of resources and raw materials as well as development and supply of goods for consumers and their maintenance will be conducted on the Internet, so the issue of marketing quality management in Industry 4.0 in transborder markets becomes especially important.

Although modern information technologies cope with automatized processes very well, they cannot work with global issues. They are not ready to see the general vector of the company's development, understand the policy in terms of quality, or make correct decisions in these issues. That's why Quality

4.0 does not recommend delegating the tasks of quality to outside departments but recommends using a number of rules, which observation will help bring down to the minimum the number of defects, risks, and failures of equipment at the production stage, etc.

Digital transformation in Industry 4.0 envisages the introduction of completely new types of technologies. Gradual automatization of business activities can be achieved through the use of commoditized applications and IIT systems (ERP, CRM). However, the transitioning to Industry 4.0 and deep end-to-end automatization of all activities of a company require completely new types of technologies, which change the usual business models. Digitalization of industrial production is not just profitable for companies and governments from the economic perspective – it could also provide vivid advantages in ecological sustainability.

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Digital production allows companies to effectively use raw materials and to use RFID chips for storing information on product assembly and the components' materials. Thus, it simplifies the disassembly and recycling and reduces the loss of resources. This is a pivot of the circular economy – one of the major achievements from the ecological perspective. Surely, governments will like it very much. Another important argument in favour of Industry 4.0 is that it changes not only production methods – it leads to the shift of the point where the largest added value is determined in the value creation chain. Account should be taken of the stages of development, design, and technical maintenance of a product, not only its industrial production. This could lead to the reconsideration of laws on intellectual property – patents and authors' rights – and rights for “big data”. The existing laws in this sphere allowed a small number of companies to accumulate huge wealth. Industry 4.0 includes full digitalization, robotization, and automatization of a large part of the present human activities, for ensuring high speed and effective production, more effective use of materials, and more ecological industry. Technological changes, such as the electronic transfer of information between machines, could solve problem situations without human participation. The technology markets of Industry 4.0 grow constantly and are very attractive for investors and startups. Thus, as alleged by Bank of America Merrill Lynch, the market of AI will reach \$153 billion by 2022 (Porter and Heppelmann, 2015). In 2015 – 2021, the annual growth of the Internet of Things was 23%. In 2021, 16 billion out of 28 billion connected devices account for the IoT devices, which will be equipped with sensors and will be a system of the IoT. Transborder markets are growing quickly. Nowadays, consumers are attracted to such trade platforms as Amazon, eBay, Alibaba, Walmart, Rakuten, etc. In 2020, the global pandemic led to an increase in e-commerce volume by 25.7%, up to \$4.21

trillion. It is anticipated that the sales volume will continue to grow up to \$4.92 trillion in 2021. The purchases will be performed by more than two billion online buyers. Selling at a trading platform could help strengthen the brand, ensuring the convenience of purchases for customers, and increasing profit due to high-quality marketing strategies.

In the context of transborder trade, most of the old rules, which were effective for retail operations, branding, merchandising, and purchases over several decades, become actually useless. It is fair to say that it is important not to “think globally, while acting locally”, but to “think globally and act globally” – to earn \$3-4 billion, not \$300-400 million – through services for individual customers. One of such leading platforms is Net-a-Porter. Claire Chung, China General Manager of Yoox Net-A-Porter Group, told *Jing Daily* that “the Net-a-Porter platform treats the customers of the continental part of China as international mobile customers”.

It has been determined that social entrepreneurship will be using the capabilities of Industry 4.0 to optimize its activities until 2030, but will refuse from full automatization, using human intellect and AI at the same time. Technologies are changing the world in the way that each person could combine several roles: manufacturer, designer, media, and seller. Technologies open more opportunities for this entrepreneur of a new type, “pumping” new knowledge and resources into him. Digitalization becomes the most substantial factor of the global economy's growth. A transition from implementing certain digital technologies to the complex establishment of a digital ecosystem within the global and national economies takes place. This trend reflects the necessity for effective cooperation between the participants of the digitalization process throughout the world – public authorities, businesses, educational establishments, industrial companies, and financial structures. Digital economy development is a primary task of not only

separate economic systems but of a state on the whole. Special importance is assigned to the digitalization process by its crucial role in the transitioning to the Fourth Industrial Revolution and the Sixth technological mode. Digitalization of the national economy has become an important component of the economic development of most countries. Of course, Industry 4.0 and the processes it entails have rather evolutionary than revolutionary character. However, the changes quicken each year, so companies have to focus their efforts on implementing innovations in their spheres and mastering them.

