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Neurotechnologies and Artificial Intelligence in Public Administration: Application Practice and Possible Ways of Development

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ABSTRACT

Over the past few years, the field of artificial intelligence and neurotechnology has moved beyond the scope of exclusive scientific discussion to the realm of public policy. The state is an important participant in technological progress, which allows us to consider in detail the connection between government officials and neurosciences, because, according to a large number of scientists, it is this segment of sciences that will allow humanity to transition to a new technological order. **The purpose** of this study is to consider the theoretical foundations of the interaction of the subjects of the public administration system with end-to-end technologies and to search for practical examples of the implementation of this interaction. In the course of the work such **methods** as theoretical analysis, comparison and contrast, cognitive method, system analysis, and analysis of statistical data were used. The theoretical foundations of the study of neurotechnologies, as well as the market of the existing neuroprosthetics products, were considered. The authors of the research studied and compared examples of the development of plans and the application of artificial intelligence and neurotechnologies in such countries as Russia, the United States, and the United Kingdom, and analysed global rankings of digitalisation of public administration. Based on this, it was **concluded** that countries are actively participating in a new technological race, trying to introduce artificial intelligence in the field of public administration in order to gain their own advantage, however the sluggishness of states in the development of neurotechnologies, with subsequent implementation in the public sector, was noted, and the fact of significant differences in the understanding of artificial intelligence in public administration around the world was revealed. This fact creates a field for further research and discussion. The results of the research can be used in the framework of further study of the analyzed aspects by scientific and research organizations, within the framework of the activities of federal authorities, as well as private companies.

Keywords: artificial intelligence; neurotechnologies; neural interface; digital technologies; public administration; public service; public sector; end-to-end technologies

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INTRODUCTION

Public administration in the 21st century has entered a period of structural transformation, which is manifested both in the rethinking of its modern methods and in the modernisation of the existing management system at the state and municipal levels of government. One of the important links in this process is the development and use of neurotechnologies and artificial intelligence (AI) in public administration. All over the world the problem of modernisation of administrative and management processes is increasingly considered through the prism of brain-computer interface (BCI) and AI technologies (which is reflected in this article), but the actual application of theoretical and research developments in this area is still an open issue. In this regard, the analysis of the relationship between the state and new technologies, as well as the formation of proposals for the introduction of such technologies in the future are becoming the most relevant today. The novelty of the work done by the authors of the article lies in the selection of the technologies under study, as well as in the conclusion regarding their use in the implementation of several possible ways of development of state and society management.

In doing so, they analysed both scientific works devoted to haptic research and ethical problems (early works of foreign scientists) and modern publications that focus on the present and future of neurotechnologies.

Artificial intelligence and the results of its exploitation are described in the textbook by E.V. Borovskaya and N.A. Davydova.[1] The application of neurotechnology and AI in the public sphere is an open field of study, but already now foreign and domestic researchers are trying to study it as deeply as possible. By collecting different points of view and approaches to analysing the development of digital technologies and their application in public administration, it is possible to approach a comprehensive consideration of the issue of implementing state transformations within the framework of digitalisation of decision-making and service delivery processes.

The aim of this research is to study the general trends in the development of neurotechnology and AI and the practice of implementing artificial intelligence and neurointerfaces in public administration, as well as to analyse the future of this direction.

To achieve the goal, the following tasks were set:

- to review current trends in the development of neurotechnology and AI and the potential for their relevance to humans in the future;
- to find out which of these technologies are already used in public administration in Russia and the world, and how they may change in the near future;
- identify the main factors that may slow down the introduction of neurotechnologies in the public sector in each of the countries considered in the study;
- on the basis of the analyses conducted, propose new ways of developing this area, which could have a structural impact on public administration in the future.

RESEARCH METHODOLOGY

This article considers the possibility of introducing artificial intelligence and neurotechnology into the public sector. This can be achieved with the help of cybernetics (as well as neurocybernetics [1]), which allows to identify the most effective actions to control certain elements of the system, and neuroscience, which studies brain structures and neural connections (*Fig. 1*). The interrelation of AI and neurotechnologies is expressed in their

[1] Borovskaya E.V., Davydova N.A. Fundamentals of Artificial Intelligence. Textbook. 4th ed., electronic. Moscow: Laboratory of Knowledge; 2020. 130 p.

common orientation related to the cognition of human intellect and brain — a biosocial and multifaceted being [2]. Many specialists use artificial intelligence as a tool: modern AI perceives the results of neuroresearch, possessing advanced perceptual and cognitive abilities of biological systems, including object recognition capabilities and decision-making functions [3]. Based on the application of AI and other tools, neurointerfaces are created, which, in turn, are divided into invasive (interacting directly with the subject) and non-invasive (not penetrating the body). The number of neurotechnologies is enormous, but this article will touch upon only those in which the state can see the greatest benefit for the implementation of its functions.

APPLICATION OF NEUROTECHNOLOGY AND AI IN VARIOUS FIELDS

The trend towards neurotechnology and AI is evident everywhere: artificial intelligence analyses security threats for financial institutions and neural networks analyse the credit histories of banking customers; neural interfaces enable medical professionals to perform complex operations; the world's major universities use neurotechnology for adaptive learning for students; the Moscow Metro uses facial recognition for fare payment; and the United Nations (UN) studies migration flows through automated analyses of data on the geolocation of migrants across the planet [4].

Neurotechnology is defined by most scientists as a set of methods and tools that provide a direct connection between technical components and the nervous system [5]. Artificial intelligence is a programme that imitates the human thinking process with the help of a computer [6]. When considering neurotechnologies and AI, it should be noted that there are many approaches to their implementation, each of which involves a different view of the development of the human brain and its behaviour. The main methods of applying neurotechnologies are invasive and non-invasive [7]. The former is exemplified by implant chips,[2] and the latter includes virtual reality glasses.[3] In the scientific community, neurotechnologies and neurointerfaces have historically been generalised and referred to by the term 'brain-computer interface', which refers to a device that uses neural activity recorded by the brain to establish direct communication with external actuators, such as, for example, prosthetic hands. [8, 9].

MODERN METHODS AND PERSPECTIVES OF BCI DEVELOPMENT

In order to understand what brain-computer interfaces are, it is necessary to consider the main ways of development of this direction. Neurotechnologies are aimed at studying the brain and its interaction with the created neurodevices. However, it should be understood that this is not always done with the help of a chip implanted in the human brain. For example, at this stage of neuroscience development, brain imitation methods are actively used. The fact is that the classical way of using an invasive (implantable) neurointerface (based on reading brain activity) can actually be equated to experiments on animals or humans. Such 'live' research often leads to increased costliness of experiments and ethical as well as reputational losses, which increases the risks of failure of any scientific project in this field. However, in the last ten years, the implementation of neurotechnology and artificial intelligence has been based on mathematical modelling of the brain. A new research paradigm has emerged, aimed at creating a comprehensive digital model or copy of the brain. In other words, the neurointerface executes the host's commands based on

[2] The development of Neuralink (an American neurotechnology company founded by Ilon Musk).

[3] The Apple Company's product.

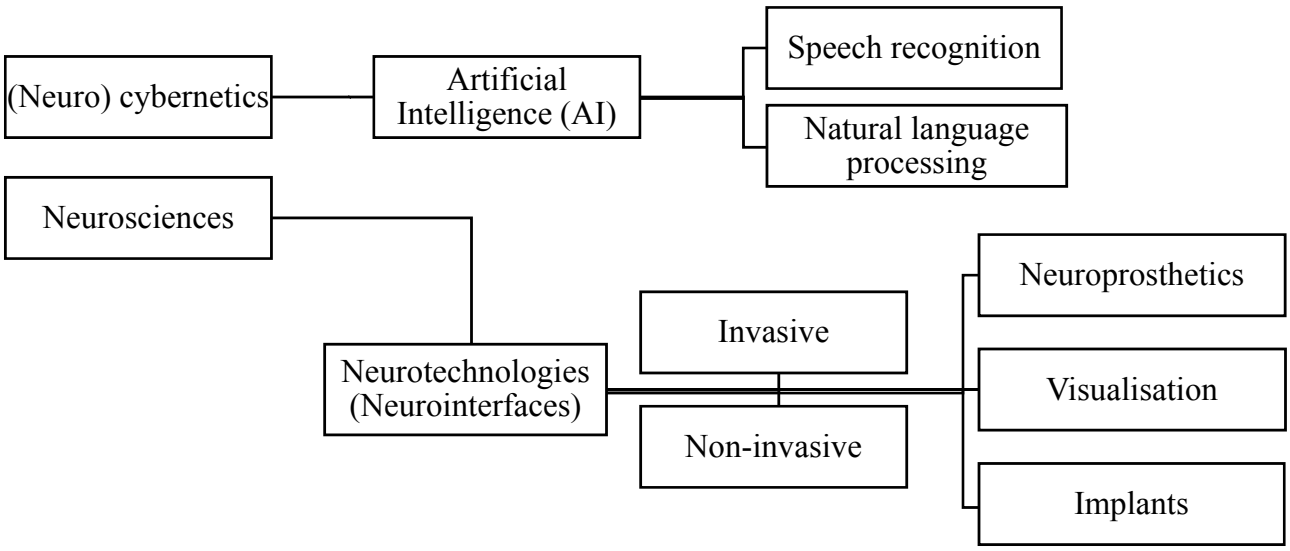

Fig. 1. **The relationship between neurotechnology and artificial intelligence**

Source: compiled by the authors.

a simulation of the brain, which is the safest and most practical method of study. But even the presence of significant computing power does not guarantee the accuracy of the transmission of neuronal activity, as technical capabilities are still limited [10].

Another area of neurotechnology development in recent years is the combination of neural recording and brain stimulation. The former is based on recording (reading) brain activity and analysing it, while stimulation allows a neurointerface to activate or inhibit certain areas of the brain using electrical impulses. While previously these methods of interaction were used separately, now many BCIs can influence brain activity while simultaneously reading it, which allows for future consideration of such technology as communication between individuals' thought centres and the like [10].

AI is more popular than neurotechnology, but often many civil servants do not have a clear understanding of it. The task of artificial intelligence is to replicate the brain's neural network to make logical inferences and decisions. Neurons are nerve cells that transmit information to their counterparts for the brain to perform its functions. The idea of AI involves the creation of artificial neurons in the form of mathematical functions and models, and its main goals are to automate human labour, further research to understand the essence of decision-making processes and, finally, to create an amplifier of human intelligence, which faces more and more problems every year [11].

The main approaches to AI research are divided into symbolic and connectionist approaches. Symbolic seeks to reproduce intelligence by analysing cognition independently of the biological structure of the brain in terms of symbol processing — its essence is learning based on the sequential demonstration of symbols or learning goals. The second approach involves the formation of artificial neural networks that mimic the structure of the brain. In other words, a program is created that is able to analyse different objects to obtain a result [12]. Neural networks, in fact, are the result of the second approach.

Thus, the theoretical basis and the main directions of development of neurotechnology and AI in the modern world allow us to understand most precisely what achievements

of this scientific direction can be applied to public administration and public service. To relate theoretical data to the results of this study, general scientific methods (comparison, analysis, generalisation), as well as statistical data comparison, benchmarking, forecasting, and cognitive method were used.

RESEARCH RESULTS

In recent decades, the popularity of such products as prostheses, virtual reality glasses, implants — has been growing; the concepts of 'neural networks', 'artificial intelligence', etc. have firmly entered our lives. This is primarily due to the potential revolutionary nature of these technologies, the existence of interest in the research of neurotechnologies and their simplification to the level when the results of this work become available to the mass consumer. On the basis of such a breakthrough the products appear (which can be bought by anyone) which are related to virtual (VR) and augmented (AR) realities.[4] Invasive and non-invasive technologies allow us to learn more about brain function and behaviour when interacting with virtual reality glasses or neuroprostheses.

The global interest in end-to-end neurotechnologies by private companies and governments is encouraging more focused research (which has been done in the last few years) thanks, for example, to programmes such as the BRAIN Initiative, organised in the United States in 2013 as part of the study of the brain through innovative technologies,[5] or the Human Brain Project, set up by the countries of the European Union.[6] This kind of projects allow us to introduce neurotechnologies into almost any sphere of society's life; therefore, they are called "end-to-end" projects [13]. Their necessity and popularity are explained by the fact that the political will of various subjects of public administration is growing every year. Technogenic catastrophes, epidemics of new viruses, population aging, and other factors cause increased human interest in neurotechnologies as a means of solving many problems [14]. However, it should be noted that the results of research can be considered relevant if the main market participants and states receive economic benefits from them — in this case, modern science has the best chance of development. Therefore, in order to analyse the prospects of this scientific direction in public administration, we should not forget about the economic attractiveness of neurotechnologies (*Fig. 2*).

As can be seen from the diagram, the global neurotechnology market size in 2022 was USD 12.82 million. According to forecasts, it is expected to continue growing (over the next 10 years it is planned to increase by 11.53% on average). It is important to clarify that this forecast is optimistic. There are analytical reports stating that the spread of neurotechnologies will be complicated by the global economic crisis, sanctions and trade wars, and the consequences of the coronavirus epidemic.[7]

Based on economic data and the increased interest in the topic of neurotechnology research, we can conclude that neurointerfaces and AI can not only improve the life of an individual, but also transform entire spheres of social life, including public administration. This conclusion has been made by many countries, and the Russian Federation is no exception — in 2019, the President of Russia signed Decree No. 490 "On the Development of Artificial Intelligence in the Russian

[4] Apple Vision Pro. Apple. URL: https://www.apple.com/apple-vision-pro/ (accessed on 21.09.2023).

[5] The BRAIN Initiative. National institutes of Health. URL: https://braininitiative.nih.gov/ (accessed on 12.09.2023).

[6] Welcome to the Human Brain Project. HPB. URL: https://www.humanbrainproject.eu/en/ (accessed on 19.09.2023).

[7] Neurotechnology Global Market Report 2023 ReportLinker. URL: https://www.reportlinker.com/p06464230/Neurotechnology-Global-Market-Report.html?utm_source=GNW (accessed on 19.09.2023).

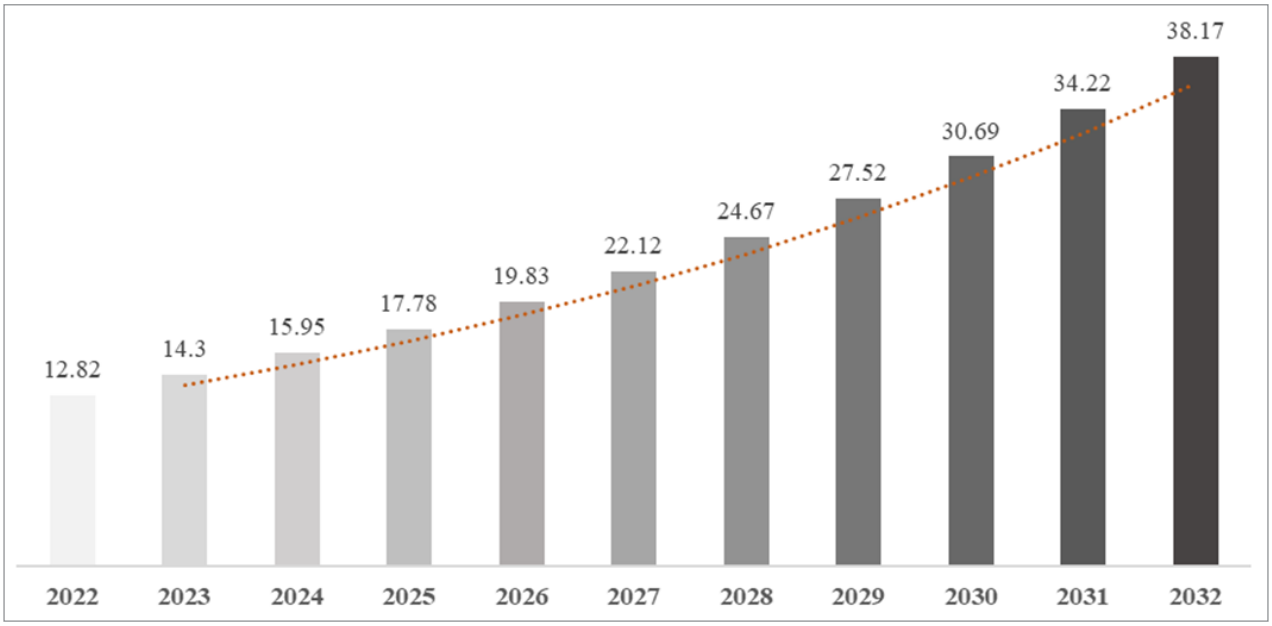

Fig. 2. **The volume of the global neurotechnologies market, USD millions**

Source: compiled by the author based on the Neurotechnology Global Market Report 2023 ReportLinker. URL: https://www.reportlinker.com/p06464230/Neurotechnology-Global-Market-Report.html?utm_source=GNW (accessed on 19.09.2023).

Federation (together with the "National Strategy for the Development of Artificial Intelligence until 2030"), according to which our country should not only support existing research, but also create all conditions for the emergence of new technological products, as well as professional staff capable of creating such products.[8] This document promotes the implementation of a roadmap for the development of "end-to-end" digital technologies,[9] which details the technological challenges that the state must address in order to succeed in technological development.[10] One of them is the digital platform for control (supervision) activities (the CSA platform), according to which artificial intelligence will connect employees of departments and law enforcement agencies with business representatives, processing all requests and applications automatically created in the database network,[11] as well as performing other departmental tasks, which in the classical management system are realised by civil servants independently. In this way, the work of several ministries is optimised, and the government can interact more effectively with private companies as well.

Despite existing documents and programmes, some authorities are only contemplating the use of AI in their activities. For example, in 2020, seven of them belonging to the federal level announced the introduction of AI to optimise

[8] Presidential Decree No. 490 of 10.10.2019 "On the Development of Artificial Intelligence in the Russian Federation (together with the "National Strategy for the Development of Artificial Intelligence for the period until 2030"). URL: https://www.consultant.ru/document/cons_doc_LAW_335184/bcc09a1a0e0ad09ec444cf158d88121676e237d0/ (accessed on 22.09.2023).

[9] It is worth noting that the goals related to the development of neurotechnology were later removed from the development strategy,

[10] Roadmap for the development of 'end-to-end' digital technology 'Neurotechnologies and Artificial Intelligence'. Ministry of Digital Development, Communications and Mass Media of the Russian Federation. URL: https://digital.gov.ru/ru/documents/6658/?utm_referrer=https%3a%2f%2fyandex.ru%2f (accessed on 17.09.2023).

[11] Control (supervisory) activities. CSA Portal. URL: https://knd.gov.ru/main (accessed on 24.09.2023).

tasks.[12] In 2023, the topic of AI development was raised by the Ministry of Economic Development of the Russian Federation — its representatives reported that AI can be used to assess the investment attractiveness of regions [15].

One of the important tools actively used in Russian state administration is the Vera (Faith) robot, which allows hundreds of applications to be automatically processed in the relevant departments. The robot is combined with the voice assistant Marusya from VK and is a full-fledged neurosystem with a recommendation component. This integration makes it possible to analyse the flow of documentation in the most competent and functional way and offer the best management solutions to the authorities [16].

The Federal State Autonomous Institution Research Institute 'Voskhod', responsible for the development of such products as the State Automated System of the Russian Federation 'Elections'; JSC National Certification Centre (NCC); National Data Management System (Federal State Information System 'Single Information Space NDMS'), etc., are actively cooperating with the state. These products contain AI technologies that automate the work of all levels and branches of government in Russia.[13] Non-invasive neuro-interfaces as a separate type of technology are actively used at the University of the Moscow City Government, and the university uses VR-technologies to train civil servants, prefects, employees of city administrations and registries.[14]

The above-mentioned programmes and practical examples of AI and VR applications suggest that Russia as a state mechanism is considering the spread of end-to-end technologies in the sphere of governance; however, the authors of the study concluded that there are almost no practical examples of implementing complex neurotechnologies (e.g., implants or motor neurointerfaces).

The reason for this is several factors. On the one hand, with all the variety of technologies, public administration is an area where only some of them can be applied, most of which are directly related to virtual assistants and neurotechnologies related to data visualisation [16]. Thus, due to the relatively small choice of products of scientific progress, the state is limited in the possibilities of realising innovative projects and does not always ensure the promotion of effective technologies. It also explains why neurotechnologies with invasive implementation and motor neurointerfaces are still not so actively used in public administration. On the other hand, the Russian economy is under sanctions restrictions, which makes the expert community have doubts about the effectiveness of AI exploitation in the public service in the near future [17]. Sceptical forecasts are also based on the poor results of the 2019 programme implementation. Thus, in 2012–2019 (according to the report of the National Research University Higher School of Economics), 660.26 billion roubles were allocated for the informatisation and digitalisation of federal executive bodies (FEBs).[15] At the same time, the number of FEBs staff gradually continued to increase, although the purpose of the spread of new technologies is to automate and simplify the decision-making structure in the management system. It is also worth noting that the number of staff grew (even despite the

[12] Seven agencies were caught in the neural network. RBC. 16.12.2020. URL: https://www.rbc.ru/newspaper/2020/12/16/5fd774869a7947c27f22fe25 (accessed on 18.09.2023).

[13] System innovations. Research Institute Voskhod. URL: https://www.voskhod.ru/ (accessed on 18.09.2023).

[14] From marriage ceremonies to public speeches: how VR-technologies help civil servants. Official portal of the Mayor and Government of Moscow. URL: https://www.mos.ru/news/item/93351073/ (accessed on 07.01.2024).

[15] Responding to the challenges of digitalisation: data-driven public administration, the ''headquarters'' model of management and structural manoeuvre in the number of civil servants. Report of the National Research University Higher School of Economics. MOSCOW: NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS; 2020.

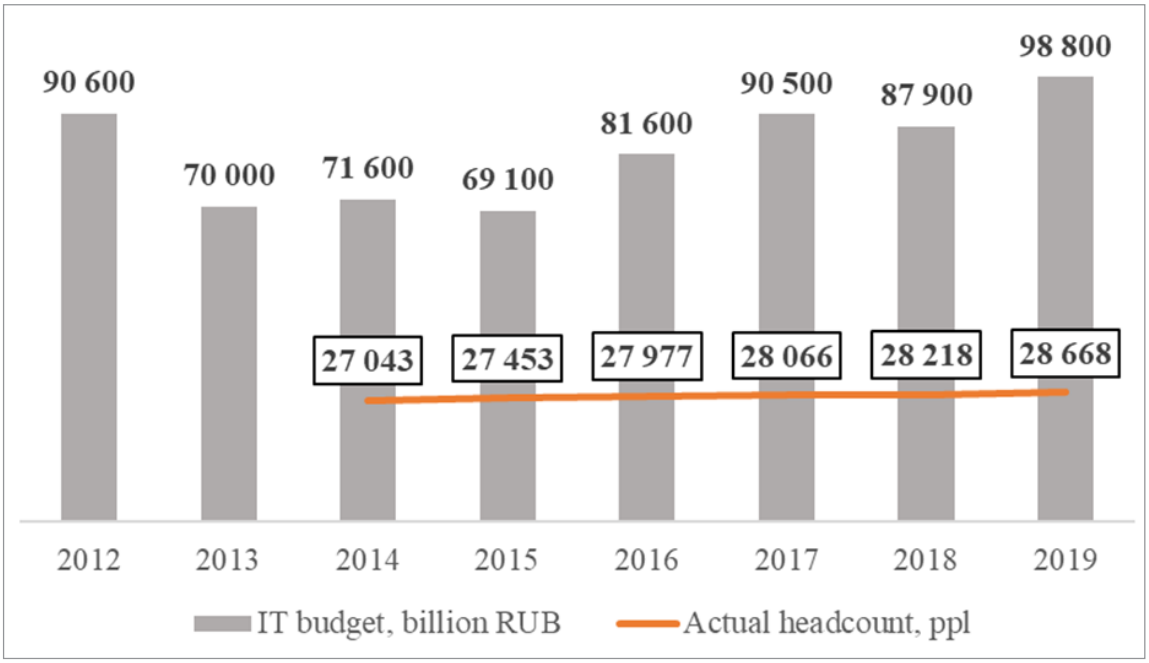

Fig. 3. **Costs of informatization in comparison with the actual number of personnel, 2012–2019**

Source: compiled by the author on the basis of the NRU HSE report "Responding to the Challenges of Digitalization: Data-Driven Public Administration, the "Headquarters" Management Model and Structural Maneuver in the Number of Civil Servants". Moscow: HSE; 2020.

reduction in staffing levels of federal agencies) by an average of 85% (*Fig. 3*).

The above factors do not allow us to assess the level of development of neurotechnologies and artificial intelligence in the public service in Russia as unambiguously high. There are no statistical data on this topic in sufficient volume for the analysis, but attempts to introduce neurotechnologies and AI into public administration are constantly being made.

COMPARATIVE ANALYSIS OF AI AND NEUROTECHNOLOGY APPLICATIONS IN THE PUBLIC SECTOR

As it was mentioned earlier, Russia is actively participating in the technological race along with other countries. It is worth paying attention to the UK as one of the main contenders for the title of the country that sets the main trends in the development of artificial intelligence and neurotechnology [18]. To achieve this goal, over the past few years the UK government has been approving strategic documents that define the ways of development of the digital economy and e-government. The peculiarity of these programmes is the active involvement of business in them, funding of scientific start-ups and compliance with international standards, so that talents from all over the world could get a job in the country [19]. In addition, the UK is involved in training for civil servants. For example, in 2022, a 5-part DDaT Essentials course was created: 'Data processing Fundamentals; Technology Fundamentals; Digital Fundamentals; Users First; Innovative Mindset'.[16] Such programmes can improve the future implementation of neurotechnologies in public administration and improve the digital skills of civil servants.

[16] Supporting cross profession senior civil servants with their DDaT skills [Online]. Official website of GOV.UK. URL: https://digitalpeople.blog.gov.uk/2022/03/16/supporting-cross-profession-senior-civil-servants-with-their-ddat-skills/ (accessed on 11.09.2023).

On the practical side, in 2022 (according to IBM), the percentage of AI implementation in the UK is 26%, which is higher than in the US and South Korea.[17] For example, since 2018, artificial intelligence has been used by the country's Department for Work and Pensions to detect and eliminate cases of fraud with social and state benefits[18]; AI cameras are being installed on the streets of Birmingham to combat urban waste[19]; and the Westminster City Council intends to use AI to analyse data on offenders and issue appropriate legal orders.[20] In terms of strategic work streams, Defence Science and Technology Laboratory (Dstl)[21] and Google Cloud signed a memorandum of understanding and collaboration on artificial intelligence in 2023 as part of the UK's defence sector development — the partnership with authorities is based on accelerating technology implementation and skills development.

In this way, the Ministry of Defence is working with private companies on cybersecurity, disaster response, and improving employee productivity[22] in order to digitise public administration. Government agencies are also trying to utilise neurotechnology, particularly in the provision of medical care and social services to citizens (e.g., through the Osso VR training platform at Newcastle Hospital) [20].