At present, the quality of production management depends on the provided data. Since we speak of machine learning, which will – in after years – be employed in all spheres of production, the advantages will be obtained by manufacturers with large resources and those who are the first to think about implementing the key technologies in production. Economic growth is based – to a large extent – on technologies and knowledge, making them the main production force. Thus, the digital economy and its achievement will eventually become the most essential source of providing the well-being of subjects of the global economy. For example, in biotechnologies and medicine, digital technologies stimulate the qualitative improvement of health, as well as in the telecommunication sphere, they promote the development of the social sphere and education, ensuring also more effective energy consumption in the economy. Furthermore, it is necessary to enable the use of digital technologies by the least protected social groups.

2. Literature review

This paper draws on the existing literature on quality management: Alekseev et al. (2021), Beyari (2021), Hassan and Jaaron (2021), Lee et al. (2021), Manakhova et al. (2021), Midor and Wilkowski (2021), Ondra (2021), Osipov et al. (2021), and Sahoo (2021). The

theoretical basis of the research consists of the publications on Industry 4.0: Abdul-Hamid et al. (2021), Chiarello et al. (2021), Kazancoglu et al. (2021), Popkova (2020), Popkova and Giyazov (2021), Rangaswamy (2021), Sony et al. (2021), Thach et al. (2021), Tortorella et al. (2021), Zelalem (2021), Chen (2021).

The performed literature review has shown that Industry 4.0 includes filling digitalization, robotization, and automatization of the majority of the present human activities, to ensure larger speed and production efficiency, more effective use of materials, and more ecological industry.

This research deals with three spheres: innovations в Industry 4.0, innovations in marketing quality, and the effect from the implementation of these innovations on companies.

As was mentioned in the introduction, the EU classifies marketing qualitative innovation as non-technological innovations. Nevertheless, if we want to determine innovations that are related to Industry 4.0 and draw on technical progress, we should not exclude technologies from marketing qualitative innovations. In many respects, purchases and trade will always remain the phenomena of the local level, but soon, when retail platforms and companies and brands of the USA, China, and other countries will compete against each other at the global/local scales, offering to deliver anything anywhere in two days or faster, buyers will be inclined to opt for the most attractive offers. Amazon already has the first results of these activities, while Alibaba uses their initial advantages. Eventually, it might be that against the background of transborder trade the difficulties of online trade will look like just a prelude.

Innovations in the age of Industry 4.0 are treated differently by scholars. In their research “Fifteen years of research on business model innovation: How far have we come, and where should we go?”, N.J. Foss and T. Saebi define business models of

innovations as “developed, innovative, non-trivial changes of the key components of the company’s business model and/or architecture that connects these elements”. However, we have more proofs that most of the companies in different spheres are not ready enough to obtain full profit from digital technologies (Foss and Saebi, 2017).

Frost (2018) emphasizes that innovations draw on the development of the Internet and the existence of big data. The scholars claim that major innovations include the Internet of Things (IoT), information and communication technologies (ICT), cyberphysical systems (CPS), enterprise integration (EI), and enterprise architecture (EA), as well as the use of the Internet or other network apps (IDG Business Media GmbH, 2019).

M.E. Porter and J.E. Heppelmann single out three groups of innovations in Industry 4.0, which are interrelated and influence the following spheres (Porter and Heppelmann, 2015):

1. Digitalization and integration of any production and business relations: all links of the production chain will receive access to all necessary data. This could be extremely helpful, since, e.g., machine builders, software developers, and other manufacturers of production chains, as well as the whole production chain, will be enabled to develop their products with the knowledge of the latest components that are yet to be developed and tested by the component manufacturers. The growth of digitalization influences the business activities of companies, including their business models, since they open new forms of cooperation and are responsible for the introduction of new products and services, as well as emergence of new forms of relations with customers and employees. This digitalization also makes companies reconsider their strategies and study – in a systemic way – new business possibilities.