As can be seen, the UK is actively trying to take the lead in the race to implement AI in vital areas (including public administration), but no significant examples of advanced neurotechnology implementation were found during this study — except for the training of medical staff. National programmes are related to the use of artificial intelligence [in contrast to Russian practice, where neurotechnologies are highlighted (albeit in limited variants) as a separate area of development]. In addition, the UK's national strategy appeared much later than in most countries interested in AI,[23] which does not correlate well with its intentions to become a technological superpower. Another problem of the country is insufficient mastery of new technologies by civil servants — this is confirmed by analytical reports that question the effectiveness of implementation of existing educational programmes.[24]

The greatest number of innovations, geopolitical and economic position determine the advantage of such a state as the USA over other participants of the neurotechnology and artificial intelligence market. This explains the fact that already in 2016, the first strategy for the development and implementation of artificial intelligence in all areas of American life was published, the basis of which consists of 23 recommendations to be implemented by the country's government structures. When it comes to public administration, the document emphasises the formation of public policies

[17] IBM Global AI Adoption Index 2022. IBM Corporation. URL: https://www.ibm.com/watson/resources/ai-adoption (accessed on 21.09.2023).

[18] How The UK Government Uses Artificial Intelligence To Identify Welfare And State Benefits Fraud. Forbes. URL: https://www.forbes.com/sites/bernardmarr/2018/10/29/how-the-uk-government-uses-artificial-intelligence-to-identify-welfare-and-state-benefits-fraud/?sh=52b792f540cb (accessed on 15.09.2023).

[19] AI cameras installed in Birmingham to catch fly-tippers. Official website of LocalGov. URL: https://www.localgov.co.uk/AI-cameras-installed-in-Birmingham-to-catch-fly-tippers/56659 (accessed on 13.09.2023).

[20] Westminster council to trial AI in fight against fly-tipping. Official website of LocalGov. URL: https://www.localgov.co.uk/Westminster-council-to-trial-AI-in-fight-against-fly-tipping-/55700 (accessed on 12.09.2023).

[21] The Defence Science and Technology Laboratory (DSTL) is a UK Ministry of Defence (MOD) science and technology centre with around 3,500 staff, including some of the country's leading scientists and engineers.

[22] Dstl and Google Cloud sign a MOU as part of new AI collaboration. Official website of GOV.UK. URL: https://www.gov.uk/government/news/dstl-and-google-cloud-sign-a-mou-as-part-of-new-ai-collaboration (accessed on 02.09.2023).

[23] AI Index Report. Chapter 6: Policy and Governance. Stanford University. URL: https://aiindex.stanford.edu/report/#individual-chapters (accessed on 19.09.2023).

[24] The challenges in implementing digital change. Official website of National Audit Office. URL: https://www.nao.org.uk/press-releases/the-challenges-in-implementing-digital-change/ (accessed on 11.09.2023).

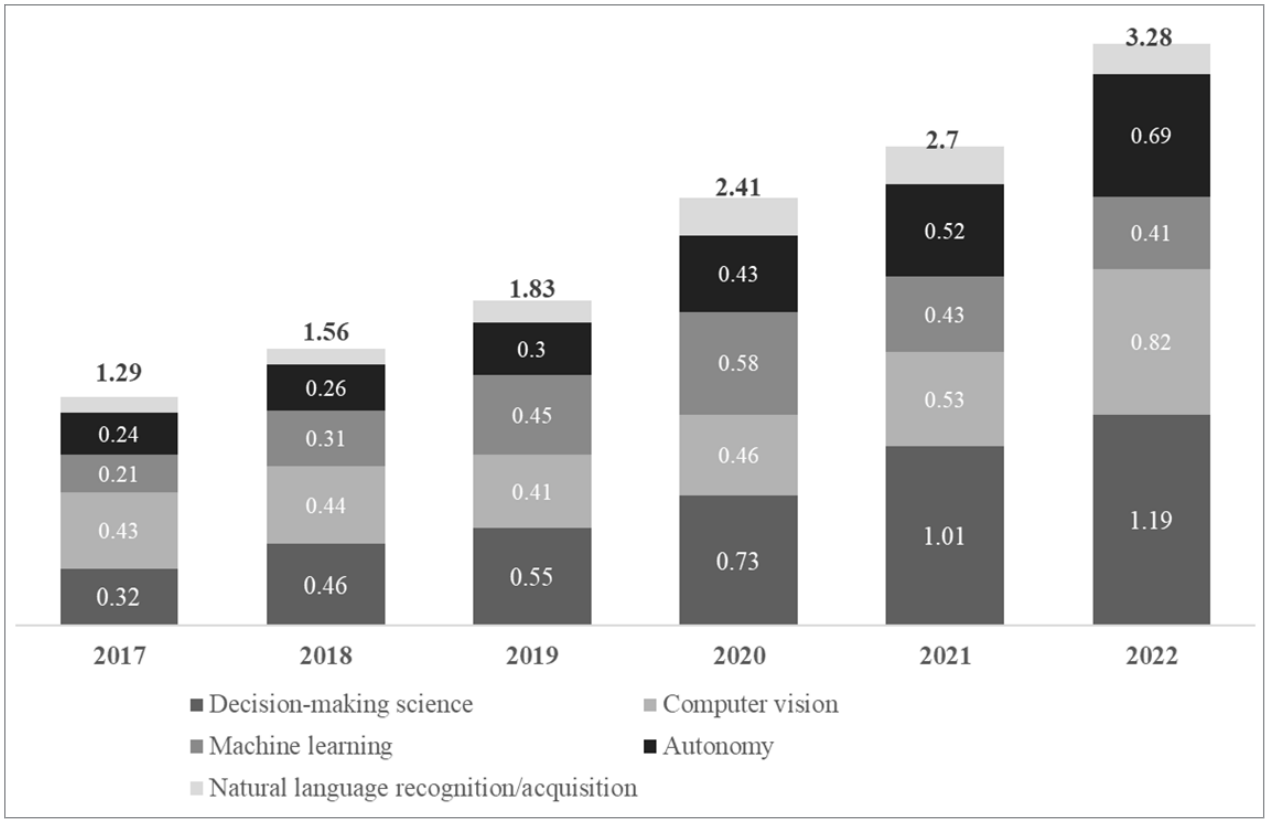

Fig. 4. **U.S. Government Spending by Segment, 2017–2022**

Source: compiled by the author based on the data of AI Index Report. Chapter 6: Policy and Governance. Stanford University. URL: https://aiindex.stanford.edu/report/#individual-chapters (accessed on 19.09.2023).

that promote the comprehensive advancement of AI in the US. A special mention should be made of Recommendation No. 4, which required the subcommittee on machine learning and artificial intelligence to create a community of public sector AI practitioners. It was to include agencies that promote educational programmes in the field of AI developed for government employees [21]. Following the recommendations allowed the United States to be one of the first to promote AI at the government level. According to the report of the United States Administrative Conference, almost half of federal agencies (45%) have experimented with artificial intelligence and related machine learning tools [22]. This paper also describes specific examples of the use of algorithmic recommendation AI systems to perform managerial and administrative tasks. For example, the Department of Housing is creating chatbots; the Transportation Security Administration is actively using facial recognition; AI tools are being implemented to protect agencies from hacker attacks, etc.

Other federal agencies using digital technologies in practice include the Office of Information Resources Management, the Office of Management Strategy and Decisions,[25] and the U.S. National Archives, among others [23]. Invasive and non-invasive neurotechnologies are being actively developed. Organisations such as the US Department of Defence's Advanced Research Projects Agency and the National Institutes

[25] Artificial Intelligence (AI). Official website of the U.S. Department of State. URL: https://www.state.gov/artificial-intelligence/ (accessed on 20.09.2023).

of Health are funding neuroscience projects. These projects are estimated to cost between US$ 5 billion and US$ 10 billion, respectively.[26] And every year, the amounts allocated to AI and neurotechnology (both in general and by segments) are only growing, although funding for some areas, on the contrary, is decreasing due to shifting priorities (*Fig. 4*). The largest and most popular programmes are the βApollo Project of the Brain [24] and the aforementioned BRAIN Initiative. The state is rather cautious in its approach to the study and application of neurotechnologies, so the work is still conducted only at the level of trials and clinical studies, but experiments with intracortical (implantable devices) and non-invasive BCIs are already underway, which can enhance human potential in the future, including in terms of making managerial decisions at the state level.[27]

However, analysing the financing of AI and neurotechnology in the US, one can identify certain problems that slow down the widespread introduction of such innovations (including in public administration). Firstly, studying the existing data, we can conclude that, unlike AI, neurotechnologies in the US are at the stage of scientific research and discussion. Second, according to the AI National Security Commission's reports on AI, there was a funding gap for the scientific field in the US (including AI and neurotechnology research projects) in 2020. According to these documents, it was not possible to hire the necessary number of specialists to implement artificial intelligence in public administration, which negatively affected the overall development of this field and reduced performance indicators. From the recommendations proposed by the commission, it can be concluded that another problem is the poor reliability and security of systems based on AI and neuro-interfaces [25].

ANALYSIS OF THE LEVEL OF DIGITALISATION OF PUBLIC ADMINISTRATION BY COUNTRY

To understand why it is necessary to embed AI and BCI in public administration, it is enough to consider one of the international indices for calculating the use of digital technologies, namely the World Bank's GovTech Maturity Index (GTMI) ranking, which reflects the level of digitalisation of public administration by country based on the following indicators: the Government Technology Maturity Index (GTMI); the Core Public Systems Index (CPSI); the Public Services Development Index (PSDI); the Citizen Engagement Index (CEI); and the Government Digitalisation Institutions Index (GDI) These parameters essentially reflect different aspects of digitalisation and allow us to conclude on the technological maturity of the public sector in the selected country (*Fig. 5*).

The results expressed graphically allow us to catch some trends in the development of digitalisation of the civil service. Firstly, despite the high level of technological development, the People's Republic of China is inferior to the other countries under study in almost all parameters, except for the Citizen Engagement Index (the US is in last place). The United Kingdom is the leader in this criterion. Digital public services (including those based on AI technologies) are most effectively developed in Singapore. In other criteria, the Russian Federation has the most points.

These rankings clearly reflect the fact that Russia has the most mature technologies and the most advanced information systems. Digitalisation institutions are also, according to the presented rating, the most developed in our country.

[26] Cause Area: Differential Neurotechnology Development. EA Forum. URL: https://forum.effectivealtruism.org/posts/Qhn5nyRf93dsXodsw/cause-area-differential-neurotechnology-development (accessed on 19.09.2023).

[27] Neuralink. URL: https://neuralink.com/ (accessed on 17.09.2023).

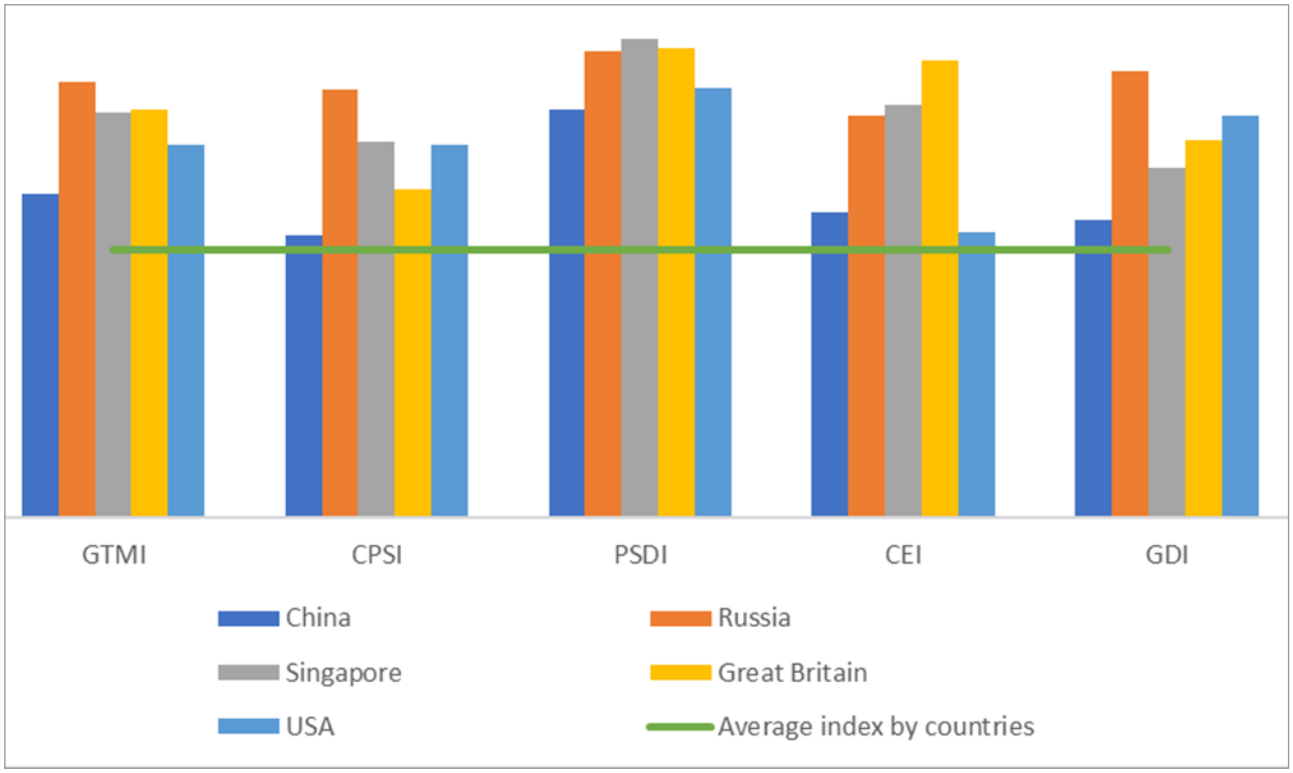

Fig. 5. **Comparison of GTMI by countries**

Source: compiled by the author based on the GovTech Maturity Index (GTMI) Data Dashboard. The World Bank (official website). URL: https://www.worldbank.org/en/data/interactive/2022/10/21/govtech-maturity-index-gtmi-data-dashboard.

RESULTS

The results of the study reveal several major trends related to the development of end-to-end technologies in public administration:

- today the market of neurotechnologies and artificial intelligence is actively developing and is capable of giving the state a competitive advantage in all spheres of society;
- due to the growing popularity and importance of new technologies, governments of all countries are actively developing regulations and long-term strategies to study and implement AI and neurotechnologies in their activities, which has led to another technological race;
- the position of each country in this race differs depending on the political, economic and technical framework, but even these factors do not always limit scientific progress in a particular state;

Examples of end-to-end technologies in almost all countries allow conclusions to be drawn about their place in public administration.

The study made it possible to compare legal documents of different states that envisage strategic development within the framework of technological progress. Of the countries represented, only the Russian Federation combined neurotechnology and artificial intelligence in one document dedicated to the digitalisation of public administration. The UK and the US have emphasised AI. However, the authors of the article revealed in the course of their work that, despite the development of the regulatory framework, at the moment developed countries are rather reluctant to consider the introduction of neurointerfaces in the public sector. Practical examples are limited to the use of virtual reality glasses and employee training, and the statisti-

cal base is either not maintained at all or relates to limited topics, which hinders future studies.

It would be wrong to say that the above-mentioned countries do not study neurotechnology — their research is conducted within the framework of medical sciences. In the course of the work, the authors of the article have identified the following trend: the state as an institution is still cautious about neurotechnology and doesn't rush to introduce the results of brain research into public administration due to ethical and legal factors, but artificial intelligence is being used everywhere. This seems to be the main problem that complicates further research on combining the spheres of public administration and neurotechnology. Government officials and scientists are still in search of ways to use neuroprostheses in the management of socio-economic processes in society. This fact confirms the relevance of this study, which is a practical reflection of the situation in which the state is now, when the unification of several sciences and a possible change in the technological mode are neither the main driver of active practical application of new technologies, nor a priority of study, although the desire for it is declared in federal strategies.

An important conclusion that follows from the results of the paper is also that sanctions pressure, foreign policy turbulence and economic situation do not always put an end to technological production. Paradoxically, according to international studies, as well as a comparison of strategies of different countries, it is the Russian Federation, rather than China and the United States, which have better resources, that is most successful in its attempt to gain technological primacy in the application of AI and is even (unlike other states) considering neurotechnology. This circumstance, however, is not a confirmation that the Russian Federation is the first in the field of end-to-end technologies, especially since it was concluded that the countries under study are on an equal position in the issue of practical application of neurotechnologies in the public sector.

A comparative analysis of the US, Russia and the UK also revealed different approaches to unlocking the potential of neurotechnologies in public administration. While the UK seeks to become a superpower in the field of AI by attracting personnel and creating educational centres, Russia focuses on the creation of information and analytical systems of artificial intelligence using neurointerfaces. At the same time, the US is preoccupied with national security and the study of various kinds of intelligent assistants. Each approach has its advantages and disadvantages, but the global trend of digitalisation and technologicalisation of public administration is noticeable.

The results of the study allow us to formulate proposals that will help the state as an institution of power and governance to make significant steps in the uptake of technology (see *Table*).

CONCLUSIONS

Neurotechnologies and artificial intelligence are a subject of study for specialists all over the world and a means of earning money for corporations due to the growing profitability of this market. However, the state, as the main beneficiary, is the first to seek to use the results of research, as the latest technologies allow it to defend its interests in the external environment and to organise management activities in the internal political and economic space. At the same time, the state is careful in its approach to complex sciences related to human nature, which is reflected in the intensity of scientific experiments.

To date, artificial intelligence is already changing public administration, while neurointerfaces are still only being discussed in scientific circles. At the same time, the available data allow us to observe the technological race,

Table

Proposals for further interaction of entities related to the development and application of end-to-end technologies in the public sector

Subject of interaction	Common communication paths
Economic set of measures — general innovative development of "end-to-end" technologies	
• State authorities at the federal and regional levels (Ministry of Finance of Russia, Ministry of Industry and Trade of Russia). • SME subjects. • Scientific start-ups. • Large businesses and their representatives (RSPP). • State companies and corporations (Rosatom, Roscosmos).	• Establishment of scientific and technological production in special economic zones. • Development of joint ventures and products through PPP-projects. (Public Private Partnership) • Development of incentives and other business support measures for products that fit the concept of "end-to-end technologies". • Development of special programmes and projects to attract investments and create scientific start-ups
Social set of measures — addressing challenges related to the use of technologies in the public service	
• State authorities at the federal and regional levels (Ministry of Labour of Russia, Ministry of Finance of Russia, Ministry of Culture of Russia). • Trade union organisations (Federation of Independent Trade Unions of Russia). • Social organisations and NGOs	• Introducing AI and neurotechnology under the auspices of social support. • Creating programmes to support socially vulnerable groups by improving their motor activity. • Popularisation of invasive and non-invasive neurointerfaces through the creation of a specialised advertising strategy and awareness training for civil servants
Statistical and legal set of measures — addressing normative, ethical, and statistical challenges	
• State authorities at the federal and regional levels (Federal Assembly, Ministry of Culture of Russia, Ministry of Education and Science of Russia). • State scientific centres (SIRIUS). • Statistical research centres (Rosstat, VCIOM (All-Russian Public Opinion Research Center), FOM (Public Opinion Foundation))	• Revision or development of a new regulatory framework for the use of AI and neurotechnologies in the government and public sectors (creation of federal laws, development of regulations and codes). • Development of an ethical framework consisting of the main provisions and principles regarding the use of «end-to-end" technologies and introduction of these provisions into the code of ethics of civil servants. • Ongoing statistical and information studies on the attitudes of citizens towards «end-to-end" technologies and the use of technologies in various spheres.
Research set of measures — addressing the lack of practical examples of "end-to-end" technologies in management processes	
• State authorities at the federal and regional levels (Ministry of Education and Science of Russia, Ministry of Culture of Russia, Ministry of Education of Russia). • Scientific state organisations (RAS). • Universities at federal and regional levels (National Research University Higher School of Economics, Moscow State University). • Private research institutes (Research Institute 'Voskhod', Autonomous Non-Commercial Organization 'Baikal Research Centre')	• Creation of a scientific base and a unified methodology for studying neurotechnologies and AI in the conditions of the Russian scientific school through clustering of existing knowledge. • Involvement of private research institutes and centres to promote innovative technologies in the public sector. • Experimental and testing application of sophisticated neurotechnologies in public authorities to improve cognitive abilities. • Conducting theoretical and practical research substantiating the usefulness and effectiveness of invasive and motor neurotechnologies for public servants. • Creation and implementation of artificial intelligence capable of independently making strategic managerial decisions at the strategic level of state forecasting and planning on the basis of processing a common system of statistical data

Source: compiled by the author.

which reflects the peculiarities of each country and makes it possible to identify the problematic and strong points of an individual state.

In the course of achieving the main objective of the study — to analyse the existing practice of neurotechnology application in the public sector — the fact of its insufficient development in general worldwide, due to both legal restrictions and scientific and financial difficulties, was revealed.

The results of the analysis made it possible to identify general trends in the development of neurotechnologies, to specify the practice of applying innovations in public administration and to draw conclusions about the interaction between public managers and neuroscience. The study confirmed the existence of a technological race and also demonstrated the difference in approaches to the application of similar products in different countries. Specific examples provided insight into the segments of governments applying AI and BCI and the goals of Western countries and Russia. Some of the challenges that governments face when trying to interact with the scientific environment were discussed.

Based on the above, the authors outlined their vision of further development of this field — from the involvement of entrepreneurs to the development of related sciences (psychology, quantum sciences).

In the author's opinion, the prospects for further work lie, first of all, in identifying and classifying existing and possible barriers to the application of neurotechnologies in the public sector. It is also worth considering the issues of strategic planning on the example of the Russian Federation and analysing the strengthening of positions in terms of digitalisation of public administration in the context of geopolitical crisis and pressure, to identify the reasons for this trend and to determine the next steps in the transition to a new technological mode.

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ORIGINAL PAPER

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Development Resources of the Border Regions of the Russian Federation

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ABSTRACT

The Russian Federation borders with 18 foreign countries. Seven of them are NATO members as of March 2024. The state border of Russia passes through the territory of almost half of the constituent entities of the Russian Federation. The shelling of the territory of the Russian Federation by the armed forces of Ukraine radically changes the situation in the sphere of not only of military, but also of socio-economic security, primarily in the border regions of Russia. The issue of their protection, elimination of weaknesses and organization of society's life in a new, unstable, largely unfavorable external environment is especially acute. The formation of resources necessary for solving these issues largely depends on the current level of economic development of the country and its border regions. The author's purpose was to illustrate some aspects of the economic situation in the border regions of the Russian Federation, given the current circumstances where Russia's adversaries are attempting to create areas of tension near the Russian borders, exemplified by Ukraine, Poland, and the Baltic States. To achieve this goal, the author solved several tasks. They are: selecting the subjects of the Russian Federation to be studied, determining the set of statistical indicators to be analyzed, and determining the length of the dynamic range for each indicator. We also constructed the dynamics of change for these selected indicators. The results of the author's analysis of seven statistical indicators that reflect the socio-economic situation in 36 selected border regions of the Russian Federation are presented below. The analyzed statistical data are taken for the period from 1995 to 2021. The economic and statistical research was carried out on the basis of data from the Federal State Statistics Service of the Russian Federation, most of which are published in statistical collections "Regions of Russia. Socio-economic Indicators". The article shows that a number of the studied parameters indicate the need to strengthen the economic power of the Russian border regions in modern and possible future conditions. The obtained results can be useful for legislative and executive authorities of the Russian Federation and the subjects of the Russian Federation in the development and implementation of the development policy of regions that have a particularly important strategic importance.

Keywords: constituent entities of the Russian Federation; border regions; socio-economic security; unfriendly states; anti-Russian sanctions

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BORDERING REGIONS[1]

As of March 2024, the Russian Federation shares borders with 18 countries (*Table 1*). Nine of them[2] are unfriendly states to Russia,[3] and seven are members of the North Atlantic Treaty Organisation (NATO). Azerbaijan, Kazakhstan, and Mongolia co-operate with NATO and conduct joint military exercises.

The state border is shared by 41 constituent entity of the Russian Federation. We will exclude five of them from consideration: Samara Region, whose land border with the Republic of Kazakhstan is 300 m long; Kamchatka Territory, Sakhalin Region and Chukotka Autonomous District — they have only a sea borders; the Republic of Crimea, as data on the state of its economy are not presented for all the years we have analysed. We will divide the remaining regions into two groups. Group A includes those of them that border with states unfriendly to Russia. All other border constituent entities of the Russian Federation will form group B (*Table 2*).

From the non-border regions we will form group C. Since the values of most of the economic indicators of Moscow and St. Petersburg that we have studied significantly exceed the values of indicators of many other constituent entities of the Russian Federation (they are statistical outliers), we will exclude these cities from this group. We will not include Sevastopol city in this group for the same reason for which we did not include the Republic of Crimea in Group B.

Let us consider what resources all three groups have for their development. A resource is a stock and (or) source of something. We call the development of an object its change, which results in a new qualitative state of its composition (structure), organisation, size (mass-scale), internal and external relationships[4] [1]. The resource for the development of human society (hereinafter referred to as society) is understood as the resources available to society and necessary for its development.

The most important of them, as is known, include the number and composition of the population, natural, material, information resources, knowledge and opportunities for their use, the number of workers employed in production, the quality of management at all levels. Foreign trade helps to provide modern Russia with important development resources (foreign currency, money coming into the budget system of the country, imported means of production). With regard to the border constituent entities of the Russian Federation, the data of official statistics available to the author allow us to study the size and dynamics of the population, the number of people employed in the economy, the volume of investment in fixed capital, the level of capital productivity of fixed production assets, the volume of exports and imports. [2–4].

Analyses were performed on four time periods:

- 1995–2000 — the difficult period of Russia's socio-economic development under Russian President B.N. Yeltsin;
- 2001–2013 — a period before the introduction of anti-Russian sanctions;

[1] The term "region" is used in this paper as a synonym for the term "constituent entity of the Russian Federation".

[2] The list of unfriendly states is established by the Order of the Government of the Russian Federation No. 430-o dated March 5, 2022 (ed. Oct. 29, 2022). URL: http://static.government.ru/media/files/wj1HD 7RqdPSxAmDlaisqG2zugWdz8Vc1.pdf (accessed on March 12, 2022).

[3] Foreign unfriendly states are foreign states committing unfriendly actions against the Russian Federation, citizens of the Russian Federation or Russian legal entities. Unfriendly actions are defined as the imposition of political or economic sanctions against the Russian Federation, citizens of the Russian Federation or Russian legal entities, committing other actions that pose a threat to the territorial integrity of the Russian Federation or are aimed at economic and political destabilisation of the Russian Federation. Federal Law of July 4, 2018 No. 127-FL 'On measures to influence (counteract) the unfriendly actions of the United States of America and other foreign states'. Art. 1, part 1, part 2. URL: https://www.law.ru/npd/doc/docid/557585063/modid/99 (accessed on July 18, 2023).

[4] "Development is a concept reflecting such a change in the organisational and/or elemental composition of an object (its quality), which is the emergence (in the object) of a new type or a complex of organisational interactions and its consolidation (retention) in a series of successive states of the object with the help of the whole complex of its internal and external interactions — naturally, artificially or naturally-artificially" [1, p. 158].