2. Digitalization of products and services: the data that are available via the cloud will

enable the manufacturers to predict, for example, a collapse of any manufacturer of electronic components that are necessary for machines or equipment. Digitalization of data production allows optimizing demand, increases efficiency, and allows for the effective value delivery at the company’s production sites. Implementation of Industry 4.0 requires a large computational capacity for planning, processing, modelling, and monitoring of production lines, as well as optimizing and analyzing data that are generated throughout the product’s life cycle.

New business models: they appear as a consequence of digitalization and use of big data, and entail the precise determination and the following use of a uniform target group.

Industry 4.0 is based on the six main principles:

- 1) Functional compatibility: the ability of cyberphysical systems, humans, and all components of a smart company to interact with one another via the IoT.
- 2) Virtualization: ability to connect physical systems with simulated models and modelling tools.
- 3) Decentralization: decision management and governance are conducted in an autonomous and parallel way in separate subsystems.
- 4) Real-time operation ability: observation of requirements in real-time is the essential requirement for all kinds of communication, decision-making, and control in real systems.
- 5) Service orientation: preference for computer philosophy of provision and use of standard services, resulting in the establishment of SOA (service-oriented architecture).
- 6) Modularity and reconfigurability: systems of Industry 4.0 should be modular and with the ability for self-sustainable reconfiguration based on the automatic detection of a situation.

General information on the main tools of marketing quality in Industry 4.0 was

collected and published in the National Industrial Initiative 4.0, in which a group of authors, under the auspices of the Ministry of Industry, compiled a review of 10 groundbreaking tools of Industry 4.0.

Let us consider an expert opinion of H. Stephen Hawking. In an interview for IK4-TEKNIKER, he refers to Germany's hi-tech strategy, which promotes the idea of production's computerization. He states that Industry 4.0 has four bases: interoperability (compatibility), virtualization, decentralization, and work on a real time basis. Interoperability is treated as an ability for mutual Internet connection and communication of humans with cyberphysical systems and smart factories (IDG Business Media GmbH, 2019).

A study of Quality 4.0 by Boston Consulting Group (BCG) together with ASQ and Deutsche Gesellschaft für Qualität (DGQ) was performed in late 2019 for a better understanding of the role of technologies in transforming quality management. The main attention in this research was paid to the opportunities, general challenges, and technologies in reference to quality, along with the means of optimizing the conventional leading methods of quality management. According to this report, two-thirds of manufacturers think that quality will significantly influence their work over the period of the next 5 years.

Before, the 2018 World Economic Forum, there was published a range of reports which pointed out that the influence of Industry 4.0 on the economy did not justify expectations (Hawking, 2018). Thus, direct measuring of the multifactor efficiency in the USA and the UK show that while during the previous technological revolutions efficiency was growing by 2% a year, now this indicator is about 0.3%. This means that new technologies do not ensure a sufficient level of value in terms of consumption or the prime cost of products and services. Obviously, the world just enters the age of

the Fourth Industrial Revolution, so the "opportunities and threats" are only starting to manifest themselves.

The ongoing changes in the industry under the influence of IT contribute to the quality improvement of manufactured products and provided services. This increases the loyalty and satisfaction of customers. Manufacturers also gain advantages: new approaches and business models that appear in Industry 4.0 allow them to make more money and invest in the enhancement of products.

3. Methodology

We offer the following hypothesis: quality of marketing allows increasing quality in Industry 4.0 in transborder markets. The research relies on economic statistics (econometrics). With a view to testing the hypothesis, we determine the effect of quality on the volume of exports and imports (e.g., trade in transborder markets) of the products of Industry 4.0 (according to WIPO "Global Innovation Index"):

The subjects of this research are as follows:

- influence of quality on the volume of exports and imports (e.g., trade in transborder markets) of the products of Industry 4.0 (according to WIPO "Global Innovation Index": https://www.wipo.int/global_innovation_index/en/2020/).
- dependence of the quality of products of Industry 4.0 on the quality of marketing of companies' activities (according to World Economic Forum's "The Global Competitiveness Report" for 2019 and 2020).