Table 1

The length of the Russian Federation's state border with neighboring countries, km

Country (ranking by border length)	Border, km				
	terrestrial	river	lake	marine	Total
Republic of Kazakhstan	5936.1	1516.7	60.0	85.8	7598.6
People's Republic of China	650.3	3489.0	70.0	0.0	4209.3
Mongolia	2878.6	588.3	18.1	0.0	3485.0
Ukraine without Crimea	1500.2	422	3.4	320.0	2245.6
Republic of Finland	1091.7	60.3	119.8	54.0	1325.8
Republic of Belarus	857.7	362.3	19.0	0.0	1239.0
Republic of Georgia	572.5	0.0	0.2	0.0	572.7
Republic of Estonia	89.5	87.5	147.8	142.0	466.8
Republic of Azerbaijan	272.4	55.2	0.0	22.4	350.0
Republic of Lithuania	19.9	206.0	30.1	22.4	288.4
Republic of Latvia	137.2	127.5	5.8	0.0	270.5
Republic of Abkhazia	177.0	55.9	0.0	22.4	255.3
Republic of Poland	203.3	0.0	0.8	32.2	236.3
Kingdom of Norway	43.0	152.8	0.0	23.3	219.1
Japan	0.0	0.0	0.0	194.3	194.3
Republic of South Ossetia	70.0	0.0	0.0	0.0	70.0
USA	0.0	0.0	0.0	49.0	49.0
DPRK (North Korea)	0.0	17.3	0.0	22.1	39.4

Source: compiled by the author based on: URL: https://ru.wikipedia.org/wiki/Государственная_граница_России (accessed on Feb. 1, 2024).

Table 2

Groups of border constituent entities of the Russian Federation

Group A	Group B
Belgorod, Bryansk, Voronezh, Kursk, Republic of Karelia, Kaliningrad, Leningrad, Murmansk, Pskov, and Rostov Regions	Smolensk Region, Krasnodar Territory, Astrakhan and Volgograd Regions, Republics of Daghestan, Ingushetia, and North Ossetia (Alania), Kabardino-Balkarian, Karachayevo-Chircassian and Chechen Republics, Orenburg, Saratov Regions, Kurgan, Tyumen less autonomous areas, Chelyabinsk Regions, Republics of Altay, Tuva, Buryatia, Altai, Tran-Baikal, Primorye and Khabarovsk Territories, Novosibirsk, Omsk and Amur Regions, and Jewish Autonomous Region.

Source: compiled by the author.

• 2014–2016 — the most difficult years for the Russian economy after the imposition of sanctions [5];

• 2017–2021 — during these years, the economy adjusted to operate under the conditions of a long-term hybrid blockade imposed by a group of unfriendly states the Russian Federation.

The time at which the events occurred, and the significantly changed conditions of the society's activities, was chosen as a criterion for dividing the timeline into periods [6].

POPULATION SIZE

In the periods under study, the dynamics of the population of all considered groups of regions was similar: there was a tendency towards its reduction (with a slight increase in 2014–2016). (*Fig. 1*).

In the total number of Russians, the share of the population of the group of regions C decreased by 2.7 percentage points (p.p.), group A — by 0.6 p.p., group B increased by 0.2 p.p., residents of Moscow and St. Petersburg increased by 3.1 p.p. (*Fig. 2*).

At the same time, the population density in group A was higher than in group B and the latter higher than in group C (*Figure 3*).

MOTORWAYS AND RAILWAY LINES

It is natural to expect that the density of roads and railways will be higher in regions with higher population density. This was the case for the groups of the Russian Federation constituent entities under consideration (*Figures 4, 5*).

After the imposition of anti-Russian sanctions, the rate of construction of paved public roads in Russia slowed down (*Figure 6*). For railways, the drop in average annual density-change rates in 2014–2016 was only evident in the regions of Group C. It was compensated for in 2017–2021.

A well-developed transport network plays a significant role in the development of a territory, its natural resources, and the socio-economic growth of the society inhabiting that area. At the same time, it serves as an indicator of such progress.

HOUSEHOLD INCOMES

The factors that attract people to live in a particular region include monetary income. The cost

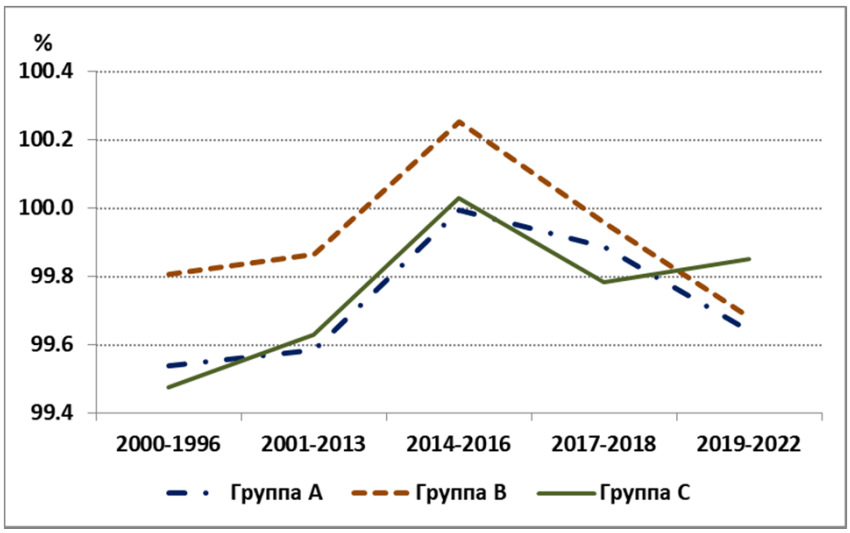

Fig. 1. **The average annual rate of change in the population of the constituent entities of the Russian Federation, 1996–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 022.

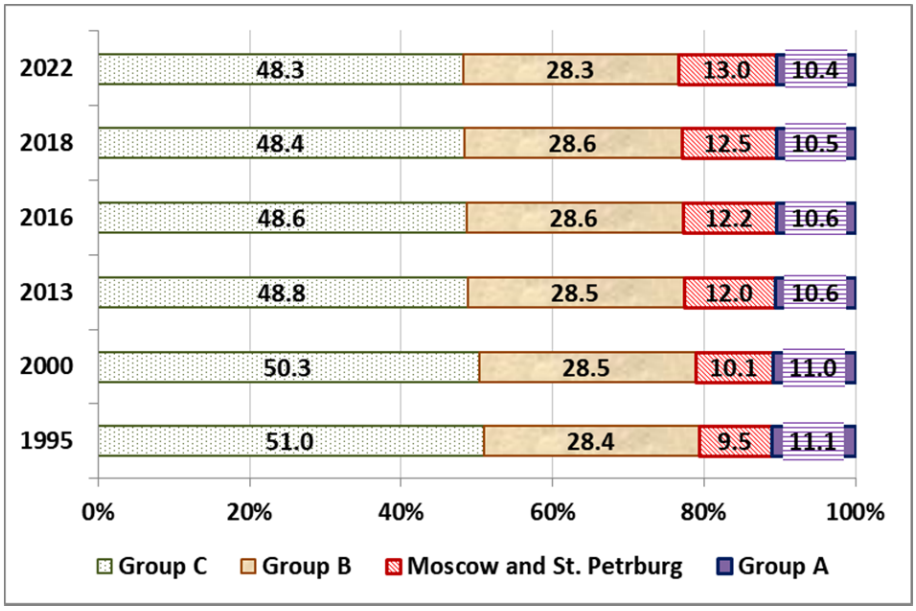

Fig. 2. **Population structure according to regional groups, 1995–2021, percent**

Source: developed by the author on the basis of data of statistical collections Regions "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

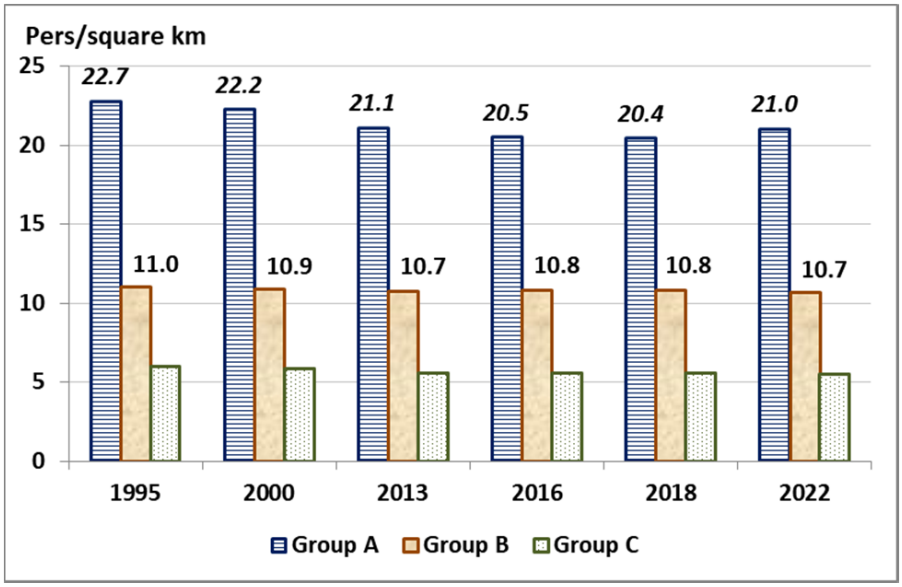

Fig. 3. **Population density in groups of constituent entities of the Russian Federation, 1995–2021, person per sq. km**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

of living in a given place is also important. For example, in 2021, the average per capita cash income in the Chukotka Autonomous District was 2.3 times higher than in Krasnodar Territory; if it is divided by the subsistence minimum set for the fourth quarter of 2021, the ratio of the obtained values is 0.98.[5] Judging by this value,

[5] Regions of Russia. Socio-economic indicators. 2022. Statistical collection. Moscow: Rosstat; 2022. 11220 p.

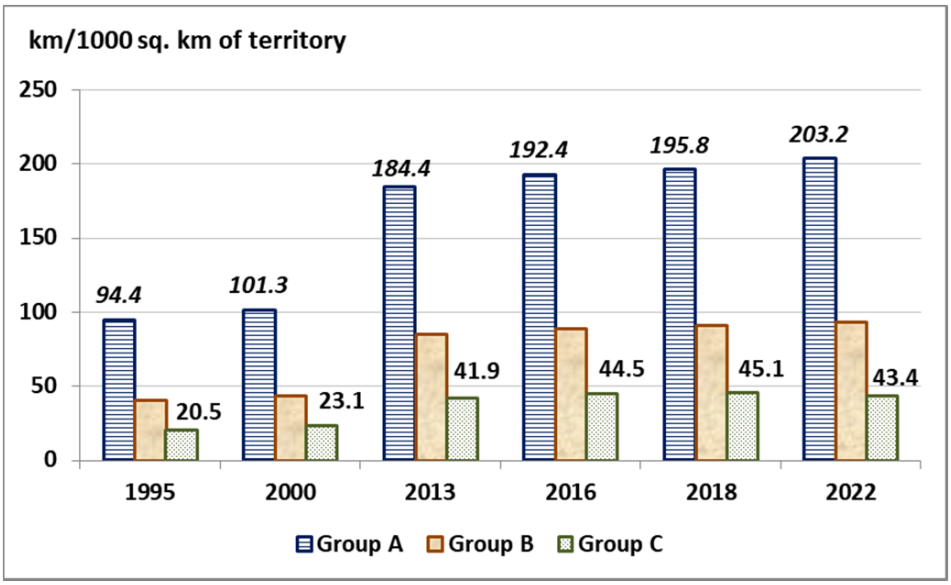

Fig. 4. **Density of paved public roads in the regions of groups A, B and C in 1995–2021, km/ 1000 sq. km of territory**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

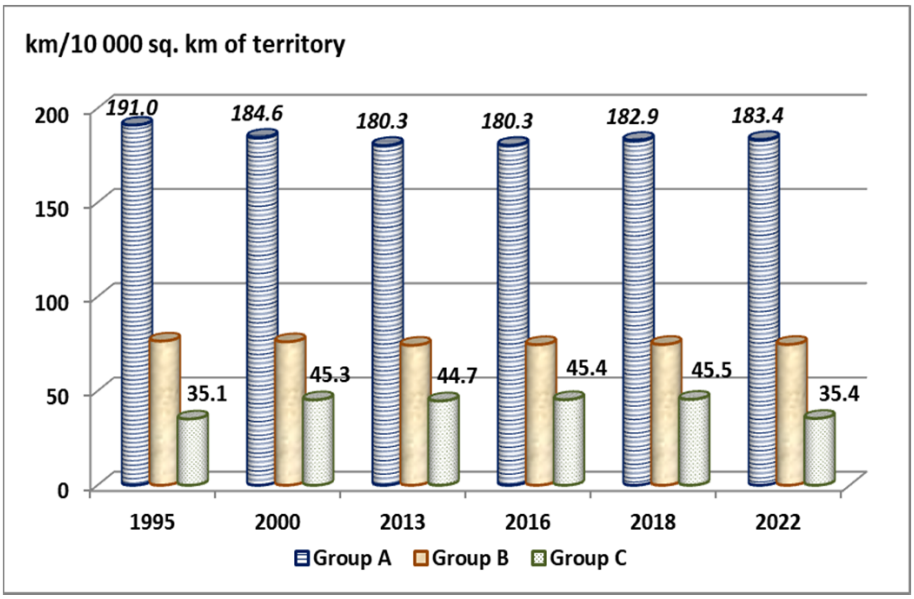

Fig. 5. **The density of public railway tracks in the regions of groups A, B and C in 1995–2021, km per 10 thousand sq. km.**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022. km/10 000 sq. km of territory

it is better to receive the same amount of cash income in Krasnodar Territory than in Chukotka Autonomous District.

On this basis, let us assess the attractiveness of regions by the ratio of average per capita cash income to the subsistence minimum. In

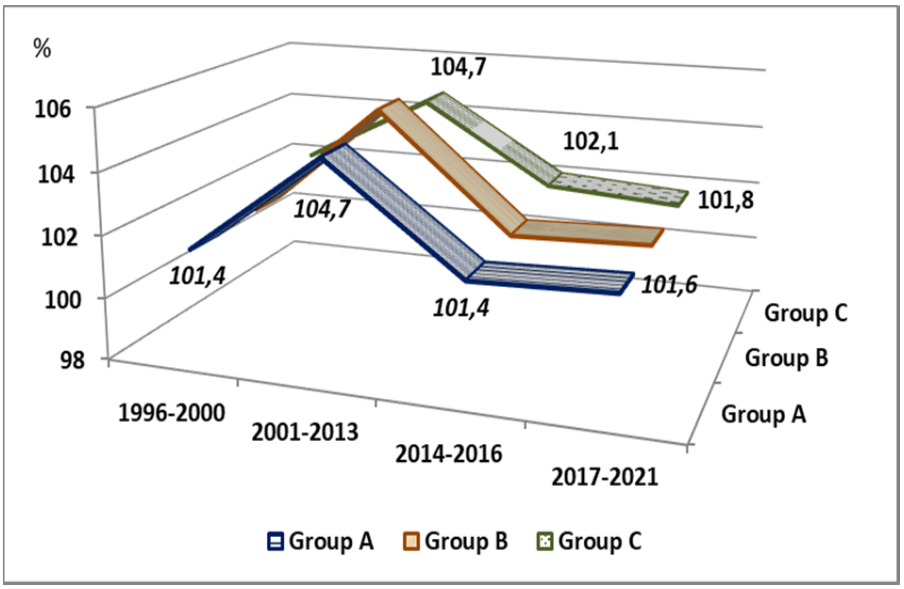

Fig. 6. **The average annual growth rate of density of paved public roads in the regions of groups A, B and C in 1995–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

Table 3

The ratio of the average per capita income of the population to the subsistence minimum in groups A, B, C, units.

Group	2005	2013	2016	2018	2021
A	2.3	3.3	3.5	3.2	3.3
C	2.4	3.3	3.5	3.1	3.2
B	2.2	2.9	3.1	2.7	3.3

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

the years under consideration,[6] group A was the leader in this indicator, while group B lagged behind (*Table 3*), which corresponds to a higher population density in the group of regions A (*Figure 3*).

The dynamics of the ratio of the average per capita cash income to the subsistence minimum in the considered groups of the RF constituent entities in 2006–2021 is shown in the *Figure 7*.

It is noteworthy that the drop in the indicator in question occurred not in the most difficult years after the introduction of anti-Russian sanctions (2014–2016), but after adapting to life in changed conditions in 2017–2018. The reason for this was, as it seems, the increase in the subsistence minimum. Examples of its growth outstripping the average per capita income are given in *Table 4*.

FIXED CAPITAL INVESTMENTS

Investments in fixed capital are one of the key sources of technological and economic develop-

[6] Data on the subsistence minimum in the constituent entities of the Russian Federation could be found only since 2005.

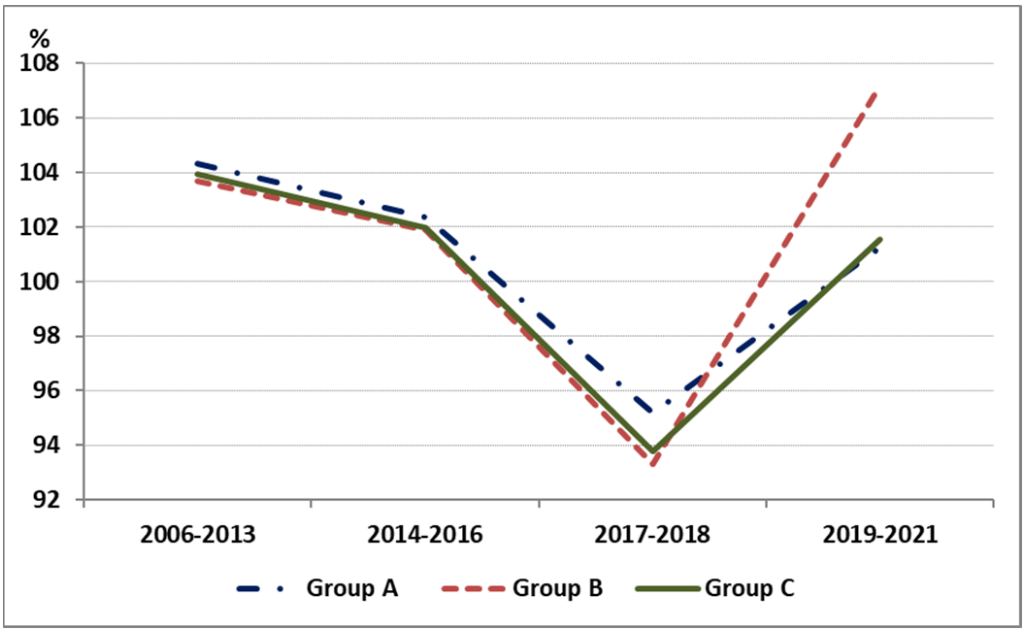

Fig. 7. **The rate of change in the ratio of the average per capita income of the population to the subsistence minimum in the regions of groups A, B and C in 2006–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

Table 4

The average annual growth rate of the per capita monetary income of the population and the subsistence minimum, 2017–2018, percent

Constituent entity of the Russian Federation	Average per capita monetary income	Subsistence minimum
Russian Federation	103.9	107.1
Kaliningrad Region	103.0	111.5
Moscow	107.5	118.6
Krasnodar Region	102.4	110.2
Nizhny Novgorod Region	101.3	107.4
Chukotka Autonomous District	111.0	106.4

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

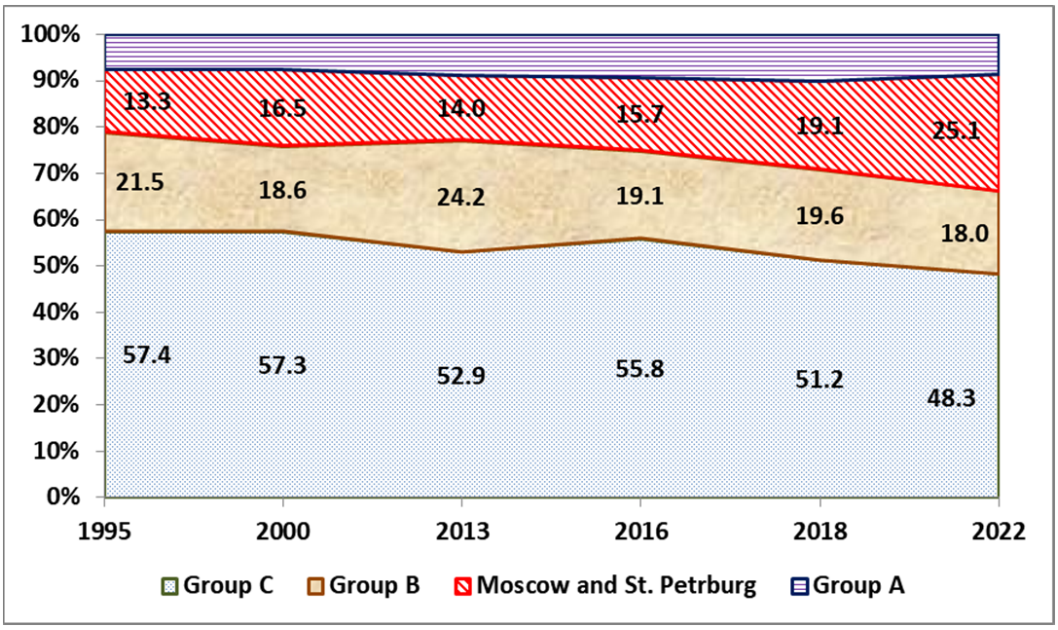

Fig. 8. **The structure of investments in fixed assets by group of regions, 1995–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

ment and are an important factor in ensuring the economic security of the country, its regions, and economic entities [7].[7] The bulk of these investment expenditures in the period under review was directed to non-border regions (group C) [8]. The least amount was invested in the constituent entities of the Russian Federation bordering with unfriendly states (group A). At the same time, in the time interval under study there was a consistent decrease in the share of investments in fixed capital of the regions of groups B and C (*Figure 8*): from 1995 to 2021 by 3.5 p.p. and 9.4 p.p., respectively; in this period, investments in fixed capital were more concentrated in Moscow and St. Petersburg. In 2021, their share increased by 11.9 p.p. compared to 1995.[8]

While production in the Russian Federation is not 100% robotised, people play an important role in it. And investments go to the creation of fixed assets on which these people work. Therefore, let us correlate the investments made with the number of people employed in the economy. Then the picture of investment security of groups of regions presented in *Figure 8* will change. Thus, in 2021 the RF constituent entities with no borders with other countries received 48.1% of the total volume of investments in fixed assets, which is 5.5 times higher than the share of investments in the subjects of group A (8.8%). And the value of investments in fixed capital per one employed person in the economy in Group C is not 5.5, but 1.1 times higher than in the regions of Group B (*Figure 9*).

The data presented in *Figure 9* show that in the period under study, group C was also the leader in terms of investment in fixed capital per one employed person in the economy. However, the

[7] "The economic security of regional development is also significantly determined by the amount of investment expenditures. In their structure it is necessary to emphasise investments in fixed capital as one of the basic sources of regional economic development" [12].

[8] Regions of Russia. Socio-economic Indicators. 2020. Statistical collection. Moscow: Rosstat; 2020. 1242 p.; Regions of Russia. Socio-economic Indicators. 2022. Statistical collection. Moscow: Rosstat; 2022. 11220 p.

change in the dynamics of investment (*Figure 10*) and the average annual number of employed led to the convergence of the values of the studied indicators of all the considered groups of regions.

In general, these data suggest that the development of a group of regions of the Russian Federation, that do not share borders with other countries, was better supported by investments

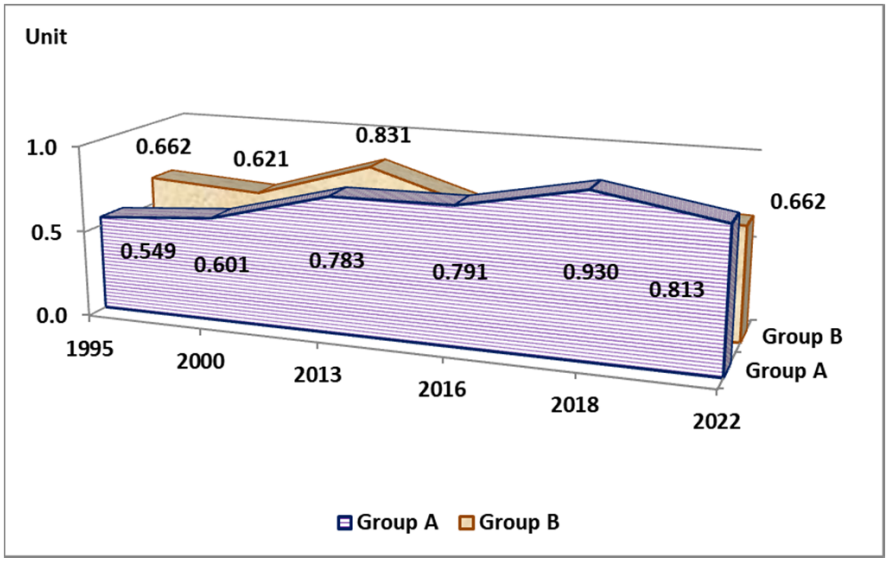

Fig. 9. **The ratio of the values of the indicators of investment in fixed assets per person employed in production in the regions of groups A and B to the value of this indicator in the regions of group C, fractions of units.**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

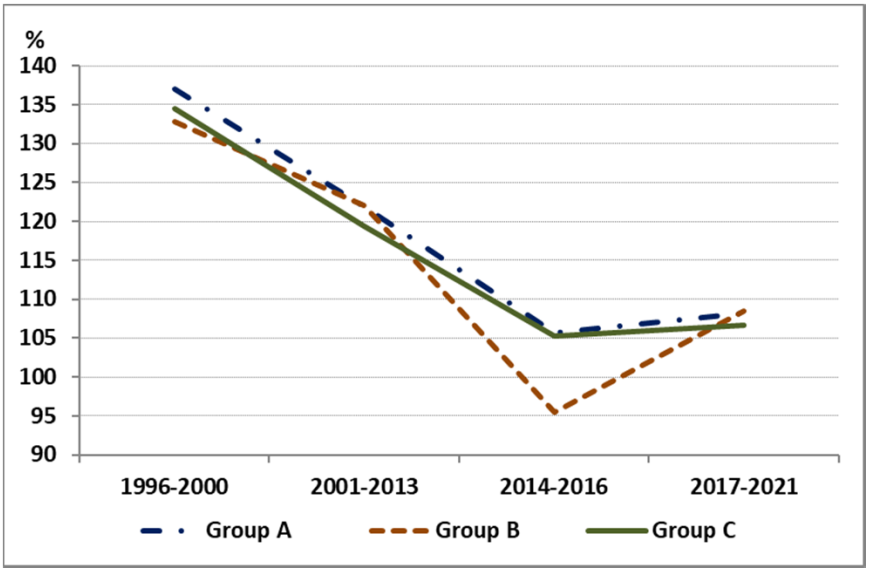

Fig. 10. **The average annual rate of change in the volume of investments in fixed assets per person employed in the economy, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

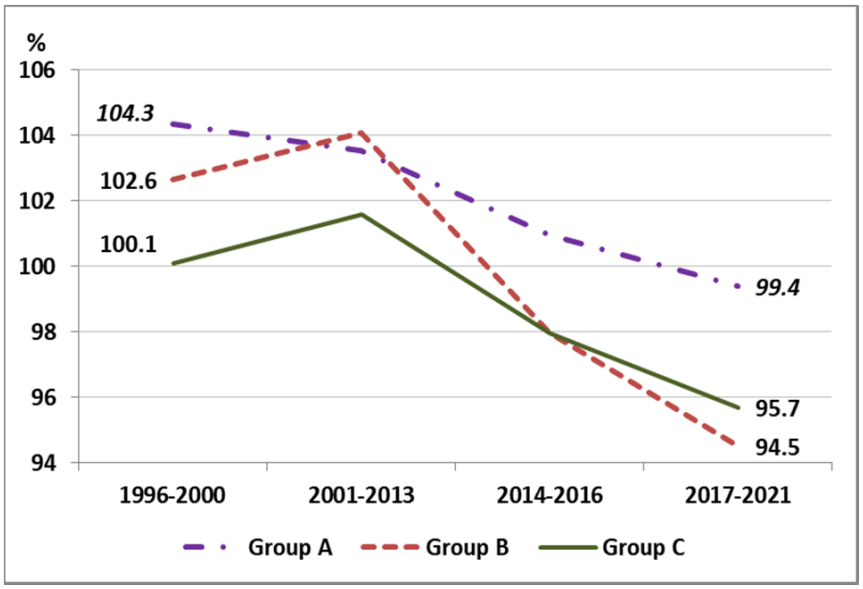

Fig. 11. **The average annual rate of change in the return on fixed assets, 1995–2021, percent**

Source: developed by the author on the basis of data of statistical "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

in fixed assets from 1995 to 2021 compared to groups of regions that border other countries.

RETURNS ON ASSETS

Investments in fixed capital are used for renewal and expansion of fixed assets (buildings, structures, machinery and equipment, vehicles, cultivated biological resources of animal and plant origin, etc.), and their composition, quality, technological characteristics, nature, and level of professional use, as is known, affect the rate of economic development. And all this depends on the quality of management at all levels of management. The efficiency of fixed assets is judged by the index of fund yield or return on assets — the ratio of the value of created products to the value of fixed assets.

The gross regional product (GRP) serves as an indicator of the value of output at the level of the constituent entities of the Russian Federation; the value of the fund efficiency indicator, which is equal to the ratio of GRP to the value of fixed assets, has been decreasing in recent decades in all groups of regions under consideration (*Figure 11*). The largest decrease in the fund efficiency after the introduction of anti-Russian sanctions occurred in the group of regions B.

The reasons for the fall in the level of return on assets or stock return may be different: obsolescence of funds; reduction of the time of their use (for example, due to the COVID-19 pandemic, reduction in the volume of output as a result of a decrease in exports, increase in the repair period due to the shortage of imported products, etc.); replacement of imported funds from unfriendly countries with less technologically perfect ones, etc. The result is the same — a narrowing of development opportunities. The result is the same — narrowing of development opportunities.

The performed study showed that, in terms of capital return, both groups of border regions lag behind the group of non-border regions (*Figure 12*). Consequently, as well as by the "investment in fixed assets" resource, the latter have more development opportunities than the groups of cross-border constituent entities of the Russian Federation under consideration.

INTERNATIONAL TRADE

The important role of foreign trade in the economy of the Russian Federation is well known. The proceeds from exports provide funds for the purchase and creation of necessary development resources. Thus, having assessed the strategic factors of development of border regions of the Russian Federation, S. V. Doroshenko and K. A. Posysoeva concluded that "exports turned out to be a significant and positively influencing variable on the development of all border regions of

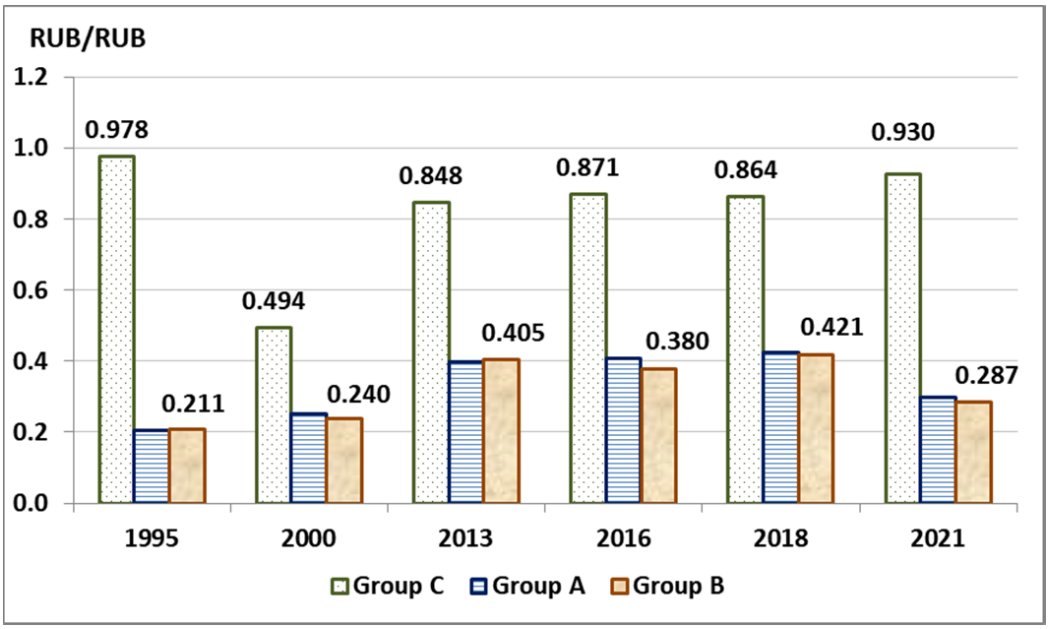

Fig. 12. **Return on fixed assets in groups of regions in 1995–2021, ruble / ruble**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022, RUB/RUB

Table 5

The shares of exports and imports of groups of the constituent entities of the Russian Federation in total Russian exports and imports, 1998–2021, percent

Group	1998	2005	2013	2016	2018	2021	Trend
	Exports						
A	6.4	5.8	5.8	6.6	6.5	7.5	Growth
B	21.7	19.4	12.6	9.4	8.7	8.8	Decline
Moscow	29.3	37.0	47.6	47.0	49.8	48.1	Growth
	Imports						
A	8.1	16.3	10.1	8.2	8.4	7.4	Decline
B	13.5	12.6	8.4	8.9	9.8	10.1	Decline then growth
Moscow	35.3	59.4	54.2	53.6	53.0	53.0	Relative stability

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

Russia, regardless of the type of borders" [9]. Imported goods are used to meet the needs of the population, the state and business. It is no coincidence, therefore, that the bulk of the finances of economic sanctions against the Russian Federation operates in the financial and foreign economic spheres.

Although the share of groups of border subjects of the Russian Federation in the total volume of Russian exports and imports in the

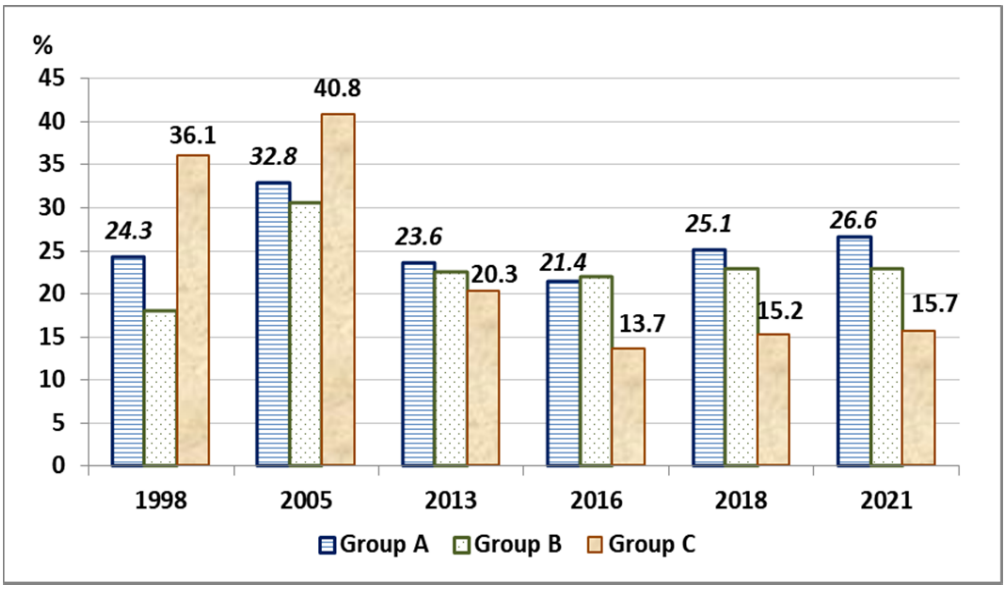

Fig. 13. **Share of exports in GRP, 1998–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

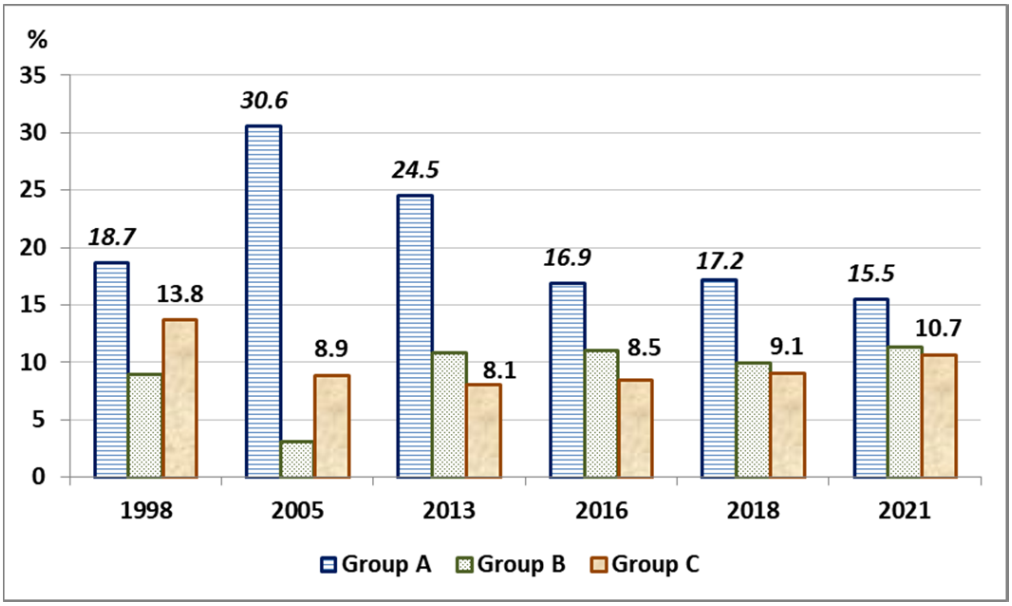

Fig. 14. **Share of imports in GRP, 1998–2021, percent**

Source: developed by the author on the basis of data of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

period under consideration does not exceed 30% (*Table 5*) (since the main volume of foreign trade flows through Moscow), foreign trade contributes to the economic development of these regions.

To assess this contribution, the shares of exports and imports of the RF constituent entities in gross regional products were calculated in this paper. To make export and import volumes, which Rosstat gives in US dollars, co-comparable with gross regional products (in Rosstat's statistics they are given in roubles), the latter were converted from roubles into dollars at the exchange rate set by the Bank of Russia.

According to the data obtained, since 2013, the group of regions A has been more dependent on foreign trade than B and C (*Figures 13, 14*). The ratio of exports to gross regional product of group A has tended to increase since 2016 and exceeded 25% in 2018. On the other hand, the ratio of imports of the subjects of group A to GRP has been decreasing since 2005, but remains higher than in other groups of regions. All this indicates that the RF constituent entities of group A are more dependent on the state of foreign trade and may be more vulnerable than other groups to sanctions, bans and restrictions in the sphere of foreign trade activities.

The dependence of Group B regions on exports and imports was decreasing before the introduction of anti-Russian sanctions, but after adjusting to them it has been increasing since 2016. The composition of the regions in this group suggests that, especially in terms of imports, this may be due to the reorientation of Russia's foreign trade from European markets to Asian ones. Economists M.G. Polozkov and Associate Professor N.S. Epifanova included high dependence on imports of the most important products and declining exports among the main threats to the economic security of 12 border subjects of the Siberian Federal District (all of them are included in the group of regions B formed by us) in 2014. [7].

CONCLUSIONS

The study has shown that for the successful socio-economic development of Russia it is necessary to increase the volume and improve the efficiency of the use of development resources, which first of all refers to the number of populations.

Its decrease in the period under study both in the Russian Federation as a whole and in the groups of its regions under consideration weakens the country's power. At the same time, the population density in the border constituent entities of the Russian Federation is higher than in non-border constituent entities (excluding Moscow and St. Petersburg). It is highest in the regions that make up Group A, bordering with countries that are unfriendly to Russia.

In the same group in the period under review, the ratio of average per capita money income of population to the subsistence minimum was better, and this is a favourable factor for attracting the population and increasing its number. However, the researchers note that 'previously favourable border regions of the European part of the country due to geopolitical instability are beginning to lose their attractiveness' [10].

Simultaneously with the measures to at least stop the population decline, it is necessary to work on increasing the technological level of all spheres of social production. Widespread use of modern technologies, equipment, tools, instruments, devices, means of communication, software will allow, of course, with a lag in time, to increase the capital productivity. In 1995–2021 in the groups of border regions under consideration it was 2–3 times lower than in the non-border regions, but in the years of anti-Russian sanctions the capital productivity is decreasing in the latter as well (*Figure 12*). It is clear that technological innovations require investments.

In 1995–2021, the regions in Group A had a higher investment resource for development than the constituent entities of the Russian Federation in Group B. In 2014–2016, the most difficult years

for the Russian economy after sanctions and other restrictions were imposed on it, the investment in fixed capital, taken in actual prices, decreased by 14.7% in the regions of Group B,[9] while in other groups of regions it increased. Both groups of the border subjects of the Russian Federation lagged behind the non-border constituent entities by the level of capital productivity. Consequently, both the investments coming to the border regions and the efficiency of fixed assets utilisation reduce the development opportunities of these subjects in comparison with non-border regions.

The high density of roads and railways in these groups of border regions is favourable for the economic development and life of the population, compared to the non-border regions (Group C). The modern transport network also increases the speed of movement of people, civilian and military cargo in case of emergencies, and enhances the safety of life in the society. However, after the imposition of anti-Russian sanctions, the pace of construction of paved roads and public railways in Russia slowed down.

[9] Calculated by the author on the basis of statistical collections "Regions of Russia. Socio-economic Indicators" for the years 2005, 2012, 2015, 2020, and 2022.

Although the volume of foreign trade of the considered groups of Russian border regions is low compared to the total volume of foreign trade in the Russian Federation, the share of their exports and imports in gross regional products is significant, especially in the bordering with unfriendly countries regions. This indicates their increased reliance on the state of foreign trade and, consequently, their potential vulnerability to measures of foreign trade isolation taken by states that are not friendly to Russia.

It seems that these and other spheres of activity, which can be hit by states hostile to Russia in order to damage the domestic economy and society, should be strengthened. It seems necessary: 1) to protect and eliminate weaknesses of the border regions of the Russian Federation; 2) to develop special programmes for the development of border regions, which would help to create a deep echeloned protection against armed invasions by land, water and air and the necessary logistics for this purpose; 3) to have action plans both to prevent the emergence of new aggressive actors near the country's outskirts and to carry out preparatory and urgent measures in the border regions in case of emergencies.

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ORIGINAL PAPER

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Capital Adequacy and Bank Profitability: the Moderating Effect of Macroeconomic Variables

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ABSTRACT

Based on earlier research, two primary categories of characteristics influence bank profitability. First, each bank has a unique set of profitability drivers that are often the direct outcome of management choices (quality, size, capitalization, efficiency, asset structure, and revenue divergence). The second group of determinants consists of elements like industry concentration, economic growth, inflation, and interest rates related to the profitability of the industry formation and the macroeconomic environment in which the banking system conducts. Capital adequacy may be defined as the ratio of the institution's main capital to its assets, including loans and investments, to gauge a financial institution's stability and strength. This paper examines the correlation between capital adequacy and banks' profitability through the moderating impact of macroeconomic variables like inflation, interest rates, and exchange rates in the banking sectors of Malaysia, Indonesia, and Turkey. To this end, panel data were gathered from the OIC statistics database concerning 2010 and 2021. The study's regression analysis exposed that although inflation has a significant negative influence on banks' profitability, while the capital adequacy ratio, exchange rate, and interest rate have positive and significant impacts. Regarding the moderating effect, both inflation and interest rates have a significant positive and negative impact on the relationship between banks' profitability and capital adequacy, respectively. Additionally, macroeconomic variable interactions with capital adequacy are not statistically significant.

Keywords: Capital Adequacy; Profitability; Macroeconomic Variables; Interest Rate; PLS Regression Method; OIC; Inflation; Moderating Effect

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INTRODUCTION

Banking and other financial intermediaries facilitate the transfer of savings to investors. Banks in today's market do this by skillfully balancing risk-taking with risk management. Lenders and borrowers are in a state of information asymmetry since no one knows the "real" risk associated with a borrower's investment project. Banks may address knowledge asymmetries by including various restrictions in their lending contracts. According to Bester (1985), collateral may be used as a signaling technique, allowing borrowers to convey their actual riskiness through the amount of collateral they are ready to supply. Devices like collateral can only work if rules outlining the nature of collateral connections and sufficient enforcement mechanisms exist. Better collateral rules and arrangements may lead to more collateral being used to counteract knowledge asymmetry and lower risk. Borrowers in countries with weak legal protections may place several loans against the same asset or refuse to give it up in the event of failure. According to this belief, there will be more lending and a higher readiness to employ collateralized loans under an improved institutional framework. This aligns with findings in the law and finance literature that point to a favorable correlation between substantial creditor rights and the expansion of loan markets [1].

Risk-based capital requirements are vital to the new Basel II regulatory framework. The capital requirements for a particular exposure under the so-called IRB (internal-ratings-based) method are based on the projected credit risk

of that exposure. This leads us to believe that the four factors of estimated credit risk — probability of default (PD), loss given default (LGD), exposure at default (EAD), and maturity (M)— are predefined. The "advanced" version of the IRB method requires banks to use their models to determine all four characteristics. The Basel Committee will externally determine the other three parameters; the only bank operating under the "Foundation" variation of the IRB method will be liable for the PD parameter. The many possible advantages of risk-based capital requirements are evident. Suppose risk-based capital requirements successfully reduce price distortions across loan categories and the incentives for banks to engage in regulatory capital arbitrage. In that case, they will improve the original Basel-I framework's "one-size-fits-all" approach. However, several things could be improved about this novel method of capital control. Many are worried that increased capital norms would worsen business-cycle variations, yet this worry has received little official research. Or it simply can be stated as a bank's capital base is likely to dwindle due to loan losses during an economic downturn, the applicable credit-risk models will downgrade the bank's existing (non-defaulted) debtors, causing it to keep additional capital against its loan portfolio. If the bank is unable or unwilling to acquire new external capital during challenging economic circumstances, it will reduce lending activities, aggravating the original recession [2].

The minimum capital requirement refers to the amount of money banks must have to comply with financial regulators. The provision of loans and advances to different industries exposes banks to various sorts of risk. Maintaining enough capital is critical for banks to weather any storms that may hit their operations. Financial systems are more stable and efficient when banks have sufficient capital to safeguard their depositors against unexpected events. Banks are safeguarded against bankruptcy, excessive leverage, and other financial difficulties by maintaining a sufficient capital adequacy ratio [3].

CAR = Tier I + Tier II + Tier III capital (Capital Funds)/ Risk Weighted Assets (RWA)

Tier I Capital: paid-up capital (ordinary shares), statutory reserves, disclosed free reserves, Innovative Perpetual Debt Instruments (IPDI), and capital reserves, which represent the surplus from asset sales are the components of Tier I capital. These components are subject to laws that are in force occasionally. Tier I capital, commonly called "core capital," allows a bank to weather losses without closing its doors, giving depositors more security.

Tier II Capital: Unseen funds, funds set aside for revaluation, funds for general provisions and losses, hybrid capital instruments, subordinated debt, and investment reserve accounts are all components of Tier II capital. Its supplemental capital is what absorbs losses in the case of winding up, giving its depositors less overall protection. Tier II items might be considered regulatory capital if they can help mitigate losses caused by the bank's operations.

Tier III Capital: This is set up to compensate for some of the risks associated with the market, such as fluctuations in interest rates, currency rates, stock prices, commodity prices, etc. A bank's Tier III capital is defined as its unsecured subordinated assets with a minimum maturity of two years and a maximum ceiling of 250% of its Tier I capital.

Several factors may influence bank profitability, some of these factors include the bank's size, degree of diversification, owners' and managers' risk tolerance, ownership structure, and the intensity of external competition [4]. Companies must know the micro and macroeconomic elements influencing their performance to mitigate their effects on future cash flows and profitability. Organizations can anticipate and control microeconomic factors like demand and production, but they have no say over macroeconomic variables like unemployment and corporation tax rates. As a result, companies must try to forecast the varied impacts of these

macroeconomic variables (interest rates, inflation rate, balance of payments, employment rate, corruption index, gross domestic product, deficit/surplus rate, tax rate and borrowing rate) on their future performance. Economic and business cycles have growth, contraction, and recession periods. The expansion begins once again after the recession. Recent crises in Latin America, East Asia, Russia, and the global financial crisis in 2007 show that none of the models and theories developed by economists and finance professionals worldwide have been able to eliminate the economic and business cycle or even significantly mitigate its effects [5].

The financial segment is acting an essential starring role in keeping the economy running smoothly. There is a growing body of work highlighting the importance of the banking industry, and along with it comes a more significant push to quantify its performance and isolate its factors [6]. There are a lot of techniques to measure how well banks are doing. According to Makkar and Singh (2013), Return on assets, return on equity, and net interest margin are the main indicators of a bank's profitability. By comparison, some banks are more profitable than others [7]. To prepare for the steady and long-term expansion of the banking sector, policymakers and management could benefit from information about the variables impacting banks'' profitability, which is the main issue [8]. A bank must have sufficient capital to avoid going bankrupt and maintain depositors'' confidence. Capital is necessary to preserve depositors'' trust and strengthen the worldwide financial system. Capital adequacy assesses the soundness of a bank's finances and ability to come across the need for more capital. The aforementioned correspondingly shows that the bank has sufficient capital to weather unpredicted losses. Banks' leverage may be seen via capital adequacy ratios [9]. Governments, bankers' groups, central banks, other financial regulators, and bank management have a vested interest in knowing how capital adequately impacts financial sector profitability. We conducted this research because we are concerned about extrapolating our results to other countries where this is a significant problem. Our findings will fill any gaps in the literature, mutually theoretical and practical.

LITERATURE REVIEW

Rendering to the literature, internal and external variables impact bank profitability. A bank's internal determinants of profitability are the specific internal variables that influence the bank's bottom line. Contrarily, outer factors are not within the control of bank management but instead imitate macroeconomic and industry trends that affect the banking industry as a whole. Both internal and external factors affected the banks' profitability and earnings. More reliable evidence is needed to support the results of the literature. According to the literature review, a better capital ratio, higher inflation rates, better interest margins, operational efficiency, and non-interest income contribute to a bank's profitability. Conversely, increased credit risk negatively affects banks' profitability and capital costs [10].

To examine the effects of bank capital on risk and profitability, Lee and Hsieh (2013) uses the Generalized Method of Moments for dynamic panels using data collected from 42 Asian nations' banks between 1994 and 2008. The current research gives a clearer picture of the effect of bank capital on profitability (risk) when affecting variables are ignored. Still, three clear findings emerge when these factors are included. Before anything else, it's important to note that the capital impact on profitability is lowest for investment banks and greatest for commercial banks, in contrast to the reverse capital effect on risk, which results from a shift in the categories of banks. Another interesting finding is that the capital impact on profitability is greatest for banks in low-income nations, lowest for banks in high-income countries, and highest for banks in lower-middle-income countries. Thirdly, the capital impact on profit-

ability is the biggest and most positively skewed by banks in Middle Eastern nations. The reverse capital impact on risk is greatest in Central and Far Eastern Asian banks, while it is lowest in Middle Eastern nations. Lastly, our findings demonstrate that various profitability determinants significantly impact profit persistence, whereas all risk variables exhibit persistence from one year to the next [11].

Ramadhanti and Hidayati's (2019) research examines the connections between profitability and capital adequacy, liquidity, and credit risk for 27 banking corporations registered on the Indonesia Stock Exchange in relation to 2015 and 2017. The findings validate that liquidity and the capital adequacy ratio positively influence profitability, but credit risk significantly outweighs them [12].

Nguyen (2020), based on the Basel II Accord, examines the effect of capital adequacy on the profitability of Vietnamese banks. Findings reveal a positive relationship between profitability metrics and banks' capital adequacy measurements (net interest margin and non-interest revenue). However, the credit risk indicator metric and state ownership hurt bank profitability [13].

Taking capital adequacy into account as a moderating variable, Adiatmayani and Panji (2021) analyze the influence of operational and credit risks on profitability. According to the results, revenue was negatively and significantly affected by operational and credit concerns. However, there was no discernible correlation stuck between credit risk and capital adequacy. Capital adequacy contributes positively to profitability. However, operational risk significantly reduces it. When there is enough capital on hand, operational and credit risks have less of an impact on profitability [14].

Using data from 2016–2020, Arseto (2022) determines how liquidity and the capital adequacy ratio affect the profitability of Indonesia's Islamic commercial banks. According to the finding and conclusions, the equation Y = 2.108 + 1.380 CAR + 0.158 CR may represent the connection between the variables. The formula determines profitability based on CAR and liquidity. According to the results [8], additional variables may explain the remaining 59% of the variance in the profitability variable, whereas the CAR and liquidity factors account for 41% [8].

Biswas and Mondal (2023) investigated the influence of the capital adequacy ratio (CAR) on the profitability of Islamic banks in Bangladesh. The analysis used a panel data set spanning from 2005 to 2018, which included five Islamic banks operating in Bangladesh. The research results revealed that CAR (capital adequacy ratio) had a

Table 1

Description of Variables

Variables Name	Description	Resource
Capital Adequacy Ratio (CAR)	Total equity of shareholders/Amount vulnerable to credit, market, and operational risks	(Polat & Al-khalaf, 2014)
Profitability (ROA)	Net Income / average total assets	(Polat & Al-khalaf, 2014)
Exchange Rate	(1) US dollars' worth at the end of the year, measured in national currency units	International Financial Statistics (IFS)
Inflation	The annual% change in the consumer price index at the conclusion of a certain period compared to the same time in the previous year.	SESRIC calculations
Interest Rate	The monetary authorization intends to affect the development of the primary economic variables via the yearly interest rate. The additional interest rate, as a percentage, that commercial banks pay to borrow money from the central bank.	(IMF)

Source: compiled by authors.

noteworthy positive influence, but inflation and domestic credit to GDP had an adverse impact on the profitability of Islamic banks in Bangladesh.