It should be emphasized that the quality of the development of transborder trade creates numerous effects for adjacent spheres, government and consumers. Adjacent spheres receive – throughout the development of transborder trade – an additional increase of demand for the products and services, consumers receive access to a large assortment of goods as well

as economy due to reduced market prices resulting from strong competition between various suppliers, while the government benefits from the increased volume of tax revenues. As the quality of marketing of transborder trade improves, large international players start localizing procurement, allowing products of domestic manufacturers to their platforms, creating alliances with local players, and investing in storage and commercial infrastructure, which also creates conditions for GDP growth and employment generation. Thus, due to qualitative marketing in transborder markets, transborder trade starts acting as the “accelerator” for retail export. Besides, the market of online trade in 2020 “formed \$80 billion of additional revenues in the budget as tax payments (without VAT) and about \$2 billion as customs payments”. According to statistics, the development of online trade in 2020-2021 also led to a growth in demand for the workforce, and more than 100,000 new jobs were created in the recent year.

The Fourth Industrial Revolution (Industry 4.0) envisages a new approach to production, that relies on the wide implementation of IT in industry, wide automatization of business activities, and dissemination of AI.

The advantages of the Fourth Industrial Revolution are obvious: increase of efficiency, large security of employees through reduction of jobs with dangerous work conditions, increase of competitiveness, pioneer products, and many more.

Similarly to all previous industrial revolutions, the Fourth industrial revolution changes not only production but also all-out life – economy, human relations, and even – to a certain extent – the very understanding of what being a human means. AI and robotization, the IoT and 3D print, virtual and alternate reality, and biotechnologies and neurotechnologies — all these new methods are becoming part of our everyday existence.

The Fourth Industrial Revolution could lead to an unprecedented expansion of a gap between the poor and the rich. The volume of investment in projects that deal with AI grows since their technologies can reduce companies’ expenditures. However, a side effect will be the quick reduction of jobs.

According to the McKinsey’s forecast, by 2030 around 400 million people, or 14% of the workforce, will be turned out of job due to programs or robots performing their functions.

53% of workers think that automatization will considerably change their jobs or make them outdated over the next 10 years (only 28% think that it is unlikely).

77% of workers will have – shortly – to gain new skills or new qualifications due to robotization.

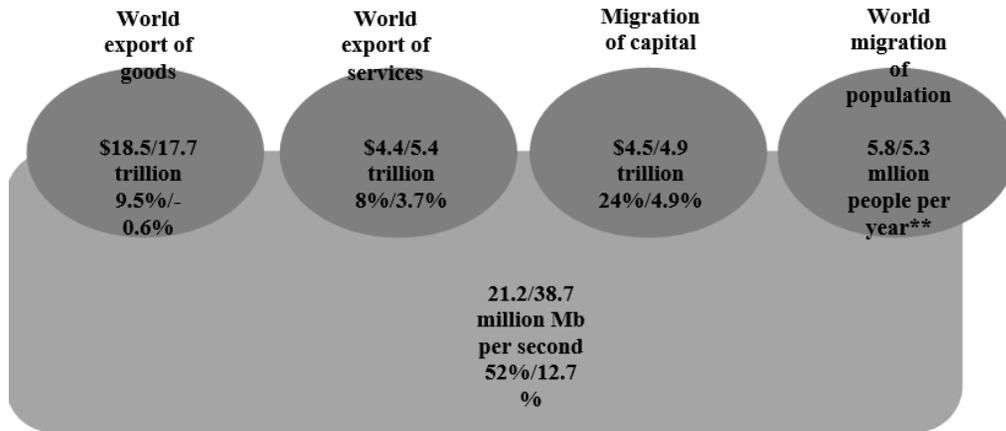
Because of robotization, 80% of males gain new skills, as compared to 74% of females.

34% of adults without vocational or higher education, do consider it necessary to acquire new digital skills.

69% of people aged 18 - 34 positively evaluate the potential effect of digitalization on the job market. Their opinion is shared by 59% of people aged 35 - 54 and by 50% of people aged 55+.

Statistical information has made it possible to determine the following (Figure 1):

- 1) growth rates of the global export of goods slowed down, acquiring a negative annual average value for 2016-2019;
- 2) average growth rates of the export of services and export of capital (including direct foreign investments, portfolio investments, and other investments (credits) decreased;
- 3) annual average flows of migrants decreased;
- 4) the highest average rate of growth is observed in the exchange of information flows (however, here the dynamics are also less active compared to 2006-2015).