RESEARCH METHODOLOGY

This study tests the link between capital adequacy and bank profitability in OIC-upper middle-income (Indonesia, Malaysia and Turkey) countries. It uses balanced panel statistics from the OIC Statistics Database for 2010–2021. It also looks at how macroeconomic factors affect this relationship. Multiple varieties of panel analytic models (robust, dynamic panel, and covariance structure) may include models with constant coefficients, fixed and random effect models [10]. All the coefficients (slopes, intercepts, and others) are fixed with a pooled regression model. The pooled ordinary least squares (POLS) standardized regression model was employed to examine the combined data. According to the Fixed Effect model, there is a difference in the variance of the regression model's constant term, which stands for the

Table 2

Descriptive Statistics

Mean	PROF	CAR	EXR	INF	INR
	1.925833	**10.34694**	**4166.384**	**6.220000**	**5.767500**
Median	1.745000	10.25500	4.235000	3.560000	4.875000
Maximum	3.040000	14.62000	14481.00	36.08000	22.50000
Minimum	1.070000	7.180000	1.540000	−1.390000	1.630000
Std. Dev.	0.565450	1.797597	6082.424	6.787278	4.159416
Skewness	0.565587	0.445187	0.810785	2.674130	2.259337
Kurtosis	2.132976	2.271917	1.766373	11.77679	8.975780
Jarque-Bera	3.046929	1.984307	6.226986	158.4540	84.19256
Probability	0.217955	0.370777	0.044445	0.000000	0.000000
Sum	69.33000	372.4900	149989.8	223.9200	207.6300
Sum Sq. Dev.	11.19068	113.0974	1.29E+09	1612.350	605.5259
Observations	36	36	36	36	36

Source: compiled by authors.

Table 3

Correlation Matrix

	PROF	CAR	EXR	INF	INR
PROF	1.000000	0.292402	0.575377	0.051158	0.077556
CAR	0.292402	1.000000	0.469009	−0.100312	0.060234
EXR	0.575377	0.469009	1.000000	−0.227908	−0.027096
INF	0.051158	−0.100312	−0.227908	1.000000	0.750551
INR	0.077556	0.060234	−0.027096	0.750551	1.000000

Source: compiled by authors.

changes between the various cross-sectional units. Here in model, the intercept term represents the ongoing influence on the bank. Contrariwise, the random-effect model shows that people's impacts are spread out throughout the many units under investigation. The regression model incorporates an intercept term with a consistent value across all units to capture these unique effects. First, the POLS effect model was run through EViews 12 to determine which regressions model should be used in this research. Then, the Lagrange Multiplier Tests for Random Effects test was used to run the POLS model instead of the fixed or random effect models. The results showed that the effects were statistically significant, rejecting the null hypothesis that no effects existed. Relying on the

Table 4

Ordinary Least Square Regression (POLS-R)

Dependent Variable: PROF					
Method: Panel Least Squares					
Date: 01/20/24 Time: 11:40					
Sample: 2010 2021					
Periods included: 12					
Cross-sections included: 3					
Total panel (balanced) observations: 36					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Sig**
C	–1.948085	1.586188	–1.228156	0.2300	
CAR	0.351498	0.163872	2.144951	0.0411	**
EXR	0.000216	0.000104	2.080962	0.0471	**
INF	–0.252222	0.132638	–1.901579	0.0679	*
INR	0.802358	0.364751	2.199740	0.0366	**
(CAR*EXR)	–1.58E-05	9.61E-06	–1.640208	0.1126	
(CAR*INF)	0.028174	0.015416	1.827605	0.0787	*
(CAR*INR)	–0.079980	0.033286	–2.402778	0.0234	**
(CAR*EXR*INF*INR)	5.71E-08	5.71E-08	0.999203	0.3266	
Root MSE	0.270889	R-squared		0.763937	
Mean dependent var	1.925833	Adjusted R-squared		0.693992	
S.D. dependent var	0.565450	S.E. of regression		0.312795	
Akaike info criterion	0.725783	Sum squared resid		2.641705	
Schwarz criterion	1.121662	Log likelihood		–4.064088	
Hannan-Quinn criter.	0.863955	F-statistic		10.92203	
Durbin-Watson stat	1.538555	Prob(F-statistic)		0.000001	***

Source: compiled by authors.

Note: The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

study's fixed and random effect models becomes unnecessary when the null hypothesis is rejected.

STUDY'S VARIABLE

The *Table 1* some explanations considered in relation to the variables of research.

Research Hypothesis

This is what the research hypotheses include:

H1: CAR is positively and significantly correlated with banks' profitability.

H2: There is a reverse association between exchange rate and banks profitability.

H3: Does inflation act as a moderator that boosts the correlation concerning capital adequacy and banks' profitability?

RESULTS AND FINDING

Descriptive and Correlation Matrix Analysis

The descriptive statistics of the study's variables are displayed in *Table 2*. Based on analysis the average profitability of a bank is 1.92, with a standard deviation of 0.56. The banks' profitability also varies insignificantly, ranging from a minimum of 1.07 to a high of 3.04. There are significant variations in CAR among the banks, with values ranging from 7.1 to 14.62.

Table 3 showings the correlation matrix of the study's variables concerning PROF, CAR, EXR, INF, and INR. *Table 3* shows that banks' profitability is positively connected with exchange rates and adversely correlated with inflation and interest rates. There is a positive association between profitability, exchange rate, and interest rate and a negative correlation between capital adequacy and inflation.

MODEL SPECIFICATION

Based on the argument, the explanatory variables of our study are CAR, exchange rate, inflation, and interest rate. Therefore, we have predicted the following equation to notice the effect

Table 5

Coefficient Confidence Intervals (CCIs)

Sample: 2010 2021							
Included observations: 36							
		90% Coefficient Intervals		95% Coefficient Intervals		99% Coefficient Intervals	
Variable	Coefficient	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
C	−1.948085	−4.649820	0.753650	−5.202673	1.306503	−6.342908	2.446738
CAR	0.351498	0.072376	0.630620	0.015260	0.687737	−0.102540	0.805537
EXR	0.000216	3.93E-05	0.000394	3.03E-06	0.000430	−7.17E-05	0.000505
INF	−0.252222	−0.478142	−0.026301	−0.524372	0.019929	−0.619720	0.115276
INR	0.802358	0.181081	1.423634	0.053950	1.550765	−0.208252	1.812967
(CAR*EXR)	−1.58E-05	−3.21E-05	6.06E-07	−3.55E-05	3.96E-06	−4.24E-05	1.09E-05
(CAR*INF)	0.028174	0.001916	0.054432	−0.003457	0.059805	−0.014539	0.070887
(CAR*INR)	−0.079980	−0.136676	−0.023283	−0.148277	−0.011682	−0.172205	0.012246
(CAR*EXR*INF*INR)	5.71E-08	−4.02E-08	1.54E-07	−6.01E-08	1.74E-07	−1.01E-07	2.15E-07

Source: compiled by authors

Table 6

Lagrange Multiplier Tests for Random Effects (LMTf RE)

Null hypotheses: No effects			
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives			
Test Hypothesis			
	Cross-section	**Time**	**Both**
Breusch-Pagan	1.570994	6.768918	8.339913
P- Value	(0.2101)	(0.0093)	(0.0039)
Honda	–1.253393	2.601714	0.953407
P- Value	(0.8950)	(0.0046)	(0.1702)
King-Wu	–1.253393	2.601714	–0.132478
P- Value	(0.8950)	(0.0046)	(0.5527)
Standardized Honda	–0.252374	2.666313	–1.652744
P- Value	(0.5996)	(0.0038)	(0.9508)
Standardized King-Wu	–0.252374	2.666313	–3.412602
P- Value	(0.5996)	(0.0038)	(0.9997)
Gourieroux, et al.*	–	–	6.768918
P- Value			(0.0131)

Source: compiled by authors.

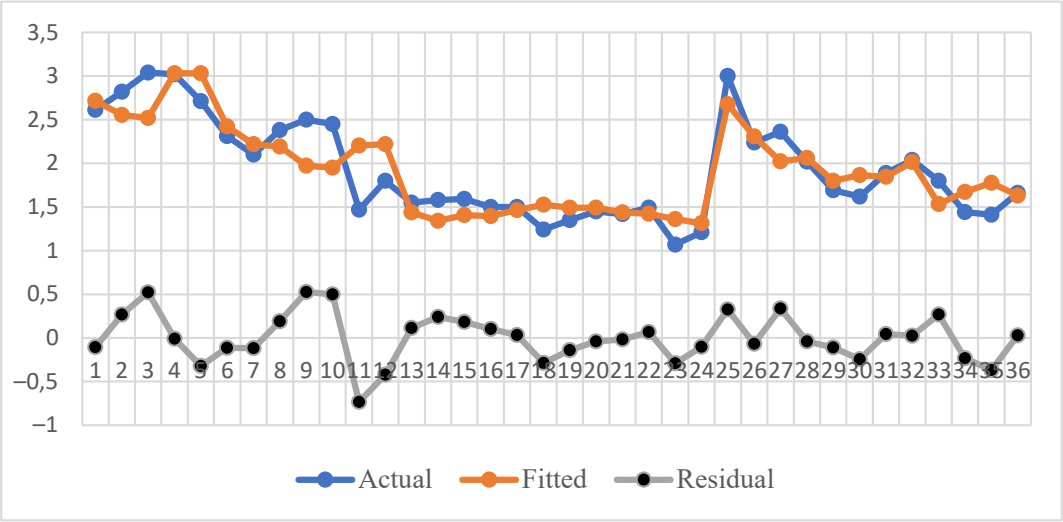

Fig. **Residuals of the model**

Source: compiled by the authors.

Table 7

Testing the Research Hypothesis

Hypothesis	Standard Error	t- Statistics	P- Value	Status
H1: A direct correlation exists between the profitability of banks and their capital adequacy ratio.	0.1638	2.144	0.04	Accepted
H2: There is a reverse link between exchange rate and banks profitability.	0.0001	2.080	0.04	Rejected
H3: Inflation as moderator strengthens the relationship between banks' profitability and capital adequacy.	0.015	1.827	0.07	Accepted

Source: compiled by authors.

of CAR upon profitability of banks of OIC: upper middle income selected countries.

$$PROF = f(CAR, EXR, INF, INR), \quad (1)$$

Based on equation (1), Profit is the function of capital adequacy ratio, exchange rate, inflation, and interest rate.

$$PROF_{it} = \beta_0 + \beta_1 * \mathrm{CAR}_{it} + \beta_2 * EXR_{it} + \beta_3 * INF_{it} + \beta_4 * INR_{it} + \\ + \beta_5 * (CAR_{it} * EXR_{it}) + \beta_6 * (CAR_{it} * INF_{it}) + \beta_7 * (CAR_{it} * \\ * INR_{it} + \beta_8 * (CAR_{it} * EXR_{it} * INF_{it} * INR_{it}) + \varepsilon_{it}, \quad (2)$$

where: β_0 – Intercept of the equation; CAR_{it} — Capital adequacy ratio; EXR_{it} – Exchange rate; INF_{it} – Inflation; INR_{it} – Interest rate; (CAR_{it} * EXR_{it}) – Interaction form of capital adequacy ratio with exchange rate; (CAR_{it} * INF_{it}) – Interaction form of capital adequacy ratio with inflation; (CAR_{it} * INR_{it})— Interaction form of capital adequacy ratio and interest rate; (CAR_{it} * EXR_{it} * INF_{it} * INR_{it})–Interaction form of capital adequacy ratio, exchange rate, inflation, and interest rate;(β_1, β_2, β_3, ... β_n) — Coefficients of the variables; and ε_{it}–Error term.

The model relies on the assumptions of the intercept and slope coefficients for parameter estimation. Panel data allows for time- and individual-specific intercept and slope coefficients. Common effect or pooled regression, fixed effects, and random effects models may all have a place in the study of penal data. The common form of the panel data regression model is given by the below equation no. (3).

$$Y_t = \alpha_t + \sum_{j=1}^{k} \beta_{jit} X_{jit} + U_{it}, \quad (3)$$

where: Y_t— is response variable of the (i) individual and t time period; α_t — is constant value/ intercept of the (*i*) individual and t time period; β_{jit}(β_{1it}, β_{2it}, ... β_{kit}) — are coefficients of (K) independent variables; X_{jit}— is the independent variables value of (i) individual and t time period; U_{it} — is the error of (*i*) individual and *t* — time period, and (*i* and *t*) — are the number of individual (*i; 1, 2, 3…, N*) and time period (*t;*1,2,3*…, T*), respectively.

Pooled regression (CEM Model) implies that the intercepts and slope coefficients for all individuals and time periods have the same value. This model does not consider both individual dimensions and time. Equation (1) illustrates the common effect model:

$$Y_t = \alpha + \sum_{j=1}^{k} \beta_j X_{jit} + U_{it}. \quad (4)$$

The EViews 12 common effect model was used. Bank profitability is positively correlated with CAR, interest rate, and exchange rate and negatively

correlated with inflation regarding capital adequacy. When considering the moderating impact of macroeconomic variables on this correlation, inflation strengthens, and interest rates weaken the relationship in the middle of capital adequacy and bank profitability in the selected Organization of Islamic Cooperation (OIC) countries [16]. As seen in *Table 4*.

The coefficient confidence intervals at 10%, 5%, and 1% significance levels are shown in *Table 5*, along with the values of each variable at minimum and maximum levels and the study's interaction forms.

To use Lagrange multiplier tests for random effects to see if the common effect model is the best way to choose the study's results. If the probability or (P) value is greater than 0.005, the variables significantly affect each other. However, the test's alternative hypothesis will be accepted, and the null hypothesis will be rejected (*Table 6*).

There is no need to conduct the fixed effect or random effect approach in this circumstance, given the Breusch-Pagan tests investigate a *(P)* value greater than 0.005. The model's validity and accuracy are shown below in (*Figure*), where the actual and fitted lines of the model coincide.

Two hypotheses were accepted, and one was rejected according to the pooled ordinary panel regression model. That is, as seen in *Table 7*.

RESULT AND CONCLUSIONS

A bank's profitability provides insight into its management's worth in making a profit. An excellent indicator of a bank's health is its profitability, which contributes significantly to a country's economic development [1]. Banks should keep a substantial and sufficient amount of capital to prevent bank failures and increase depositors' trust, as research (Kosmidou, 2008; Irshad & Zaman, 2011) states that a bank's capital sufficiency impacts profitability. To ensure that all banks maintain an appropriate amount of capital commensurate with their size and risk exposure, the minimum capital requirement for deposited funds should be reviewed continuously [5, 16]. This analysis confirms the positive and substantial link between capital adequacy and bank profitability, which is in line with earlier research (Adiatmayani & Panji, 2021; Arseto, 2022; Biswas & Mondal, 2023; Nguyen, 2020; Ramadhanti & Hidayati, 2019). This study was examined to draw broad conclusions about the same outcome in other regions, particularly Islamic nations [12–15].

Current research has a limited number of drawbacks. To begin with, the study encompasses just three member nations of the Organization of Islamic Cooperation (OIC). In addition, the study tested the impact of CAR, currency rate, inflation, and interest rate on profitability, treating them as independent variables. The R^2 figures indicate that 76.39% of the bank profitability variations can be attributed to these variables, while other factors may be attributed to the remaining changes. There is potential for performing more research on this issue by expanding the scope to include more OIC member nations and including other variables to assess the influence on profitability within the framework of both commercial and Islamic banks.

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Evolution of The Content of the Service Function of the Tax Authorities

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ABSTRACT

The subject of the study is the activities of the Federal Tax Service (FTS of Russia), which annually strives to fulfil the objectives of not only increasing tax revenues to the budgets of the budgetary system of Russia, but also to improve the quality level of its activities. The key tool for the fulfillment of this goal for more than a decade remains digital technologies, allowing primarily for the improvement of tax control. **Aim** and **objectives** of the study. The analysis of the evolution of the development of technologies of control activity of tax authorities has led to the conclusion that strategically the control activity of the Federal Tax Service of Russia is increasingly built on the changing significance of other functions of tax authorities, among which the tax authority highlighted the service function. The article considers the foundations of the origin of the service function of tax authorities, transformation processes and development prospects taking into account new tools of interaction between tax authorities and taxpayers. At the same time, it touches upon the new services of the Federal Tax Service of Russia, as well as current directions of solving acute issues, in particular, the transition to EDI, the expansion of tax monitoring subjects, construction of a digital tax code, new tools for pre-trial consideration of tax disputes and minimization of tax risks. The study ultimately resulted in the construction of a scheme of the digital outline of the Russian tax system with the allocation of promising areas for further development.

Keywords: tax administration; service function; digital transformation; digital contour; tax monitoring; pre-check analysis; functional and sectoral approach; risk-oriented approach; tax relations

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INTRODUCTION

The current stage of development of society is characterized by a complex transformation of the relationship between the state and a person who, being a client of state legislative and executive authorities, can interact with it in various statuses: as a citizen (as well as a foreigner or a stateless person); a representative of a business (commercial or non-commercial organization; an individual entrepreneur or self-employed person; a state or municipal employee representing public authority in relations with external clients (citizens and businesses), as well as participating in interdepartmental interaction. The Government of the Russian Federation has set the task of developing public administration in order to organize functional activities and services that allow effectively satisfying human needs and are constantly improving based on the analysis of customer experience and requests.[1] In 2020, Prime Minister of the Russian Federation M.V. Mishustin, speaking with a report on the results of the work of the Government of the Russian Federation, defined one of the five basic values as "building all state services around the needs of people".[2]

The human-centric approach to management is interpreted as a relationship with a citizen based on mutual trust, respect, and cost reduction. Public services/functions, improved taking into account the analysis of customer experience at points of interaction and feedback, are convenient for residents of the country. According to the Analytical Centre under the Government of the Russian Federation, citizens' satisfaction with them varies greatly by region. Thus, 98% of the population likes the services for checking vehicles and registering with clinics; 44% approve of services in the field of labour and employment, 59% — approve of services in the field of housing and communal services; and 43% — approve of services in the field of social services and security.[3]

HUMAN-CENTRICITY IN THE TAX POLICY OF THE STATE

The most important factor in development with a human-centric approach is digitalization, because fundamental and rapid changes in the management of economic processes are impossible without fast and high-quality processing of an unprecedented large-scale flow of information. Within the framework of the national project "Digital Economy" (2019–2024), the section "Digital Public Administration" is highlighted.[4] All legislative and executive bodies in Russia solve the assigned tasks in one way or another.

The Federal Tax Service of Russia was the first executive body to begin forming an eco-landscape of tax administration based on the client-centric model and implying both individuals and legal entities. The principles of client-centricity in the current conditions of increasing requirements for the efficiency of tax administration while ensuring the quality of control over compliance with tax legislation are implemented in the context of the tasks of the service function of tax authorities. In her interview, the head of the Tax Monitoring Department of the Federal Tax Service of Russia M.A. Krashenninikova said: "Our goal is not to weaken or minimize control over taxpayers. The goal is to control effectively" [1]. Digitalization of tax administration in Russia is breakthrough and innovative, which is recognized by the in-

[1] Ministry of Economic Development of the Russian Federation (official website), Customer-centricity standards. URL: https://www.economy.gov.ru/material/directions/gosudarstvennoe_upravlenie/gosudarstvo_dlya_lyudey/standarty_klientocentrichnosti/

[2] Government of Russia (official website). Annual report of the Government to the State Duma. URL: http://government.ru/news/40074/

[3] Analytical Center under the Government of the Russian Federation. URL: https://ac.gov.ru/activity/activity/gosudarstvo-dla-ludej-9

[4] Passport of the national project "National Program "Digital Economy of the Russian Federation" (approved by the Presidium of the Council under the President of the Russian Federation for Strategic Development and National Projects, protocol dated 04.06.2019 No. 7). URL: https://www.consultant.ru/document/cons_doc_LAW_328854/

ternational community [2, 3]. It has acquired a new momentum due to serious changes in business processes in the economy. The result was the transformation of the work of the country's tax authorities as a service based on modern digital technologies. Head of the Federal Tax Service of Russia D. Egorov noted that the service function of the tax service can affect the amount of tax payments: "In the future, thanks to digitalization, we can ensure effective tax collection with our services, while reducing the costs of this process".[5] Digitalization in the tax administration eco-landscape is seen as both a driving force and a challenge from business.

Tax administration tools can be divided into several types:

- control (or control and supervisory, since the modern policy of tax authorities has inextricably linked these two concepts), determining the current activities of tax authorities [4];
- risk-oriented, aimed at early prediction, identification, assessment and prevention of tax risks of the state (capable of having a negative impact on the state of the tax and budget system) through monitoring of the tax authorities;
- service-oriented, the purpose of which is to increase the degree of trust of taxpayers to the tax authorities through the implementation of the policy 'from client-oriented approach — to interaction', as well as the use of appropriate mechanisms and services. However, it is difficult to establish the moment of the beginning of the service function with the predominance of such instruments, including due to the discussion of issues regarding the criteria for their definition.

In particular, it is proposed to consider such a criterion as the formation of the ability of tax authorities to calculate taxpayers' tax liabilities without additional documents (declarations). At the same time, in modern conditions it is acceptable to argue (although not without objections) that the definition of tax and fee as payments levied from taxpayers (Art. 8 part 1 of the Tax Code of the Russian Federation[6]) contains the idea of abandoning the principle of their self-accrual on the part of the taxpayer.

STAGES OF CREATION OF THE DIGITAL CONTOUR OF THE FEDERAL TAX SERVICE OF RUSSIA

It is possible to recognise that 2003 is a turning point in the issue of the origin of the service function of the Russian tax authorities, when Chapter 28 'Transport Tax' was added to Part 2 of the TC RF. Then Chapter 30 'Property Tax' and Chapter 31 'Land Tax' were introduced into the TC RF in 2004 and 2005 respectively. At that time, the vector of shift towards the establishment of the order in determining the tax base and tax calculation by the tax authorities themselves became evident — this was the content of their service function. The then head of the Federal Tax Service of Russia M.V. Mishustin noted that in the Russian Federation the tax authorities are in fact entrusted not only with the functions of control over compliance with tax legislation, but also with the service function,[7] which, conventionally speaking, by 2024, based on digital technologies, has passed 7 stages, including various measures and the results of their implementation (see *Figure*).

Service-oriented mechanisms of tax administration continue to be implemented through the introduction of simplified procedures for filing tax returns and paying taxes, as well as creating improved service conditions for taxpayers, which contributes to increasing the confidence

[5] The Ministry of Finance predicts a simplification of the tax system in Russia. Finam. 14.01.2021. URL: https://www.finam.ru/publications/item/minfin-prognoziruet-uproshenie-nalogovoiy-sistemy-v-rossii-20210114–133940/ (accessed on 25.02.2023).

[6] Tax Code of the Russian Federation (TC RF). URL: https://www.consultant.ru/document/cons_doc_LAW_19671/?ysclid=lwrkeflzhn706383516

[7] The Federal Tax Service has decided to create a system of data centres. Federal Tax Service (official website). URL: https://www.nalog.gov.ru/rn77/news/smi/5602364/ (accessed on 15.08.2023).

of the latter in the tax authorities. However, the full (or reasonably acceptable) implementation of the idea of charging tax liabilities will require a radical transformation of the current interaction between tax authorities and taxpayers. One of the conditions for achieving these goals is the transition to 100% electronic document flow (hereinafter — EDF), through which taxpayers can submit declarations and reporting in electronic form, which simplifies the procedure and reduces the time required for processing of documents by the tax authorities. At the same time, the mechanism itself belongs to the control and supervisory mechanism, as systems and services of tax authorities can perform a number of functions, which allows them to refer to several types of tax administration mechanisms.

In this paradigm, the principles of tax monitoring (introduced in 2015)[8] as a form of tax control and tax on professional income (introduced in 2019)[9] can be traced. The immediate goal will be the transition to the charging of turnover taxes, in particular VAT, by the tax authorities — this will be possible when the maximum available and sufficient digital data on sales and purchases is formed. The information thus obtained will allow the tax authority to pre-fill the VAT return and send it to the taxpayer for verification. Such practice exists in some countries. However, we should agree with the statement of D. Egorov at the Tax Forum in the Chamber of Commerce and Industry on 25 October 2023 that 'the requirement of mandatory transition to electronic invoices is most likely a convenience for the state, because it naturally increases the level of reliability of the volume of tax revenues, however, for the representatives of small businesses, the innovation does not yet meet the positive "value for money" ratio.[10] In this regard, for the quality of service functions performed by the tax authorities of the Federal Tax Service of Russia, a more comfortable option for taxpayers was chosen in the form of a focus on eliminating difficulties on the way to EDF implementation — this makes it possible to accelerate the spread of the practice of using electronic invoices already on a voluntary basis. A positive result was the fact that at present electronic documents account for 46% of all document turnover in the tax sphere against 10% in 2021.[11] In just 10 years the market of EDMS (electronic document management system), ECM (Enterprise content management) and CSP-systems (Content Security Policy)[12] has grown by 175%.[13]

It should be noted that work on EDF implementation continues. A significant step forward in this direction was the development of Electronic Power of Attorney (EPOAR). They formed the basis of a proactively developed model — not mandatory for use, but supported by business. It provides a distributed system that allows users to work on the basis of EPOAR with the rights and accesses they define themselves. The format for stabilisation of trust rules is currently being finalised, which is expected to simplify the existing mechanism and strengthen the institution of trust; accordingly, a simple logical system with access to all government bodies (B 2B) will be created, with the help of which it will be easier for companies to manage business processes.[14]

[8] Federal Law No. 348-FL "On Amending Part One of the Tax Code of the Russian Federation" dated 04.11.2014. URL: https://base.garant.ru/70782826/

[9] Federal Law No. 422-FL dated 27.11.2018 "On conducting an experiment to establish a special tax regime "Professional Income Tax". URL: http://publication.pravo.gov.ru/Document/View/0001201811270056?ysclid=lwrlmf4ngt167512902

[10] Speech by D.V. Egorov at the All-Russian Tax Forum. 25.10.2023. URL: https://nalogforum.tpprf.ru/den2 (accessed on 03.01.2024).

[11] Speech by D.V. Egorov at the All-Russian Tax Forum. 25.10.2023. URL: https://nalogforum.tpprf.ru/den2 (accessed on 03.01.2024).

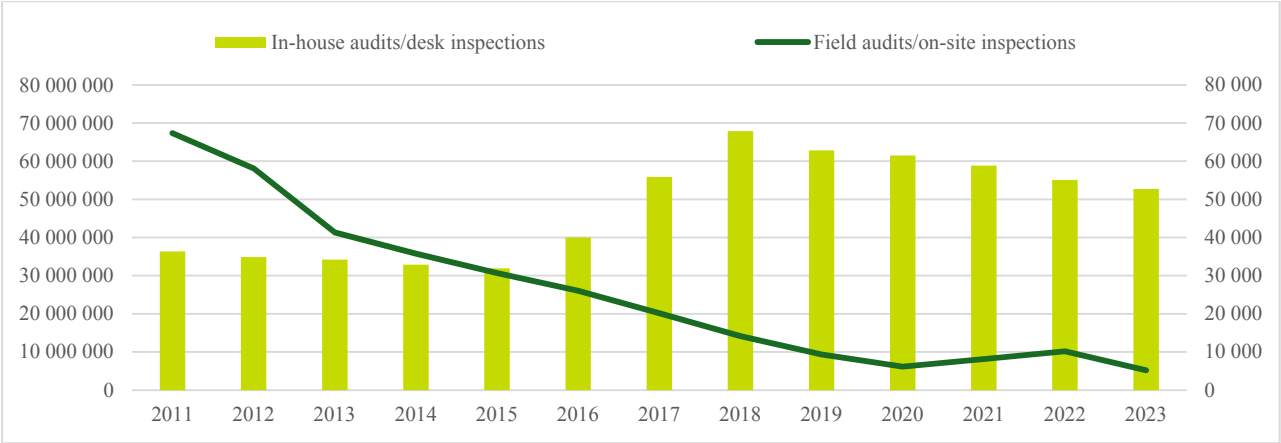
[12] EDMS — Electronic Document Management Systems; ECM — Enterprise Content Management — corporate content management systems; CSP (Content Services Platforms) — Content management or content services platforms capable of operating in cloud and hybrid environments.