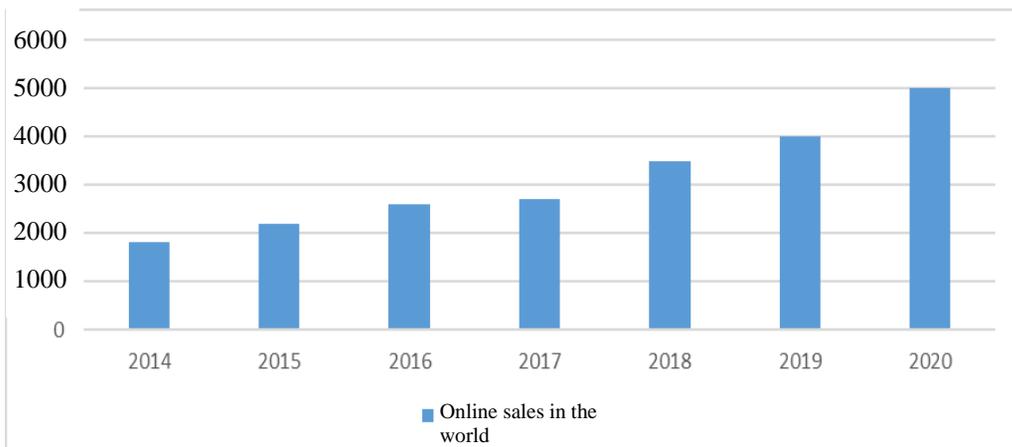


Source: Compiled by the authors based on (World Investment Report, 2017)

Figure 1. Global flows in the age of digitalization

The increase in the share of export of services that are related to digital technologies is a sign of the digitalization of the world economy's service sphere. The share of ICT products (products of information and communication technologies) in the global export of goods is stable, varying from 10.5% to 12.9%. From 2017 to 2020, with the general downward dynamics of the global export of goods, the share of ICT products was growing, being

indicative of stable world demand for this category of products; however, different trends confirm the thesis of the absence of the influence of digitalization on the increased volume of international commodity trade (World Economic Forum, 2019). In 2020, the published forecast on the development of e-commerce throughout the world showed high rates of annual growth of sales (above 15% per year, Figure 2).



Source: Compiled by the authors based on <https://www.pwc.com/mt/en/publications/assets/the-new-digital-economy.pdf>.

Figure 2. The progress of e-commerce development throughout the world in 2014-2020 (\$ billion)

The following conclusions can be made based on the analysis of the progress in the development of international flows of goods, services, and capital in their interconnection with the digitalization processes:

- digitalization in its new manifestation of technical solutions of Industry 4.0 is not a driver of growth of the global processes of exchange of products in the real sector of economy (physical products);
- new stage of economy's digitalization will result in the transformation of the competitive environment of certain hi-tech companies of the service sphere, namely: e-commerce companies, information and communication companies, and communication providers;
- achievements of new digital technologies in a limited scale will increase the international contracts of specialized professionals in the field of healthcare, education, and fundamental and applied sciences;
- digitalization and development of the virtual economy will pose new challenges for traditional spheres (need for retraining, diversification, and/or transformation of business strategies).

Industry 4.0 is a novel way to organize production means. Here we speak of production processes that are built on innovations in the field of the IoT and digital technologies: AI, alternate reality, robotization, 3D print, cloud drives, and additive production with the possibility of data processing. The Fourth Industrial Revolution envisages the transformation of production systems through the implementation of new technologies.

This industrial revolution is aimed at establishing smart companies that can easily adapt to the production processes. Such

company of the future or “company 4.0” becomes an innovative, fully digital enterprise that builds upon new technologies and is responsible for local ecology and social relations. In point of fact, due to a new organization of production, such a company provides the economic effect and influences the society, policy, and environment.

The year 2020 became the best year for marketplaces in the decade. The growth of e-commerce was very large, and the growth of marketplaces accounts for its larger share. This was the most successful year for sellers and brands.