[13] . EDMS (Russian market). TAdviser (business portal). URL: https://clck.ru/3B 3LaD

[14] Speech by Egorov D.V. All-Russian Tax Forum. 25.10.2023. URL: https://nalogforum.tpprf.ru/den2 (accessed on 03.01.2024).

After reorganising the functioning of a number of internal services, the Russian Federal Tax Service began modernising its external infrastructure in 2013. The Tax Service was one of the first in the country to introduce the Queue Management System, create call centres, and integrate with the portal of state services. The result of the five-year transformation of digital software products was the enshrinement of the concept of 'personal profile of the taxpayer' in the TC RF. It should be noted that even in 2023 such a concept as 'information resources' was not enshrined in all federal legislative acts.

In parallel with the consolidation of the service function of the tax authorities in terms of the methodology of tax assessment and models of relations between tax entities, this function was also considered in the context of a set of software products and mechanisms that improve the efficiency of control over the procedure of tax collection (including the completeness of tax amounts). Over 15 years, the Federal Tax Service of Russia has formed a system of multidirectional mechanisms and services that ensure the collection, systematisation, and processing of taxpayer data — the digital contour of the Federal Tax Service of Russia (see *Figure*).



Antivirus defence A full-fledged solution from Kaspersky Lab JSC	**ACS VAT-1** Automated data processing solution	**ACS VAT -2** Automated solution for control over VAT payment	**Cash register technology** Collection of information on most transactions	**Unified product labelling system** Traceability of the goods movement chain	**EPOARand esig (computer-generated signature)** Digitalisation of document authentication	**Transformation of the service function** as a set of digital services
SAP BI reports Fast and automated visualisation of data from the Federal Tax Service of Russia	**Taxpayer's personal profile** Single centre for interaction with taxpayers	**Tax monitoring**	**Definition of Big Data** The volume of data of the Federal Tax Service of Russia was defined as complying with Big Data criteria	**Tax monitoring reform**	**ASTS (automated simplified taxation system)** A taxation system in which tax amounts are calculated by the Federal Tax Service in an automated manner	**Development of the Digital Tax Code**
Document recognition Ability to work not only with electronic documents	**Integration with the State Services Portal** Creation of a centralised information channel	**AIS Tax-3** Unified system for the work of tax officials	**Consolidation of data streams** Collection and processing of information linked to registers	**Professional income tax** First sample application of self-assessment tax policy	**Federal State Information System SRN (single registration number)** Information register containing data on the population of Russia	**Regional Information System.** Gives governors an overall picture of the region's economy

Figure. **Digital outline of the Federal Tax Service of Russia for 2023**

Source: compiled by the authors.

Thus, by 2007, a service for paying tax payments using the self-service device 'Electronic Cash Desk' was introduced in Sberbank branches and commercial banks. Further, in a few years, a service for debt control was created, and in 2010 — "Personal Cabinet of the taxpayer" was introduced. However, the order of development of digital services was fragmented and aimed more at meeting the current needs of the tax authorities.

Since 2010, their policy with regard to digital solutions has changed — the trend was a comprehensive modernisation consisting of 4 components, such as:

- modernisation of the organisational structure of the tax authorities (as a result, since 1 April 2009 out of 49 tax inspections there were 25 with a unified structure and functional order of work) [5];
- application of the process approach through the re-engineering of business processes, namely through the sequential execution of certain technological operations);
- modernisation of the information system (the key element was the creation of an automated information system AIS 'Tax-3', which currently performs the functions of a single digital service for the work of tax authorities — its development was started in 2010) [6];
- implementation of modern IT infrastructure (in the period from 2013 to 2015, two large federal data centres [DCs] were built, the activities of which are aimed at accumulating, storing, and processing big data of the Federal Tax Service of Russia; they perform their functions in full to this day).[15]

This vector of development already had a methodological basis, because in 2008 the project 'Modernisation of the Tax Service — 2' was completed, during which the concept and regulatory and methodological documentation were developed to ensure the processing, registration, operational and archival storage of information both in paper and electronic form — in particular. The project resulted in three fundamental documents for the practical work of tax specialists:

- The procedure for maintaining an archive of hard copy documents under conditions of centralised data processing.
- Procedure for destroying documents and technological data of temporary storage period formed in the activities of the Federal Tax Service of Russia.
- A draft of technical specifications (functional requirements) for serial software solutions to carry out development work to create a system that ensures processing, registration, operational and archival storage of documents in both paper and electronic form in accordance with unified principles.

Over the five years of work in this area, many products have been implemented that have already become commonplace, but were considered revolutionary at the beginning of the 21st century.

In 2011, the Russian Federal Tax Service purchased a full-fledged antivirus protection solution for its entire information system from Kaspersky Lab, which was a continuation of the cooperation started in 2008 as part of the purchase of 120,000 licences for the Service's employees following an unsatisfactory experience with ESET software [7]. However, even in 2012, there was a problem of lack of up-to-date antivirus software (even in developed countries, it was only installed on 80–90% of computers) [8].

In 2012 the companies SAP CIS and ABBYY Russia implemented two services that are key to the work of tax specialists: to create ready-made visualised reports in real time (SAP BusinessObjects Edge BI) and streaming document recognition (ABBYY FlexiCapture), which were introduced at the stage of their creation, but are still not widespread among organisations.

[15] Analytical portal of the Federal Tax Service of Russia. URL: https://analytic.nalog.gov.ru/ (accessed on 18.04.2023).

THE ROLE OF NEW MONITORING IN THE PERFORMANCE OF THE SERVICE FUNCTION

Simultaneously with the digital transformation of tax authorities, a similar process took place on the side of taxpayers. Over 10 years, the volume of data on taxpayers has grown significantly. Most of the information they generated and continue to generate — independently, which determined the need for a powerful analytical tool to control the correctness of calculation and payment of all tax payments.

All of the above in aggregate became the reason for the emergence and widespread introduction of risk-oriented approach in the service function of the tax service, which manifested itself in the development of such a form of tax control as tax monitoring, although recently its implementation was considered theoretically possible, but practically unrealisable in Russia. Monitoring is commonly understood as a system of measures that allow for continuous observation of the state of the object, process, or phenomenon under study, register their most important characteristics, evaluate them, and promptly record the results of the impact of various factors on the object. Tax monitoring will further develop both 'outwards' — this will lead to an increase in the number of its potential participants, and 'inwards', which will cause an increase in the degree of digitalisation of relations between taxpayers and tax authorities [9].

The first refinements to the mechanism of tax monitoring were made in 2017. In 2021, based on the accumulated experience, it again underwent a large-scale transformation affecting all aspects of its functioning. Thus, the range of potential participants was expanded, the procedure for submitting an application to switch to monitoring and the procedure for early termination were clarified.

From the position of implementation of the task of the tax authorities as a service, it is important to change the procedure for drawing up a reasoned opinion on the initiative of the tax authority and early termination of monitoring — this procedure has become two-stage. The inspectorate must notify the taxpayer before the moment of drawing up a motivated opinion (making a decision on early termination of monitoring) on the existence of relevant grounds. In response, the taxpayer may provide explanations or make the necessary corrections.

In the future, if the tax authorities focus on tax monitoring, the information aspect of interaction between monitoring participants and tax authorities will increase. The main objectives are to ensure integration of company information systems with AIS Tax-3, and to automate the process of document exchange between taxpayers and inspectorates.[16] The concept of development and functioning of the tax monitoring system in Russia envisages the expansion of the list of its potential participants to more than 7,800 by 2024, as well as ensuring the level of growth of tax monitoring participants not less than 20% per year (actual values of this indicator are as follows: in 2020–115%; in 2021–120%; 2022–62%; 2023–31.2%).[17] One of the tools to expand the number of participants is to lower the entry threshold (e.g., from 1 billion roubles in turnover and assets and 100 million roubles in taxes paid today to 800 million roubles and 80 million roubles respectively in the near future[18]).

According to M.A. Krasheninnikova, Head of the Tax Monitoring Department of the Federal Tax Service of Russia, the motives for expanding the range of taxpayers involved in tax monitoring are as follows [1]:

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[16] Integration with AIS 'Tax-3'. Taxman. 2023;(1);39.

[17] Tax office "vita nova". URL: https://nalogoved.ru/art/13403.html (accessed on 02.12.2023).

[18] Draft Law No. 577665–8 "On Amending Parts One and Two of the Tax Code of the Russian Federation and Article 8 of the Federal Law "On Amending Part Two of the Tax Code of the Russian Federation and Certain Other Legislative Acts of the Russian Federation, as well as on the invalidation of Certain Legislative Acts (Provisions of Legislative Acts) of the Russian Federation". URL: https://sozd.duma.gov.ru/bill/577665–8

1. Formation of an array of data for analytical processing not only to make decisions to ensure the efficiency and effectiveness of tax control, but also to obtain information about the object by other government agencies, such as the Ministry of Finance of the Russian Federation, in the formation of budget planning indicators.

2. Increased coverage, so that the information obtained becomes more diverse; in particular, data on incorrect or insufficient tax legislation, court decisions, etc. appear, which are then categorised according to the level of standardisation of the causes that caused them. If expert judgement is required, the data are subject to further elaboration. Otherwise, they are processed automatically.

In the conditions of digitalisation and relevant information processing technologies, the boundaries and depth of implementation of the service function of tax authorities are expanding in the interests of not only participants in tax relations, but also other stakeholders. Tax authorities often assume the costs arising in this process (within the framework of their functional activities). Thus, in the system of the Federal Tax Service of Russia for each declaration a 'factor analysis with a depth of up to five years and with a forecast of up to four periods ahead' with the planned transfer of results to taxpayers is performed. For the state such information is valuable in planning budget indicators, as well as in the development of measures to address the tasks of socio-economic development [1]. An important aspect here is also the fact that the materials are actually received by tax authorities in the process of analytical preparation of control measures and tax monitoring, concerning the effectiveness of the use of state support measures by recipients, including those within the framework of national projects.

Analytical work by the tax authorities both in general and as part of the pre-inspection analysis in preparation for an on-site tax audit, in particular, has become the most effective tool for budget replenishment, as it encourages taxpayers to voluntarily clarify already declared tax liabilities. With the help of the ACS VAT-2 programme, the tax authorities have become quicker in identifying companies used for illegal tax savings and not paying VAT. Thanks to the analytical work, the tax authorities have already collected 158 billion roubles in 2020, 174 billion roubles[19] in 2021, 189 billion roubles in 2022, and in 2023–218 billion roubles.[20]

CURRENT TRENDS IN IMPROVING THE SERVICE FUNCTION OF THE RUSSIAN TAX AUTHORITIES

The opportunities offered by digitalisation provide a significant stimulus for the development of the service function of tax authorities. Let us focus on a new project that is gradually being implemented — the digital tax code. In fact, it is a set of control directories, registers for tax monitoring and others.[21] Since the technological model of tax monitoring does not accept paper documents of tax authorities, their electronic version was created. The system as if prescribes a strict regulation of action and does not miss mistakes of taxpayers. Thus, the directories become a tool of self-monitoring for participants of tax relations. At the same time, work continues to ensure that such control exists at the preliminary stage, i.e., before the taxpayer submits documents to the tax authority.

The digital tax code is a tool that frees the tax inspector from controlling standard situations through automatic processing and allows him to focus on complex schemes. An important place is given to the identification of those norms of the current tax legislation that have signs of ambiguous interpretation, as a result of which their application often leads to errors in the course of

[19] The Federal Tax Service considers it necessary to create an institute for tax counselling. Federal Tax Service of Russia (official website). URL: https://www.nalog.gov.ru/rn02/news/smi/4286090/ (accessed on 18.04.2023).

[20] URL: https://analytic.nalog.gov.ru/

[21] Federal Tax Service of Russia (official website). URL: https://www.nalog.gov.ru/rn77/

court proceedings or pre-trial resolution taking into account the expert judgement of specialists.

As a constituent element of the service function, it is correct to consider monitoring of tax risks arising from the participants of tax relations on both sides. In this case, the tax authority pays great attention to the standardisation of such risks, as well as deciphering the indicators of tax reporting. As a result, conditions are being created for the implementation of services for the automatic control of a number of tax reporting indicators (for example, income — both from sales and non-operating). As part of the expansion of requirements for the mandatory element of tax monitoring — the internal control system (ICS) — the need to disclose information on atypical, specific transactions (operations) and major transactions (operations) that meet the criteria established in legislation for joint stock companies and limited liability companies was identified. The motivation for making these changes was the need to control the risks arising from their execution.

'There are also plans to create a common library of tax risks for monitoring purposes. In particular, so that it is possible to form a unified methodological base on controversial issues' [10]. Moreover, algorithms are being developed to identify potential risks of the development of artificial intelligence, its application in the tax sphere. Thus, additional incentives are created for the transition to monitoring, as the range of grounds for tax audits is narrowed. At the same time, these measures reflect the principles of openness and certainty declared by the state in the process of interaction between participants of tax relations, and maximum automation of such relations.

Monitoring of tax risks of the state involves monitoring the functioning of the tax system in terms of compliance of actual tax revenues to budgets with their planned indicators, as well as the effectiveness of tax benefits and preferences, tax control and administration, correctness of changes in tax legislation, losses of tax revenues due to the shadow economy and tax havens (offshore zones), competitiveness of the national tax system, etc. It is important for taxpayers to know the contours of their tax risks in various situations, including those identified during tax audits or by analytical services of tax authorities. The overall objective is to avoid or minimise negative consequences.

Another problem within the service function needs to be solved, namely, the extension of the principles of the Federal Tax Service to inspections of different levels and functionality. Thus, one of the important trends in improving tax administration is the reorientation of the evaluation system from the achievement of economic indicators to the satisfaction of taxpayers with the quality of administration. In order to organise the interaction between the Federal Tax Service of Russia and the largest taxpayers in 2022, a voluntary survey of the latter was conducted [11].

This kind of feedback allows the Federal Tax Service to identify problems, including uncertainties in methodological issues (for example, the organisation of a taxpayer's work when making a decision to join a tax monitor, or when refusing to join a consolidated group of taxpayers), and to promptly find correct answers [12, 13].

In the second decade of the 21st century, one of the directions of institutional improvement of the system of tax authorities within the framework of updating the model of their interaction with taxpayers was the introduction of functional-sectoral approach [14]. Thus, the tax authorities for transfer pricing (2013), desk audits (2015), debt management (2022), etc. (and even earlier — the tax inspectorate supervising organisations of the financial sector of the economy — banks, stock exchanges, insurance companies, etc.) were institutionalised. As part of the Expert Council under the Federal Tax Service with the participation of representatives of the country's largest business structures, the above-mentioned surveys of taxpayers are conducted, as well as meetings with them to promptly obtain information on the risks and methodological positions of the

Federal Tax Service on controversial issues. In particular, in 2021, a meeting was held to discuss the metallurgical industry; in 2022, several events were held on the topic of transfer pricing, and in November of the same year — on the settlement of methodological issues in connection with the termination of a consolidated group of taxpayers.

The factors of the transition to a functional tax institution (for example, in the form of a debt management platform) were, firstly, the presence of layers in the relationship between the participants of tax relations (which may hinder the achievement of a meaningful search for ways to resolve the situation), and secondly — the implementation of the service function of the tax authority in the form of, in particular, consulting on possible areas of debt repayment (management). According to the head of the Federal Tax Service of Russia D.V. Egorov, as a result of the creation of an institutional platform for debt management and granting a deferral of 800 billion roubles for 1 rouble — 96 kopecks (cents) of repaid debts were received, and most importantly, companies did not go bankrupt and continue to work.[22]

Thus, the formation of a tax authority for debt management based on the functional principle means that the consideration of the substance of tax liabilities involves highly qualified personnel, focused on a predetermined range of problems. Thus, the path, and thus the time between the emergence of a particular claim (issue) and their resolution is significantly reduced.

Another issue of concern to taxpayers concerns the validity of the amount of information requested during counterparty audits, including proof of due diligence measures taken in relation to counterparties, which may help to reduce the administrative burden on taxpayers. To solve this problem, unified information bases on counterparties have been developed — as capacious and accessible as possible. Since March 2022, a taxpayer — a legal entity in the section of the personal account 'How the tax authorities see me' has a new tab 'Indicators for partners. A taxpayer may access the data of any partner if that partner accepts a request sent via the new service'.[23]

In order to increase information openness and trustworthiness of relations with taxpayers, it seems appropriate to abolish in the TC RF the possibility to conduct an on-site inspection of a monitoring participant within the framework of control by a higher tax authority over the activities of a lower one (subparagraph 1, paragraph 5. of Article 89; subparagraph 1, paragraph 4.1. of Article 89.1). Such 'revision' of monitoring results does not contribute to the consistency of taxation.

The Federal Tax Service of Russia continues to search for tools to improve the climate in the course of interaction between participants in tax relations. And in this context, there is another aspect of requesting information. Thus, pre-trial settlement of disputes may often arise due to a real lack of supporting documents. In order to promptly eliminate such tax conflicts, it is correct to suggest the following:

- introduction of a simplified procedure for appealing decisions of tax authorities, namely, directly to the territorial tax authority, and only in the absence of a correct decision — to a higher one;
- directing complaints to the state body or official, whose competence includes dispute resolution.

Thus, additional opportunities are created to expand horizontal ties of a positive nature between taxpayers and tax authorities. Accordingly, the proposal of the head of the Department of pre-trial settlement of tax disputes R.V. Yakushev to introduce the institute of objections to requests for documents [15] seems reasonable. For taxpayers it would allow to suspend the es-

[22] Speech by D. Egorov at the Plenary Session of the CCI Tax Forum on 25.10.2023. URL: https://nalogforum.tpprf.ru/den2/

[23] Federal Tax Service of Russia (official website). New service 'How the tax authorities see me'. URL: https://www.nalog.gov.ru/rn65/news/activities_fts/12170882/ (accessed on 02.12.2023).

tablished term for the fulfilment of the request and, in particular, to justify the impossibility/incorrectness of submission of the requested information. Increasing the time limit for collecting information is also relevant in the framework of tax monitoring, for example, in the process of mutual agreement procedure. Since objections must be filed electronically, the tax authorities will have at their disposal information on the number of objections in the territory under the jurisdiction of the tax authority, the quality of responses to them and the dynamics of the process. This will create additional prerequisites for the FTS of Russia to fulfil the most important task within the framework of the service model of operation — to increase the validity of the claims of the tax authorities.

Parallel to the requests, there is also in practice the summons of taxpayers to tax commissions. This controversial issue is widely discussed in economic and legal literature, both practical and scientific [16, 17]. According to par. 4 p. 1. art. 31 of the TC RF, tax authorities have the right to summon a taxpayer on the basis of a written notice to give explanations in connection with either the payment (withholding and remittance) of taxes, or — with a tax audit (or other cases). Inspections at the same time exercise this right actively enough to obtain explanations from the taxpayer on the identified facts of alleged violations outside of tax audits, sometimes exceeding their authority. According to the experts, 'it is inadmissible to identify this right with the actual actions of summoning to the commissions within the framework of pre-inspection analysis... This form of tax control or procedure in the provisions of tax legislation is absent, therefore, it is illegal and inadmissible' [16].

It seems that if the regulations are observed, such a control tool within the framework of the service function is positively assessed by subjects of tax relations. Taxpayers have the right to contact tax authorities in the event of detection of certain contradictions between regulatory acts and tax legislation, which may lead to negative consequences for the interaction of participants in tax relations.

CONCLUSIONS

Improving the service function has been a promising direction for the development of tax legal relations for more than 10 years. In this regard, the importance of analytical tools of tax authorities increases, among which the AIS (Automated information system) "Tax-3" system stands out, summarizing the data obtained as a result of interaction with taxpayers. Thus, the process of integrating tax monitoring participants with the AIS "Tax-3" is one of the steps towards improving the service function of tax authorities, as well as improving the quality of internal tax monitoring of state risks.

However, the required level of efficiency in the implementation of the service function can only be achieved if the tax authorities adhere to the principles of openness, honesty, and integrity in their activities. This is expressed, in particular, in the publication of internal regulatory documents disclosing typical violations in order to prevent the employees from making them in the future. Among the possible violations are: "sending notifications to request documents; the presence in the notifications of a requirement to submit revised tax returns in the absence in the notifications of a detailed description of the grounds for the summons; a summons to the tax authorities for a meeting of the commission on the legalization of the tax base".[24]

The article noted the importance of creating not only tools designed specifically to ensure the operation of tax authorities, but also "infrastructure" products that stimulate the

[24] Letter of the Federal Tax Service of Russia dated 02.12.2021 No. EA-4–15/16838 "On sending notifications of a taxpayer's summons to the tax authority within the framework of subparagraph 4 of paragraph 1 of Article 31 of the Tax Code of the Russian Federation". URL: https://www.consultant.ru/document/cons_doc_LAW_404050/?ysclid=lwuoo43ujo714485850

processes of general digital transformation of participants in tax legal relations. Among them, of particular importance is the implementation of a digital tax code, which can not only simplify tax monitoring, but also stimulate the processes of automation of tax functions of taxpayers, as well as the inclusion of new participants in tax monitoring by reducing the level of uncertainty and risks of the taxpayer when calculating taxes.

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Ensuring Transparency of ESG Transformation of Corporations (Using the Example of Retail Companies)

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ABSTRACT

In recent years, companies in the retail sector have begun to introduce and incorporate the principles of sustainable development into their strategies and began to publish reports on sustainable development. ESG transformation of companies in the retail industry has its own characteristics. The purpose of the work is to determine the directions of ESG transformation in retail companies, as well as tools for ensuring transparency of activities in the field of sustainable development. The methodological basis of the study was the concept of sustainable development and ESG, methods of statistical analysis, a systematic approach, scientific works of leading domestic and foreign scientists in the field of sustainable development, ESG transformation of retail companies. In the course of the work the author has identified 6 areas of ESG transformation that are most relevant and consistent with the Sustainable Development Goals and the industry specifics of the retail sector. It was revealed that there is a problem of comparability of ESG ratings and rankings from various agencies, insufficient prevalence of the practice of publishing non-financial reporting by organisations from this segment.

The set of non-financial indicators proposed by the author for retail companies are grouped by areas of ESG transformation, as well as by Sustainable Development Goals. The publication of the proposed indicators in the annual report or sustainability report is intended to help management and interested stakeholders evaluate the results of ESG transformation of retail companies in more depth and detail.

Keyword: sustainable development; corporate environmental responsibility; Sustainable Development Goals; ESG transformation; ESG rankings; ESG ratings; non-financial reporting; greenwashing; retailing

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INTRODUCTION

Environmental and climate trends, increasing influence of investors, consumers, and growing number of sustainability ratings are the main drivers of ESG (environment, social development, corporate governance) agenda development in Russia and globally. According to KPMG's brochure "The ESG Agenda for Retail and Consumer Businesses" for 2022 56% of consumers say they consider a firm's environmental and social practices when making decisions about buying its products.[1] International research of 19,000 consumers in 28 countries found that 93% of respondents expect leading companies (or "brands") to help address social and environmental issues [1].

Retailers are later than companies from other industries to integrate sustainability into their strategies and to embark on ESG-transformation, which refers to the selection of sustainability priorities and activities. Retailers are reducing CO_2 emissions, recycling waste, using biodegradable packaging, developing eco-brands, using green energy, producing healthy food products, and more.

An important driver of the spread of the ESG agenda in food retail companies is the pandemic-induced healthy eating market. According to estimates by the Retail Companies Association of Russia, it is growing at the rate of 15–20% per year [2].

The specific nature of the industry determines the high risks of retailers using greenwashing[2] — the number of lawsuits related to greenwashing is growing year after year abroad, with both food and beverage producers and retailers being accused. Russia has set up a committee to prevent greenwashing. Tools to combat such "environmental marketing" (or "green PR") include product certification and the presentation of specific, comparable ESG indicators in sustainability reporting.

However, in Russia, only a few companies in the industry publish non-financial reports. In the National Register of Corporate Non-Financial Reports of the Russian Union of Industrialists and Entrepreneurs, as of January 2024, only 32 reports published over several years by 8 companies belong to retailers (out of 1467 non-financial reports of 258 companies).[3] The growing number of ESG ratings and rankings does not solve the problem either. As a result, stakeholders lack reliable information for decision-making, allowing them to assess and compare companies' sustainability efforts.

The purpose of the author of this paper is to determine the direction of ESG-transformation of organisations belonging to such a business segment as retail, as well as methods of ensuring openness and publicity of their activities in the field of sustainable development to counteract greenwashing. The research object is food retail companies, and it is based on such scientific methods as analysis and systematisation of ESG-transformation practices of retail companies based on non-financial report data; substantiation of the most important Sustainable Development Goals for the industry; analysis and comparison of the values of 8 largest Russian retail companies in ESG-ratings and rankings of Russian agencies.

REVIEW OF PUBLICATIONS ON THE TOPICS OF ESG CONCEPT IMPLEMENTATION IN RETAIL COMPANIES AND GREENWASHING

The main trends of sustainable development and retailing on the basis of bibliometric analysis using online resources Web of Science and

[1] ESG Agenda for Retail and Consumer Businesses 2022. URL: https://assets.kpmg.com/content/dam/kpmg/uk/pdf/2020/12/esg-retail-consumer-proposition-november-2020.pdf (accessed on 06.01.2024).

[2] Greenwashing — unsubstantiated claims about the environmental friendliness of products.

[3] Russian Union of Industrialists and Entrepreneurs (official website). URL: https://rspp.ru/sustainable_development/registr/ (accessed on 10.12.2023).

Scopus database were considered by J.L Ruiz-Real and colleagues [3]. Many foreign scientists have studied the drivers and directions of implementation of sustainable development practices in the retail industry. Thus, a team of researchers led by D. Styles [4] reviewed the strategies of 25 major European retailers, including: environmental certification of third-party products (e.g., Forest Stewardship Council); labelling of goods in accordance with environmental characteristics; determination of environmental requirements for suppliers, etc. The results revealed that, in terms of environmental performance, speciality retailers and small co-operative retailers, due to their flexibility, tend to be the leaders in terms of supply chain improvement compared to large European chains. A. Ferreira, M. D. Pinheiro and R. Mateus [5] analysed the impact of the adoption of the Paris Agreement on the sustainability strategies of 27 major international retailers. A group of scientists from the USA [1] considered the implementation of the principles of circular economy (namely: Reduce, Reuse, Recycle [3 R]) for companies in the industry and the mechanisms of its implementation, among which they identified: sectoral norms of sustainable development; norms of public and corporate governance; private and public institutions for certification of environmentally friendly products; training and retraining of managers of companies.