Marketplace Amazon's increase in sales equalled the sales of the whole eBay. In 2020, Amazon stores sold the products' worth of \$295 billion, increasing their sales by \$95 billion as compared to \$200 billion in 2019. This attracted almost \$1 billion of the capital of aggregator companies and brands that desired to sell via Amazon.

Amazon – as a seller – is currently at stage 3 of its development. Amazon 1.0 operated as a reseller. Advertising in Amazon and its trademarks created Amazon 2.0. Today's seller – Amazon 3.0 – builds its own Amazon brands, deliberately sells multichannel traffic, attracts traffic from outside of Amazon, and invests in social commerce. The main construction blocks of the Amazon marketplace remained the same, but it had to evolve to generate additional value and exceed its rivals.

Since e-commerce was very successful during the pandemic, certain trade platforms' profit was very large. Some of them were well-prepared for the future, and some of them were taken by surprise. The four winners were Amazon, Walmart, Etsy, and, to a certain extent, Target. Each of them increased their sales (due to different reasons), added sellers, and increased their share in the market. Etsy increased the offer since the demand grew significantly. Target was the fastest growing platform, but its small pool of sellers, which usually join only

by invitation, makes it difficult to compare with much larger marketplaces due to the low base effect.

Amazon did not increase its market share this year. Its growth rate was lower than that of most retail sellers and trade platforms – partly because difficulties with deliveries at the start of the year send buyers to its competitors. This year showed a vulnerability that comes from the fulfilment operations of Amazon: Amazon stores and sends almost everything that is sold in Amazon.

eBay, Google Shopping, and Wish, are the ones that lost. eBay was growing two quarters in a row, but it is unlike that this dynamics will be preserved. Wish had long deliveries, since it counted on sellers from

China, and the increase in sales volume in the third quarter was not good. Google Shopping did not make any visible steps for becoming a channel of e-commerce – it remained an outside observer, translating ads.

4. Results

The variables should be formalized in order to formulate a mathematical setting of the task of modelling the effect of quality of marketing on exports and imports in transborder markets and to test the offered hypotheses (table 1 to table 6). A formalized description of the initial data (indicators) is given in Table 1.,

Table 1. Description of indicators for studying the influence of quality of marketing in Industry 4.0 in transborder markets

Years	Revenues from marketing activities as a consequence of implementation of Industry 4.0, \$ billion (Y)	GDP, \$ billion (X1)	Export of goods (X2)	External flows of capital X3), \$ billion
2014	400.0	13,166	69.8	100
2015	401.0	14,089	63.4	80
2016	456.08	14,549	58.2	150
2017	652.03	15,667	65.4	100
2018	782.9	19,795	47.9	180
2019	928.1	23,832	46.2	80
2020	1,040	24,800	52.0	120

Source: Compiled by the authors based on https://www.wipo.int/global_innovation_index/en/2020/

Table 2. Matrix of paired correlations of macro-economic indicators Source:

	B	X1	X2	X3
B	1			
X1	0.976351336	1		
X2	0.787729049	-0.848623608	1	
X3	0.109984699	0.064993706	-0.362661959	1

Compiled by the authors.

Thus, we have the matrix of paired coefficients of the 4x4 size.

Table 3. Matrix of paired coefficients of the correlation of the effect of marketing quality in Industry 4.0 in transborder markets

	B	X1	X2	X3
B	1	0.976351336	0.787729049	0.109984699
X1	0.976351336	1	-0.848623608	0.064993706
X2	0.787729049	-0.848623608	1	-0.362661959
X3	0.109984699	0.064993706	-0.362661959	1

Source: Compiled by the authors

Judging from the data from Table 2, we can conclude that there is interdependence between incomes and factors that influence the income volume.

- 1) The relation between incomes from GDP (X1) equals $r_{yx} = 0.976351336$. This indicator shows a significant interconnection between them.

- 2) The relation between incomes and export of goods is also large, since $r_{yx} = 0.787729049$.
- 3) The relation between incomes and external flows equals $r_{yx} = 0.10$. This indicator is a sign of the lack of density between these indicators.