M. Naidoo and A. Gasparatos in their article [6] investigated corporate environmental sustainability [CES] strategies and their key provisions applicable to companies in the retail sector and concluded that the motivation for retailers to implement a sustainable development strategy is the economic benefits expected mainly through cost savings (as a result of reduced resource use). Other authors have evaluated the impact of ESG strategies on the use of technologies that reduce water and other resource use, direct and indirect emissions of retailers. M. Naidoo and A. Gasparatos [7] studied the supply chain initiatives of major supermarket chains in South Africa, as well as consumer perceptions and willingness to support supermarket sustainability strategies.

It should be noted that the sphere of scientific interests of foreign researchers included the issues of certification and standardisation in retailers as tools for solving the problem of greenwashing.

For example, the authors of the article [8] O. Chkanikova and M. Lehner studied the role of retail ecobrands and the problems associated with their certification, compared private and public certification in terms of greenwashing risks; they found that ecobranding changes the practice of food production and consumption. Thus, retailers who can certify organic products have a noticeable impact on producers and all actors in the value chain. At the same time, there are risks associated with dishonest certification.

L. Fulponi [9] on the basis of interviews with directors of large retail companies from OECD countries, trading in food products, identified the main economic and institutional incentives for ESG-transformation and the use of private voluntary standardisation and certification. The following were identified as economic motivations: financial markets, which created conditions for the development of ESG investment criteria; increasing purchasing power of the population; growing expectations for increased environmental friendliness of products on the part of consumers, and so on. According to the researcher, the development of private voluntary standardisation in OECD countries acts as a stimulus for the development of the food and agricultural sectors towards sustainable practices.

S. Braga Junior et al. (2019) [10] studied the characteristics of greenwashing in retail through a survey of 880 consumers living in São Paulo, Brazil. The authors found that this problem has a positive relationship with PR and advertising campaigns to increase the consumption of envi-

ronmentally friendly products. This is based on the assertion of marketers S.I. Wu and J.Y. Chen [11] that the choice of a product or service is based on beliefs or expectations based on trust.

The works of Russian experts analyse the key trends of ESG-transformation of retailing in the form of increasing the environmental friendliness of products, economical use of resources, and development of the healthy food industry.

Thus, V.A. Yedemskaya, E.D. Davydov and F.I. Sukhov (2022) [12], while considering the ESG-transformation of Russian retail companies, grouped companies in terms of ESG-position, analysed their activities on the basis of the RAEX ESG-ranking, and identified their practices corresponding to all three aspects "E" (environmental), "S" (social) and "G" (in the field of corporate governance).

M.P. Afanasiev and N.N. Shash [13] studied ESG-transformation of the corporate sector, including the content and sections of ESG-reporting, compared methodological approaches to the construction of ESG-ratings and noted the existence of such a problem as harmonisation of methodologies, as well as acknowledged the need to bring the list of ESG-indicators disclosed in the reporting in line with the industry specifics. N.A. Kolesnik analysed the sustainability communications of five major retailers for the period 2015–2021 and found that the key topics for them were "health", "ecology" and "social projects" [14, p. 90].

The role of retailers in spreading the principles of sustainable development in the supplier network, as well as the ways to solve the problem of greenwashing were considered by D.V. Ralyk, P.K. Root, K.A. Gavrilova [15] and M.A. Vetrova [16], among others. The first three authors, studying the position of industry companies as supporters of the application of ESG principles in commodity supply chains, highlighted the presence of the problem of greenwashing associated with the placement of inaccurate advertising information on packaging and manipulation of product composition [15, p. 166]. M.A. Vetrova identified two types of risks associated with ESG-transformation in retail: rejection of ESG by company management and manipulation of ESG. She pointed out such tools to combat greenwashing as standardisation of ESG-ratings and transparency of assessment methods; publication of data for several years in sustainability reporting and comparing them with the values in the ratings; conducting legal expertise [16, p. 73].

The works cited in the review did not raise the issue of priorities in terms of compliance with the principles of sustainable development, directions of ESG-transformation of retail companies, as well as tools to ensure transparency of these activities for stakeholders.

DIRECTIONS OF ESG-TRANSFORMATION OF RETAIL COMPANIES TO ACHIEVE SUSTAINABLE DEVELOPMENT

This study considers sustainable development as an interdisciplinary, normative and action-oriented concept [17], based on a holistic approach and the understanding that sustainable development challenges require new ways of knowledge production and decision-making [18]. ESG transformation refers to a process consisting of practices related to the integration of sustainability principles into a company's strategy and business processes. It concerns the organisation of responsible supply chains, reducing resource and energy consumption, reducing emissions, switching to renewable energy sources, and much more.

The Sustainable Development Goals (SDGs) were chosen as benchmarks to identify areas of ESG-transformation of enterprises. In the Russian ESG navigator, 17 SDGs are distributed across 8 sectors, taking into account the national specifics; 6 goals were identified for the retail and consumer goods sector: Goal 3 — "Good health and well-being"; Goal 7 — "Af-

fordable and clean energy"; Goal 8 — "Decent work and economic growth"; Goal 10 — "Reducing inequalities"; Goal 12 — "Responsible consumption and production"; Goal 13 — "Climate action".[4]

4 out of 6 goals are environmental (3, 7, 12 and 13), and two are social (8 and 10). Thus, there is a preponderance of greening in the goal-setting of the organisations of the sustainable development strategies of companies in this industry.

For the purposes of this study, 8 retail companies were selected: X5 Group, Magnit, Lenta, Auchan Retail, O'KEY, VkusVill, Dixie Group, Azbuka Vkusa. An analysis of non-financial reports and corporate websites of the majority of Russian food retailers showed that they contribute to Goal 2 — "Zero hunger". In Russia, this problem was overcome in the period of the USSR, so the actions to achieve this goal can be considered by experts and stakeholders as greenwashing.

The greening of retail is impossible without the introduction of practices for waste and water management, control of energy and fuel consumption, sale of healthy food products and so on.

In the course of analysing data from corporate websites, non-financial reports and scientific publications, the main actions of retailers related to the implementation of sustainable development strategy were identified and systematised (*Table 1*).

It should be added that all 8 companies reviewed have adopted sustainable development strategies. X5 Group, Magnit, Lenta, Auchan publish sustainability reports; Dixie Group does not prepare a separate report, but the annual report contains a section on sustainable development.

Lenta adopted this strategy later than the others. Lenta's communications policy previously focused on investors, but now focuses on customers and a wide range of stakeholders, including as part of its work with ESG risks.

[4] Analytical Centre under the Government of the Russian Federation (official website). ESG Navigator. URL: https://ac.gov.ru/uploads/pdf/ESG.pdf (accessed on 10.12.2023).

EVALUATIONS OF RETAIL COMPANIES IN ESG RATINGS AND RANKINGS

At the next stage of the research, we compared the results of retail companies' evaluation according to ESG-ratings and rankings,[5] compiled by Russian agencies.

Currently, four agencies in the Russian market compile sustainability ratings and rankings: RA-Expert, RAEX, National Rating Agency (hereinafter NRA) and National Credit Ratings (hereinafter NCR). The first three are accredited by the Bank of Russia, which means that core and non-core services provided by the agencies are subject to verification. RA-Expert, RAEX and NRA compile ESG rankings based on open data. NCR jointly with RBC carries out questionnaires when compiling ESG rankings.

Each rating agency has its own methodology and evaluation scales, which from the stakeholders' point of view complicates the use (as well as comparison) of the data provided by their ESG ratings and rankings. In this case, the risks of greenwashing lie in the fact that companies may receive high places in ratings calculated not according to generally accepted and well-known methodologies, but in accordance with the criteria of specific agencies.

The RAEX Rating Agency methodology implies assessment according to 221 indicators, of which 89 are environmental, 91 are social and 41 are dedicated to corporate governance[6] and this methodology assumes a scale corresponding to the letters A, B and C, each of which has three levels (9 rating classes in total). RA-Expert uses 5 categories for evaluation [from ESG-I to ESG-V, as well as ESG-W (corresponding to significant violation of sustainable development interests)].

[5] A ranking is usually a list of companies ranked according to some criteria. A rating, unlike a ranking, is a tool that a company requests from a rating agency by entering into a contract with it. Rating is a numerical or ordinal indicator reflecting the level, importance, significance, competence or popularity of a certain object or phenomenon, calculated, or determined by a certain special methodology.

[6] RAEX Europe website. URL: https://raex-rr.com/files/analytics/RAEX_presentation.pdf (accessed on 10.12.2023).

Table 1

Directions for ESG transformation of retail companies in support of the UN SDGs

Direction of transformation (alignment with UN SDGs)	Characterisation of ESG-transformation direction
Reductions in energy and material intensity (Goal 7 and Goal 12)	Reducing energy and resource wastage, utilising digital technology and solutions, controlling energy and fuel consumption. For grocery retailers, reducing water consumption is of great importance
Circular economy and waste reduction (Goal 12)	Companies in the industry are focusing on reducing waste, encouraging reuse (resale) and improving the circular economy. Some retail chains are abandoning plastic packaging
Environmental performance of products (Goal 3 and Goal 12)	Companies are developing eco-labelled ranges (healthy food products in the categories of "fresh", "ultra-fresh" and FROV "fruit and veg"*)
Sustainable supply chains (Goal 12)	It is about suppliers' compliance with the ESG principles adopted by the retailer. Whereas abroad, emphasis is placed on avoiding the use of forced labour, human trafficking, and modern slavery, in Russia it is mainly a question of compliance with safety and "green" criteria, which are prescribed in the requirements for suppliers. Some chains are conducting social audits of suppliers
Decarbonization (Goal 13)	High carbon dioxide emissions in the retail sector can come from transport, distribution centres and shops (due to energy use). Reducing CO2 levels is achieved through energy efficiency, green energy sources, digital solutions, etc.
Biodiversity conservation and climate action (Goal 13)	Introduction of regenerative agriculture; regenerative approach to fish catching (both in the wild and on farms), etc.

Source: compiled by the author.

Note: * — FROV — a category of goods that includes vegetables and fruits.

In ESG-II, ESG-III and ESG-IV categories three more subcategories ("A", "B" and "C") are distinguished.[7] The ESG rating methodology of the NCR is not considered here, as it is compiled for companies in the financial sector.[8]

The positions of the food retail organisations under consideration in ESG ratings and rankings of RAEX and Expert-RA agencies are given in *Table 2*.

As it follows from its data, all the companies under consideration have an ESG rating by RAEX agency except for Auchan (as it is not Russian). Let us consider the information in *Table 2* in more detail. As mentioned above, the RAEX methodology for assessing the level of risk and opportunity management assumes 3 ranges: A (ESG risk and opportunity management is at a high level), B (ESG risk and opportunity management is at an average level)

[7] Rating scales used by Expert RA, rating outlooks and "under supervision" status. Expert RA agency website. URL: https://raexpert.ru/ratings/scales (accessed on 10.12.2023).

[8] NCR website. URL: https://ratings.ru/ratings/esg-ratings/ (accessed on 10.12.2023).

Table 2

Positions in ESG rankings and ratings of RAEX and Expert-RA agencies for 2022–2023 of Russian retail companies

Company name	ESG ranking of Russian companies RAEX		RAEX ESG rating		RAEX Ranking of ESG transparency of Russian companies and banks Expert RA	
	2023 (December)	2022 (December)	2023 (December)	2022 (December)	2023 (October)	2022 (November)
"X5 Group"	18 E Rank – 16, S Rank – 25 G Rank – 27	41 E Rank – 30, S Rank – 53, G Rank – 45	BBB	BB	1,80 E – 0.35, S – 0.45, G – 0.50, St – 0.50	1,70 E – 1.40, S – 1.40, G – 2.00, St – 2.0
"Magnit"	42 E Rank – 45, S Rank – 33, G Rank – 46	49 E Rank – 24, S Rank – 63, G Rank – 78	BB	BB	Not assigned as there is no reporting on sustainable development (SDR)	1.71 E – 1.84, S – 1.40, G – 2.00, St – 1.60
"Lenta"	68 E Rank – 90, S Rank – 86, G Rank – 43	90 E Rank – 94, S Rank – 99, G Rank – 74	CCC	B	0,35 (not included in the top 100, so the data is not fully disclosed)	Not assigned as there is no (SDR) / extended annual report
"Auchan" (Russian subsidiary Auchan Retail)	Not included in the rankings	Not included in the rankings	-	-	0,79 E – 0.29, S – 0.20, G – 0.20, St – 0.10	Not assigned as there is no (SDR) / extended annual report
"O'KEY"	74 E Rank – 149, S Rank – 52, G Rank – 102	79 E Rank – 79, S Rank – 86, G Rank – 53–54	C	B	Not assigned as there is no (SDR) / extended annual report	0.50 (E – 0, S – 0.60, G – 1.40, St – 0)
"VkusVill"	123 E Rank – 71, S Rank – 112, G Rank – 147	143 E Rank – 86, S Rank – 140, G Rank – 158	CC	CC	Not assigned as there is no (SDR) / extended annual report	Not assigned as there is no (SDR) / extended annual report
"Dixie Group"	133 E Rank – 143, S Rank – 150, G Rank – 114	123 E Rank – 150, S Rank – 154, G Rank – 107	CC	CCC	Not assigned as there is no (SDR) / extended annual report	Not assigned as there is no (SDR) / extended annual report
"Azbuka Vkusa"	154 E Rank – 134, S Rank – 154 G Rank – 153	132 E Rank – 123, S Rank – 149 G Rank- 127	C	CC	Not assigned as there is no (SDR) / extended annual report	Not assigned as there is no (SDR) / extended annual report
Total number of companies in the ranking	160	160			100	100

Source: compiled by the author based on RAEX Rating Review: URL: https://raex-rr.com/ESG/ESG_companies/ESG_rating_companies/2022.12/; URL: https://raex-rr.com/ESG/ESG_companies/ESG_rating_companies/2023.12/. ESG transparency: reinventing it. URL: https://raexpert.ru/rankingtable/esg/2022/tab2; ESG transparency: the underlying value. URL: https://raexpert.ru/rankingtable/esg/2023/tab2/

and C (ESG risk and opportunity management is at a low level), each of which has 3 sublevels.

X5 Group is rated BBB (moderately high), Magnit — BB (respectively, medium level of risk management).

The rest of the companies presented in *Table 2* have levels of rating range C: Lenta is assigned with the CCC (low level), VkusVill and DIXY Group — CC (very low), and Azbuka Vkusa and O'KEY — C (the lowest). Level C means that the company is required to take additional measures to manage ESG risks.

X5 Group ranks 18th in the *RAEX monthly ESG ranking* for December 2023 [the value in the ranking for indicator group E ("Environment") is 16, for indicator group "S" ("Social Policy") is 25, and for indicator group "G" ("Governance Quality") is 27]. Magnit company ranked 42nd (ranking for indicator group "E" — 45, for indicator group "S" — 33, for indicator group "G" — 46). "Lenta" is ranked 68th in the ranking (ranking value for indicator group "E" — 90, for indicator group "S" — 86, for indicator group "G" — 43). "Lenta" (43rd) was ahead of "Magnit" (46th) in terms of management quality. In terms of dynamics, the majority of companies improved their ESG rankings of RAEX Agency over the year. Only DIXY Group and Azbuka Vkusa worsened their positions. According to *Table 2*, Lenta is ahead of Magnit in ESG ranking in "E" category.

In the *ESG ranking of publicly traded Russian non-financial companies* in the retail sector of the National Rating Agency, Magnit ranks 1st and Lenta — the 7th. In total, the NRA ranking includes 17 companies, X5 Group is not represented in it.[9]

The analysis of ESG ratings and rankings on the example of companies in the retail industry has allowed us to establish that in 2023 the top three companies are X5 Group (1st place) and Magnit (2nd place) and Lenta (3rd place). These are the largest grocery chains, which in 2022 held a quarter of the Russian retail market (24.9%), and including sales on marketplaces — more than the third (34.4%). The distribution of places in the top three in ESG ratings coincides with the market share of companies in the industry (*Table 3*).

X5 Group is the only company in the industry to have an *ESG rating from RA-Expert*, namely ESG-II(a) level, which is very high in terms of compliance with sustainability interests when making key decisions. In other words, X5 Group's leadership is confirmed by two rating agencies. This is not the case with the rest of the industry, where the ratings given by different agencies differ; and some retailers are not rated because they do not publish sustainability reports or do not include such a section in their annual reports (i.e., they do not publish an extended version of the annual report).

NON-FINANCIAL INDICATORS TO ENSURE TRANSPARENCY OF ESG TRANSFORMATION

The analysis carried out by the author of this study has shown that there is no open data from retailers required for ESG rankings. This situation has arisen for two reasons: firstly, the publication of sustainability reports is costly, and not all organisations are prepared to incur such expenses; secondly, the diversity of assessment criteria and differences in rating agencies' scales generate greenwashing risks. This conclusion coincides with the opinion of M.P. Afanasiev, N.N. Shash [13], as well as M.A. Vetrova [16].

The Bank of Russia is taking actions to improve methods for assessing the environmental and social impact of companies — for example, in 2023, recommendations were issued to improve the quality of ESG-rating methodologies.[10]

[9] NRA website. URL: https://www.ra-national.ru/renkingi/esg-rjenking-publichnyh-rossijskih-nefin-2/ (accessed on 10.12.2023).

[10] Information letter of the Bank of Russia on recommendations for developing methodology and assigning ESG ratings (sustainability ratings) dated 30.06.2023 No. IN-02–05/46. URL:

Table 3

Comparison of the three largest food retail companies by market share and financial performance based on 2022 data

Name of the chain store	Revenue for 2022, RUB bln.	Number of shops, units.	Volume of retail space, square metres	Regions of presence	Market share,%
"X5 Group" (FIVE RX)	2596,09	21760	9203	67	13,2
"Magnit"	2281,99	27909	9623	67	9,5
"Lenta"	530,20	827	1789	58	2,2
Total					24,9

Source: compiled by the author based on Review of the food retail market in Russia in 2023. URL: https://generalinvest.ru/analytics/obzor-rinka-produktovogo-riteila-v-rossii-2023.html

Voluntary publication of non-financial indicators by companies in their annual reports may be a solution to the issue of ensuring transparency of ESG transformation. In line with the Concept for the Development of Public Non-Financial Reporting in Russia 2017[11] in November 2023, the Ministry of Economic Development approved methodological recommendations (containing 44 basic indicators, including 12 economic; 11 environmental; 11 social and 10 management indicators[12]), which apply to state-owned companies, large business entities with revenues of 10 billion roubles or more, as well as companies whose shares are traded on the stock exchange. It is recommended to disclose information in the dynamics for a retrospective period of at least three years from the beginning of reporting. In March 2023, the President of Russia V. Putin at the congress of the Russian Union of Industrialists and Entrepreneurs (RSPP) proposed to make non-financial reporting mandatory for large companies.

In addition to the above-mentioned basic ones, it is proposed to additionally disclose industry-specific indicators by ESG transformation areas. An analysis of the sustainability reports of X5 Group, Magnit, Lenta, Auchan, the annual report of O'KEY Group, as well as leading international retailers has allowed us to identify 12 additional industry indicators (*Table 4*).

The indicators are grouped according to the ESG transformation areas of retail companies, which were summarised in *Table 1* above, and their disclosure is appropriate in an extended version of the annual report or in a sustainability report. In addition, these indicators act as a convenient tool for assessing organisations' contribution to the UN SDGs. For those com-

https://www.cbr.ru/Crosscut/LawActs/File/6225 (accessed on 20.11.2023).

[11] Order of the Government of the Russian Federation No. 876-o dated 05.05.2017. URL: https://normativ.kontur.ru/document?moduleId=1&documentId=293392

[12] Order of the Ministry of Economic Development of Russia No. 764 dated 01.11.2023 "On Approval of Methodological Recommendations for the Preparation of Sustainable Development Reporting" URL: https://www.economy.gov.ru/material/file/70c9039795779d4b5b55c3fb8066afd3/764_2023–11–01.pdf (accessed on 20.11.2023).

Table 4

Basic and additional sustainability reporting indicators for food retail companies

Directions of ESG transformation	Basic (environmental) indicators recommended by the Ministry of Economic Development	Additional indicators for the retail industry
Reduction of material intensity	Volume of water used from all sources, thousand cubic metres	Water consumption per 1 square meter of sales retail space
	Volume of recycled and re-sequential water supply, thousand cubic metres, in%	
	Volume of polluted wastewater discharge (total, including untreated), thousand cubic metres	
	Water use efficiency ("specific water consumption"), thousand cubic metres / thousand RUR.	
Reduction of energy intensity	Renewable and low-carbon energy consumption, kWh, in%	
	Energy efficiency: energy consumption per unit of net value added, kWh/ thousand RUB.	Specific consumption of electricity and heat energy per 1 square metre of retail space.
The circular economy and waste reduction	Hazard Class I–V wastes generated, thousand tonnes (for each class)	Share of waste reduction, including food waste. Absolute values of collection and recycling of clothing, footwear, plastic, and aluminium collected by customers
	Hazard classes I–V waste management, including by category, thousand tonnes	Share of recycled packaging from secondary raw materials in the total volume of packaging
Decarbonisation	Mass of pollutant emissions into the atmospheric air from stationary sources, thousand tonnes	Reduction or prevention of emissions by retail chain shops
	Greenhouse gas emissions, thousand tonnes (in CO2 equivalent)	Specific greenhouse gas emissions per 1 square metre of retail space
Environmental characteristics of the products	Not provided for by the methodology of the Ministry of Economic Development	Share of ecolabelled products. Share of ecolabelled products compliant with GOST (State Standard). Share of healthy lifestyle in own trade marks (OTM)
Sustainable supply chains	Not provided for by the methodology of the Ministry of Economic Development	Share of products represented by Russian responsible suppliers (ESG-assessed)
Biodiversity conservation, combating climate change	Expenditures on the implementation of measures related to environmental protection, total in RUB thousand, including: - atmospheric air protection and climate change prevention; - wastewater collection and treatment; - waste management; - preservation of biodiversity and protection of natural areas	

Source: compiled by the author.

panies that do not yet prepare sustainability reports, the inclusion of basic and additional sectoral indicators in the expanded version of the annual report will ensure ESG transparency as well as comparability of achievements compared to other companies.

CONCLUSIONS

For retail companies, the drivers of ESG transformation are international trends, as well as the growth of the healthy food market. Only 8 Russian retailers publish non-financial reports so far, and this is despite numerous studies showing that customers and investors pay special attention to the ESG profile of the organisation.

For a segment such as retail, 6 ESG-transformation priorities that are most relevant to its companies can be identified, which contribute to real actions to achieve the Sustainable Development Goals. These are energy and material intensity reduction; waste reduction; environmental performance of products; sustainable supply chains; decarbonisation; biodiversity conservation and combating climate change.

Most retailers have RAEX and RA-Expert rankings, but not all of them have decided on the necessity of ESG-ratings. For Russian retailers in general, the problem of comparability of ESG-indicators is relevant. It can be solved by voluntary publication of both the basic sustainability indicators recommended by the Ministry of Economic Development and additional industry indicators.

In the absence of a national standard for non-financial reporting, the publication of the proposed indicators will make it easier to obtain "green" loans and bond issues under ESG criteria, and will contribute to increased transparency of organisations for stakeholders. Analysing the companies' operational performance according to the proposed indicators will enable top management to promptly assess both the results of actions taken in the field of sustainable development and their contribution to the Sustainable Development Goals. All of the above measures are designed to help improve the reputation and competitiveness of companies.

The following can be emphasised as areas for further research in the field of ESG business transformation:

Determination of additional indicators of sustainability reporting for companies from different segments of the economy.

Identification of ESG-transformation risks and search for tools to solve the problem of greenwashing for companies from different industries.

Assessment of the existing practice of private and state certification of green products in retailers in order to counteract greenwashing.

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Measuring the Company's Capabilities and Assessing their Impact on its Economic Results: Analytic Tools

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ABSTRACT

With the increasing uncertainty of the external environment, the capabilities of companies become the driving force behind their operations and development, making the management of these capabilities an important task for management. **The aim of the research** is to develop a toolkit for measuring a company's capabilities, assessing their condition, and evaluating their impact on productivity. The author's concept is presented, according to which the final results of the company's activity are formed through the mechanism of interaction of the company's organizational capability with acquired resources, the formation of resource capabilities (production, financial, labor, and market) and their transformation into tangible and intangible products. Based on this model, methodological guidelines have been developed for measuring the capabilities of organizations and assessing their impact on the final results, a value-functional approach to selecting appropriate indicators, and analytical tools. The following **methods** have been substantiated: modeling, the indicator method, data convolution, scaling, and statistical methods. To measure capabilities, it is proposed to use indicators aggregated into composite indices through a developed algorithm. The use of sales growth rate, market capitalization, profit before taxes, and net cash flow as the final results of the company (productivity indicators) has been justified. To solve analytical tasks at different levels of management, combinations of methods, tools and indicators called "research formats" (detailed, diagnostic, express diagnostic analysis) were developed. The results of the empirical testing of the author's research are presented: through detailed analysis, the validity of the proposed approach and tools has been established, and through diagnostic analysis, the stability of the selected indicators and constructed mathematical models beyond the observation period was identified. **The result** is a toolkit for researching crucial company's capabilities, enabling management to analyze and monitor these capabilities, assess their productivity, make forecasts of productivity indicators, and develop a system for managing the organization's capabilities.

Keywords: organizational capability; resource capabilities; key values; value functional approach; indicators; productivity; research format; detailed analysis; diagnostic analysis; express diagnostic analysis

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INTRODUCTION

The active spread of fundamentally new production technologies, natural disasters and global competition, as well as the blurring of boundaries between industries, the shortening of the life cycle of organizations [1–3], universal informatization and its consequences form a list of the main factors causing uncertainty and high volatility of the external environment. Some companies respond to these challenges by updating products, models of profit creation, forms of business organization [4, 5]; others copy successful experience, improve product quality, strengthen external relations. In any case, the driving force of successful functioning and development of firms becomes their capabilities, the management of which turns into one of the important tasks of management.

In this regard, there is a growing stream of scientific publications devoted to the study of the properties, micro foundations of organizational capabilities, conditions of their formation, as well as the creation of methods for identifying capabilities, etc. [6–9]. Empirical studies conducted on large samples of subjects from different industries have proved the influence of abilities on the results of companies' activities [10–12]; at the same time, the primary focus in the literature is on dynamic capabilities, although the current results are directly determined by the operational ones.

It should be noted that the study of organizational capabilities was carried out long before the concept of dynamic capabilities and the resource approach were created. In the Soviet and Russian economic science, the concepts of 'capability' and 'potential' were equated, and the identification of potentials: production, financial, labour, scientific and technical, etc., was carried out by types of companies' activities [13, 14]. At present, the study of capabilities and potentials is carried out in parallel. This may be due to the outdated but still prevalent interpretation of potential as a set of resources. However, modern organizations often build successful businesses based on resources that are not owned by them. This means that the set of resources no longer characterises the potential (from Latin potentia — strength, power) of a company. The power and strength of companies, as modern scientists believe, lie in their capabilities [13–15].