Table 4. Regression statistics of the influence of quality of marketing in Industry 4.0 in transborder markets

Multiple R	0.985857
R square	0.971914
Normed R square	0.9438
Standard error	61.76
Observations	7

Source: Compiled by the authors

Table 5. Dispersion analysis of the effect of marketing quality in Industry 4.0 in transborder markets

Regression statistics								
Multiple	0.985857							
R-square	0.971914							
Adjusted R-square	0.943828							
Standard error	61.7635							
Observation	7							
Dispersion analysis								
	df	SS	MS	F	Significance F			
Regression	3	396,035.6	132.011.9	34.60487	0.007923			
Residue	3	11,444.5	3.814.835					
Total	6	407,480.1						
	Coefficient	Standard error	T-Statistics	R-Value	Lower 95	Upper 95	Lower 95.0	Upper 95.0
Y-intercept	-1.124.02	619.3415	-1.81486	0.167176	-3,095.04	847	-3,095.04	847
Variable	0.065976	0.011359	5.808422	0.010158	0.029827	0.102124	0.029827	0.102124
Variable	8.53062	6.430034	1.326684	0.276559	-11.9326	28.99386	-11.9326	28.99386
Variable	0.969209	0.832281	1.164522	0.328399	-1.67948	3.617898	-1.67948	3.617898

Source: Compiled by the authors.

Taking the above into consideration, we deem it necessary to include the factors X1 (volume of GDP) and X2 (export of products

and services) in the models. The next step is performing a regression analysis between the resulting and factor indicators. The analysis

is carried out with the use of the “Regression” tool of the “Data analysis” package” of MS Excel.

Having analyzed the data, we can draw the following conclusions. First, the relation between the incomes, the GDP volume, and the volume of exports is rather high, which is proved by the value of the multiple regression coefficient $R = 0.985857$. The value R^2 explains that dependence of the volume is predetermined by the definite factors by 97.19%, while the remaining 2.81% are predetermined by other factors, which are not included in the regression model. Adjusted R square is an adjusted

determination factor. In our case, it equals 0.9438 – i.e., the value of the determination coefficient has not changed substantially due to the revision. The general equation has the following form:

$$Y = -20.61 + 0.045X_1 + 0.89X_2$$

The analysis has made it possible to state that the level of export has the strongest impact on the GDP indicator. Relying on the data obtained, we perform studies on modelling for 2022. Let us suppose that these factors remain unchanged or decrease/increase by 1%.

Table 6. Forecast of the income level determined by the marketing quality in Industry 4.0 in transborder markets for 2022.

Indicators	2022 (constant value)	2022 (+ 5%)	2022 (-5%)
Volume of GDP	24,800	26,040	23,560
Export of products and services	52	54.6	49.4

The data can be used for building a linear model and calculating the forecasted volume of incomes for 2022.

$$B = -20.61 + 0.045 * 24,800 + 0.89 * 52, y = \$1,145,390,000$$

$$1. y = -20.61 + 0.045 * 26,040 + 0.89 * 54.6, y = \$1,200,190,000$$

$$2. y = -20.61 + 0.045 * 23,560 + 0.89 * 49.4, y = \$1,080,500,000$$

It should be pointed out that the direct dependence between income from marketing in transborder markets, GDP volume, and exports of products and services

5. Conclusions

Globalization can be distinguished from among the dominating tendencies of modern global development, since it influences the transformation of all spheres of public life and is regarded as one of sustainable processes that stimulate the growth of interdependence of various countries and regions of the planet. The establishment of Industry 4.0 is responsible for a serious change of the whole business environment, the transformation of traditional spheres and

markets, and the formation of new (including digital) or change of the existing business models, which eventually changes not only national economies but also the global economy on the whole. This is attributed to the opportunities that companies receive through the use of the technical and technological package of Industry 4.0, in particular the Internet of Things, big data analytics, robots, and additive production. These technologies lead to profound transformations in the formation, placement, and organization of the global chains of value creation. The correlation and regression analysis has shown that the volume of incomes is influenced the most by such factors as the volume of GDP and export of products and services. The research has shown the connections between the definite factors and the indicator of incomes. Analysis based on findings can be deemed correct since all coefficients satisfy the requirements. A forecast of the level of income from marketing quality management in transborder markets based on the derived equation of the linear multi-factor regression has been compiled

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