Russian researchers have developed scientific and practical frameworks for studying potentials as the capabilities of companies, so it is reasonable to integrate and develop the achievements of Russian and global science in this area to create a modern theoretical and methodological foundation for managing organizational capabilities.

Therefore, the aim of the article is to develop a toolkit for measuring and assessing the state of company's capabilities and their impact on productivity, based on the author's idea of the mechanism of formation and application of capabilities.

THEORETICAL PROVISIONS

The theoretical framework proposed by the authors regarding company's capabilities and the mechanism of their impact on outcomes can be summarised as follows. Any firm is initially endowed with organizational capability, which is expressed in the combination of relevant material, property, financial, human and external information resources for functioning aimed at the strategic priorities or key values of the company: market, economic and organizational (external and internal). The first two mean, respectively, orientation towards external environment conditions and profit. Organizational values are priorities in the management of attracted resources and building external relations, which should support the maintenance of market and economic values.

The organizational capability of a company represents a combination of interacting complementary organizational resources grouped as follows: structural and process resources (organizational and management structure, principles, methods, and management technologies); intellectual property assets; corporate culture; information technology; external relations [16].

The purpose of organizational capability is to engage the acquired resources into the business operations, therefore, the process of its interaction with resources can be called 'the process of functioning of organizational capability'. The interaction leads to the structuring of resources and the formation of resource capabilities (i.e., resource application capabilities), which include financial, production, labour, market, formed by the structuring of financial, material, human and external information resources, respectively. The subsequent interaction of resource abilities and structured resources forms material and intangible products.

The authors' proposed model of capability formation and its impact on the company's final outcomes responds to its properties, including intangibility, organizational nature, duration of maturation, specificity, ability to reproduce, intermediate position between resources and the company's final results. [10, 17].

METHODOLOGICAL PROVISIONS

Based on the above-mentioned theoretical provisions, an original toolkit [18] has been developed, presented in *Table 1*.

The questionnaire used is based on the recommendations of T.G. Dolgopiatova [19] and is aimed at identifying organizational values of the company and actual functions of organizational capability by groups of organizational resources.

The company's capabilities are proposed to be measured by composite indices, for the calculation and evaluation of which the following algorithm has been developed:

1) identification of the company's key organizational values;
2) identification of the main and auxiliary functions of organizational resources relevant to the key organizational values;
3) determination of ways and means of fulfilment of the allocated functions;
4) identification of performance criteria for the fulfilment of functions;
5) formulating requirements for indicators;
6) compilation of a general list of measures for organizational and resource capabilities of the company;
7) selection of indicators that have a statistically significant relationship with the main productivity indicator, taking into account the lag;
8) normalisation of the selected capability indicators;
9) selection of indicators by developing regression models of the main productivity indicator from normalised capability indicators and excluding multicollinearity;
10) calculation of summary indices of organizational and resource capabilities of the company by additive or multiplicative convolution methods;
11) assessment of the level of capabilities according to the Harrington scale.

For the composite index of organizational capability, relative indicators reflecting the means of performing allocated functions are used, and for the composite indices of resource capability, those expressing the company's ability to apply the relevant resources to support organizational values are used.

Normalised indices are calculated as the ratio of actual values to baseline values (i.e., the best values for the period of observation), which aligns with the concept of capabilities.

The use of indicators for determining summary ability indices is conditioned by their specific advantages: they allow to take into account the links between all selected indicators, reduce their number, and ensure the manufacturability of measurements. The requirements to the indicators are formulated, including statistically significant relationship with the main productivity indicator.

Productivity should characterise the final useful result generated by capabilities. To assess it, different sets of indicators are considered in the literature [10, 12]. The authors of this article propose to express productivity by market and economic outcome indicators, which reflect the

Table 1

The toolkit for researching a company's capabilities and assessing their impact on final outcomes

Proposed aspects of the research	Proposed research methods	Developed tools and suggested indicators
Key organizational values	Interview with the head of the company (or deputy on key issues)	Tools: analytical questionnaire
Organizational capability (state, level, variability, dynamics)	Modelling of organizational capability functions, value-functional selection of indicators, normalisation of indicators, indicator method, indicator convolution, scaling, statistical methods (regression, correlation, lag analysis, variability measurement)	Tools: organizational capability function tree, algorithm of formation, measurement, and evaluation of the composite index of organizational capability. Indicators: measures and indicators of organizational capability, composite index of organizational capability, coefficient of variation
Resource capabilities (state, level, variability, dynamics)	Value-functional selection of indicators, normalisation of indicators, indicator method, indicator collation, scaling, statistical methods (regression, correlation, lag analysis, variability measurement)	Tools: an algorithm for education, measurement, and evaluation of composite indicators of resource capabilities. Indicators: parameters and indicators of resource capabilities, summary indices of resource capabilities, coefficients of variation
Productivity (state, dynamics, variability), impact on productivity of organizational and resource capabilities	Statistical methods (regression, correlation, lag analysis, variability estimation), control chart method	Indicators: sales growth ratio, market capitalisation, profit before tax, net cash flow, correlation, determination, and variation coefficients

Source: developed by the authors.

maintenance of relevant core values. The market result should characterise the reaction of customers and investors to the company's actions in the market — for this purpose, the sales growth ratio (SGR) and market capitalisation (MC) are proposed, respectively. The economic result serves to characterise the company's ability to transform the demand for products into corresponding final indicators, such as profit before tax and net cash flow. The sales growth ratio is proposed as the main productivity indicator because it is commonly used to assess the company's prospects [20, 21] and to develop financial plans [22]. At the same time, sales growth should be balanced in order to maintain profitability and financial policy of the organization without depleting its financial resources [21, 23].

The level of stability of composite capability indices and productivity indicators can be measured using the coefficient of variation and assessed on an annual stability scale [22]: the level is considered high if the coefficient of variation is 10% or less; the level is considered medium if the value of this coefficient is between 10 and 25%; and the level is considered low if its value is above 25%.

Taking into account the impact of capabilities on the company's final outcomes and the

Table 2

Research formats for assessing the state and productivity of a company's capabilities

Research characteristics	Detailed analysis	Diagnostic analysis	Express diagnostic analysis
Task level	Strategic	Tactical	Operational
Purpose	In-depth research with construction of regression models	A brief study involving the persistence control of regression models	Productivity monitoring, deviation control
Aspects of the study	All aspects (Table 1)	Condition, dynamics, capability variation; productivity; control of basic regression models	Productivity (state, dynamics, variability)
Indicators used	Capability indicators and measures; composite ability indices; productivity indicators; statistical indicators (correlation coefficients, determination coefficients, variation coefficients)	Summary ability indices; productivity indices; statistical indices (correlation coefficients, determination coefficients, variation coefficients)	Productivity indicators, coefficients of variation of productivity indicators

Source: developed by the authors.

dynamism of the business environment, it can be concluded that the status and productivity of abilities should be determined within the framework of strategic, tactical and operational management. Taking into account the difference between the tasks of different management levels in terms of the required depth of analysis and the urgency of obtaining measurement results, it is proposed to apply different combinations of analytical methods, tools and indicators, which are called 'research formats' by the authors of the article (*Table 2*).

Let us highlight the features of diagnostic and express-diagnostic analyses. The first one allows us to identify changes in the state of capabilities, their productivity and make timely decisions to adjust their management [16]. Express-diagnostic analysis is proposed for continuous monitoring of productivity in order to control its deviations from the set level. The frequency of studies of different formats should depend on the dynamics of external and internal processes.

APPROBATION OF THE AUTHOR'S TOOLKIT

The author's toolkit was tested in several companies. The article presents the results obtained in PJSC Chelyabinsk Zinc Plant (PJSC CZP, now JSC CZP) — a large organization that produces zinc and zinc-based alloys.[1]

In the course of the work, it was required to obtain mathematically justified answers to the main research questions:

1. Does organizational capability affect the resource capabilities of the firm?

2. Do organizational capability and resource capability affect the productivity performance of a company?

[1] Chelyabinsk Zinc Plant (official site). URL: http://www.zinc.ru (accessed on 05.03.2020).

3. Do organizational capability indicators retain relevance beyond the observation period?

4. Is it possible to use the regression models constructed for the purpose of predicting the company's productivity indicators?

The first stage (2011–2015) was planned to answer the first two questions. Given the limited format of the article, only the main results are presented below. All indicators are given in quarterly breakdown.

First of all, the company's key organizational values were identified by interviewing one of its leading managers: external — product unification; internal — cost efficiency. Next, its organizational capability indicators were selected according to the proposed algorithm (*Table 3*).

Table 3

Selection of organizational capability indicators (fragment)

Objects of intellectual property	Structural and process resources	Information technologies
Primary function		
Establishing the scientific and technical basis for product development	Ensuring internal order to maintain key organizational values	Maintaining an information environment to preserve core organizational values
Auxiliary functions		
1. Ensuring the productivity of fixed assets in the production of mastered products. 2. Ensuring cost efficiency for the production of new products. 3. Improvement of production technologies of mastered products	1. Formalisation of basic business processes. 2. Organization of production of unified products. 3. Control of activities. 4. Formalisation of employees' behaviour by administrative methods. 5. Formalisation of workers' behaviour by economic methods. 6. Creation of incentive conditions for key employees	1. Providing the company with professional reference information. 2. Ensuring the quality of management decisions. 3. Ensuring the productivity of management processes. 4. Ensuring productivity of manufacturing processes
Means of performing functions		
Own technological division; orientation of developments towards efficient use of material and property resources	Providing production with high-performance equipment; organizing and stimulating high-performance work	Application of automated production and management systems
Relevant proposed indicators		
Share of intangible assets in the total value of assets	Management workload	Engineering centre maintenance burden
Research burden	Capital-labour ratio	Share of IT development costs in the total amount of investments
Share of expenditures on development and improvement of production technologies in the total amount of investments	Average monthly salary related to the minimum subsistence level	
	Ratio of average monthly wages — in the company and in the region	Techno-information capacity of specialists and managers

Source: developed by the authors.

Table 4

Indicators of capabilities of CZP, PJSC

Organizational capability	Production capability	Labor capability	Financial capability	Market capability
Engineering centre maintenance burden (lag 5)	Share of material and energy costs in the cost structure (lag 1)	Labour productivity (lag 0)	Turnover of current assets (lag 0)	Co-operation ratio (lag 5)
Average monthly salary related to the minimum subsistence level (lag 6)	–	Wage output (lag 0)	Turnover of current assets (lag 2)	Increase in trade receivables (lag 1)
–	–	Wage output (lag 1)	–	–

Source: developed by the authors.

Table 5

Regression models of composite resource capability indices based on the composite organizational capability index

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Production Capability (PC)				
$PC_i = -0.27OC_{(i-1)} + 1.12^a$	0.89	0.65	16.37	0.0029
Labour Capability (LC)				
$LC_i = 1.12OC_i - 0.03^b$	0.95	0.89	83.72	3.57×10^{-6}
Financial Capability (FC)				
$FC_i = 0.91OC_i + 0.15^c$	0.85	0.73	26.73	0.0004
Market Capability (MC)				
$MC_i = 0.98OC_i + 0.10^d$	0.73	0.53	11.36	0.0071

Source: developed by the authors.

Note: a — PC — production capability; OC — organizational capability; *b* — LC —labor capability; *c* — FC — financial capability; *d* — MC – – market capability.

Table 6

Regression models of productivity indicators based on composite capability indices

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Impact on Organizational Capability (OC) productivity				
$SGR_i = 1.50OC_i + 0.17$[a]	0.76	0.58	13.74	0,0041
$MCap_i = 53\,227.10OC_{(i-1)} - 21510.10$[b]	0.78	0.61	13.94	0,0047
$PBT_i = 3859.73OC_i - 1883.86$[c]	0.78	0.61	15.41	0.0028
$NCF_i = 3134.99OC_i - 1411.12$[d]	0.77	0.60	14.79	0.0032
Impact on Production Capability (PC) productivity				
$SGR_i = 3.42PC_i - 2.28$[e]	0.53	0.28	5.93	0.0279
$MCap_i = 237\,827.30PC_i - 224\,015.00$	0.56	0.31	6.33	0.0247
PBT has the best connection with PC at lag 1	0.42	The linear model is statistically insignificant		
$NCF_i = 28\,181.70PC_{(i-1)} - 22915.90$	0.54	0.29	5.78	0.0306
Impact on Labour Capability (LC) productivity				
$SGR_i = 1.42LC_i + 0.23$[f]	0.79	0.63	25.08	0.0002
$MCap_i = 37\,476.12LC_i + 51\,841.56\ LC_{(i-1)} - 42\,553.90$	0.96	0.93	80.89	4.61×10^{-5}
$PBT_i = 3888.91LC_i - 1845.08$	0.86	0.73	40.86	1.21×10^{-5}
$NCF_i = 5638.15LC_i + 1375.57$	0.68	0.46	12.61	0.0029
Impact on Financial Capability (FC) productivity				
$SGR_i = 1.50FC_i + 0.09$g	0.76	0.58	19.51	0.0006
$MCap_i = 54\,204.30FC_{(i-1)} + 24\,256.90FC_i - 40\,734.30$	0.94	0.88	40.86	8.1×10^{-6}
$PBT_i = 3978.83\ FC_{(i-2)} + 3868.93\ FC_i - 4535.37$	0.88	0.77	16.54	0.0007
$NCF_i = 5433.80\ FC_i + 7433.54\ FC_{(i-2)} - 3225.53$	0.85	0.73	14.66	0.0008

Table 6 (continued)

Regression model	Multiple correlation coefficient	Coefficient of determination	F-test	Significance of F
Impact on Market Capability (MC) productivity				
$SGR_i = 1.28MC_i + 0.26h$	0.81	0.65	20.77	0.0008
MCap has the best connection with MC at lag 1	0.53	The linear model is statistically insignificant		
$PBT_i = 2438.16MC_i - 1141.92$	0.60	0.36	6.31	0.0289
NCF has the best connection with MC at lag 6	0.64	The linear model is statistically insignificant		

Source: developed by the authors.

Note: a — SGR — sales growth rate; OC — organizational capability; *b* — MCap — market capitalization; *c* — PBT — profit before taxes; *d* — NCF — net cash flow; *e* — PC — production capability; *f* — LC — labor capability; *g* — FC — financial capability; *h* — MC — market capability.

Research load is calculated as the ratio of expenses on research and development to the average number of employees; management load is calculated as the ratio of total management expenses to the average number of employees; engineering centre maintenance load is calculated as the ratio of the engineering center's budget to the average number of employees. Other indicators are determined using standard methods.

Further, by means of the proposed algorithm the capability indicators of PJSC CZP are identified (*Table 4*).

All the above calculations were performed using the SPSS software by means of stepwise selection method. The *F*-test (Fisher's criterion) was used to test the adequacy of regression models, and the *t*-test was used to assess the significance of the explanatory variable. Composite indices were obtained by the method of multiplicative convolution of indicators.

Composite capability indices were calculated and regression models of resource capabilities from organizational capability were built. (*Table 5*).

High statistical significance of the models provides a positive answer to the first question (see above).

The regression models of productivity indicators from the composite indices of organizational and resource capabilities also showed high statistical significance (*Table 6*). Therefore, the answer to the second question is also positive.

Thus, the obtained results confirm the validity of the toolkit proposed for the study of the company's capabilities.

To address the third and fourth questions, the second stage of the research was conducted, which showed that, in the subsequent period (2015–2018) the set of organizational capability indicators remained the same. This indicates a positive answer to question 3.

The stability of the sales growth rate (SGR) model based on the composite index of organizational capability (OC) was determined by comparing actual and calculated values of the sales growth rate (*Table 7*).

The calculations show that 95% of the deviations of the actual values from the estimated val-

Table 7

Validation of the regression model of the sales growth coefficient based on the composite organizational capability index

Year	Quarter	OC / Organizational capability	Actual sales growth coefficient	Calculated Sales Growth Coefficient	Deviation
2015	3	0.6348	1.1954	1.1213	0.0741
	4	0.6056	0.8085	1.0776	–0.2691
2016	1	0.6605	1.1624	1.1597	0.0027
	2	0.5211	1.0823	0.9513	0.1310
	3	0.6031	1.2284	1.0739	0.1545
	4	0.6794	1.0475	1.1880	–0.1405
2017	1	0.5407	0.9605	0.9806	–0.0201
	2	0.6173	1.1243	1.0951	0.0292
	3	0.6868	1.0482	1.1990	–0.1508
	4	0.6290	1.0580	1.1126	–0.0546
2018	1	0.6295	1.0394	1.1134	–0.0740
	2	0.5244	1.0718	0.9562	0.1156
	3	0.6563	0.8302	1.1534	–0.3232
	4	0.6391	1.1638	1.1277	0.0361

Source: developed by the authors.

ues correspond to the statistically defined interval (±2S)[2]; there are no patterns in the deviations, hence, the regression model provides a meaningful estimate of the sales growth rate until the end of 2018, which is a positive answer to question 4.

[2] 2S = 0,2988.

CONCLUSIONS

The authors of this study have developed methodological provisions and toolkit for measuring and assessing organizational and resource capabilities of a company. Approbation of the toolkit allows us to state the following:

1. The state of organizational capability, measured by the composite index, determines the company's resource capabilities (production, labour, financial, market).

2. Organizational and resource capabilities of a company have a significant impact on productivity indicators.

3. Organizational capability indicators can remain relevant for several quarters after the end of the observation period.

4. The mathematical model of the dependence of the sales growth ratio on the composite index of organizational capability can be used for preliminary estimation (forecasting) of sales growth within the limits of regression analysis capabilities. In this case, the required ratio of the periods of prospection and retrospection should be observed.

Thus, the validity of the proposed toolkit for measuring and assessing the company's capabilities and their impact on the organization's productivity can be considered proven. The toolkit (as demonstrated by a specific example) allows to:

- measure and assess the company's capabilities, and monitor them;
- evaluate their impact on the firm's final indicators (productivity indicators);
- conduct preliminary assessment of productivity indicators on the basis of composite capability indices;
- orient management towards maintaining long-term values;
- develop a set of measures to maintain the company's capabilities at an acceptable level and create a capability management system focused on key values.

In the course of further research, it is planned to create a model for integrating the proposed analytical toolkit into the balanced scorecard (BSC) of R. S. Kaplan and D. P. Norton. This will make it possible to supplement the description of companies adopted in the BSC by including capability indicators, thus increasing the flexibility of the BSC and adapting its toolkit to the conditions of increasing variability and uncertainty of the external environment.

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Features of Company Management in the Field of E-Commerce

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ABSTRACT

The relevance of the research topic is due to the increasing spread of e-commerce. For the effective development of a company in this area, a strategy with certain features is necessary, and the purpose of the study is to determine the author's concept of its development. The article reflects the most important stages of this process, defines the main competencies of developers. When forming the strategy, the following aspects were taken into account: a short period of time allowed for making managerial decisions; the need for highly qualified personnel developing a strategy, carrying out promotion and contacting the consumer, as well as the fact that innovations, the search for free markets serve as a source of development for e-commerce companies, which corresponds to the strategy of the "blue ocean". The study was carried out using methods such as analysis and synthesis, induction and deduction, a systematic approach the authors analyzed an array of scientific publications on the topic under study. The results of the work are of practical value for specialists involved in strategic planning in the field of e-commerce, as well as for the researchers and students interested in the issues discussed in the article.

Keywords: blockchain technologies; cryptocurrency; marketplace; smart contracts; development strategy; strategy typology; strategic management cycle; e-commerce

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INTRODUCTION

The development of electronic commerce (e-commerce) provides companies with certain advantages, as it creates opportunities for active business growth in those segments that were previously unavailable due to territorial limitations of sales opportunities. At the same time, the promotion of services through Internet technologies is associated with the need to build business processes of companies in a special way.

There are still quite a number of unsolved problems in this area, the relevance of which is undoubted due to market trends. Thus, in 2022 Russia demonstrated high growth rates of e-commerce (38% in value terms and 65% in physical terms) [1]. However, in 2021 the progress in this sphere was more noticeable: (52% in monetary terms and 104% in physical terms compared to the previous period).[1] The slowdown in growth may be due to the fact that online commerce has already outgrown the stage of active development, and at this stage more efforts are required from companies to increase competitiveness and retain the desired market share.

This article deals with e-commerce as a specific field of activity. Therefore, before talking about the modernised process of developing a development strategy for a company operating in the field of e-commerce, it is necessary to first focus on the specifics of the latter and its distinctive characteristics in comparison with traditional commercial activities.

When conducting the research such methods as analysis, synthesis, induction, deduction, and system approach were used. Scientific publications on the research topic were studied and the author's position was developed, explaining the specifics of strategy formation for companies operating in the field of e-commerce.

[1] According to estimates by Data Insight. URL: https://top100.datainsight.ru/#tabD 13439BA

TYPES OF E-COMMERCE

E-commerce is a special type of commercial activity involving the use of electronic services. From the point of view of a number of authors, the term 'e-commerce' is identical to the concept of 'electronic commerce' [2]. In our opinion, this statement is not quite legitimate, and the position of Doctor of Economics S.V. Pirogov, who understands e-commerce as a technology that allows to implement commercial processes with the active involvement of electronic resources, is more logical [3].

The e-commerce market covers traditional interaction sectors: B 2C (business-to-consumer); B 2B (business-to-business); C 2B (consumer-to-business); C 2C (consumer-to-consumer).

B 2G and G2B models (transactions between business structures and the state and vice versa); C 2G (interaction between consumers and the state); B 2M (transactions between business structures and professional managers); B 2E (transactions between companies and employees using electronic services) are less widespread (see the *Table*).

One of the main forms of interaction between market participants is an electronic trading platform. In this regard, the term 'marketplace' is actively used in the business environment, which is absent in Russian legislation, but is regarded as an e-commerce platform (an e-commerce site that unites sellers and buyers in one place). However, it should be noted that, according to the preamble of the Law of the Russian Federation dated 07.02.1992 No. 2300–1 'On Protection of Consumer Rights', the term 'marketplace' itself corresponds to the concept of 'owner of an aggregator of information about goods (services)', which means a right holder (a legal entity or an individual entrepreneur) or the owner of software for electronic computing machines (telephones), or the owner of a site (page) on the Internet, providing consumers with an opportunity to familiarise themselves with the offers of other persons (sellers) regarding a certain product

Table

Models used in the field of e-commerce

Name of the model	Characteristics	Examples
B2C (business to consumer)	A type of commerce that involves a company interacting directly with consumers (online shop)	Ozon, Yandex Market
B2B (business to business)	Transactions between business representatives (manufacturers with wholesalers or retailers)	Amazon, Alibaba, Rakuten
C2B (consumer to business):	Consumers, often freelancers, offer their services to legal entities	Twago, Nubelo or Adtriboo
C2C (consumer to consumer)	Consumer to consumer (individuals interacting with each other, online auctions)	eBay
B2G and G2B (business to government, government to business)	Transactions between business entities and the state and vice versa (entrepreneurs receive state services, pay taxes, fines, etc.; the state places orders).	"State Services for Business" portal; UIS (Unified Information System) Procurement
C2G (consumer to government)	Interaction between the consumer and the state (document flow, provision of state services, payment of taxes).	Public Services Portal "Gosuslugi"
B2M (business to manager)	Transactions between commercial structures and professional managers — intermediaries can act as professional managers.	
B2M (business to machine)	The technology by which entrepreneurs manage commercial equipment via the Internet	
B2E (business to employees)	Transactions between companies and employees using electronic services, corporate interaction	
D2C (direct-to-consumer)	Sales from the manufacturer directly to the consumer without the involvement of intermediaries; development of own electronic sales network	

Source: compiled by the authors.

(service).[2] Consequently, both concepts (both 'marketplace' and 'aggregator owner') serve to designate an electronic trading platform (platform), where information about the goods being sold (services being rendered) is placed, having received which it is possible to conclude a sales contract with a seller in electronic form and make payment. In other words, the marketplace acts as an intermediary between the seller and the buyer. Such subjects of the electronic market as representatives of the banking sector (banking ecosystems) are also involved in the platform economy. The most striking example is the practice of Sber, which provides its clients with various partnership offers, carsharing, entertainment media services, video, and audio streaming, and much more [4].

ADVANTAGES OF E-COMMERCE

When developing a company's development strategy in the field of e-commerce, it is justified to take into account the specifics of the business in order to create prerequisites for the adequate choice of the existing model of strategic development in each specific case or to determine the required transformations for it. The configuration of the e-business will also be of importance in determining the prospects of the latter's development.

[2] Law of the Russian Federation from 07.02.1992 № 2300–1 (ed. from 05.12.2022) 'On Protection of Consumer Rights'. URL: https://www.consultant.ru/document/cons_doc_LAW_305/?ysclid=lxsowb8p96968384428

The following features of e-commerce can be noted, which distinguish this sphere from conventional commerce and allow to take advantage of the digital economy:

- the speed of transactions in electronic networks is much higher — there is a significant saving of time and human resources;
- greater coverage of the target audience, leads[3];
- possibility of individual approach to consumers;
- increase in the probability of promotion, expansion and deepening of channels of influence on the audience;
- opportunities to use co-branding distance programmes;
- expansion of geography of presence.

These perspectives should be considered as part of strategic planning, while at the same time envisaging responses to certain threats that are specific to e-commerce.

RISKS AND LIMITS OF E-COMMERCE USE

The following are the main risks associated with e-commerce activities:

- large number of competitors, which makes it more difficult for a company to maintain certain positions and status (especially when using pricing instruments);
- increase in the amount of information available to consumers, which makes them more demanding in terms of the 'price-quality' ratio;
- increasing complexity of maintenance of electronic services, which requires the use of hardware devices of higher quality and, accordingly, more expensive;
- increasing complexity of services and increasing range of services when using electronic systems for business, which implies higher requirements to the professionalism of personnel in the field of electronic commerce and promotion;
- increasing risk of information leakage, which entails increased requirements to information security;
- electronic settlements, which increases the requirements to payment security systems.

E-COMMERCE COMPANY DEVELOPMENT STRATEGY

The development and implementation of strategy, especially in e-commerce, is a creative process, and the stages can move seamlessly from one to the other. For example, the owner has set a goal to enter new markets, but the political situation has changed and many of them have been closed; then, with the help of a strategic analysis of the external environment, the goals are revised. Strategy analysis, selection and implementation are linked processes, within which there is controlling, which allows to monitor its effectiveness and make adjustments if necessary.

When forming a development strategy, the type of e-commerce is taken into account, as well as the sphere of activity (universal assortment, sale of services, certain types of goods, etc.).

It should be noted that it is necessary to build an IT strategy and select the architecture of information solutions that support the main tasks. It is more efficient to develop this type of strategy after strategic objectives have been defined and corporate and competitive strategies have been selected.

The changes in consumer habits that have occurred with the transition to remote forms of commerce require increased attention to marketing when building a company's e-commerce development strategy. Nowadays, e-commerce promotion plays a crucial role in competing for markets along with reputation building, branding. Both positive and negative feedback about an organisation's actions in the online space spreads very quickly. Reputation can be lost literally in one day, while it can take months or even years

[3] Lead — a potential customer, someone who has performed a targeted action (subscribed to a newsletter, requested a commercial offer, indicated an email in the feedback form, made an appointment with a master).

to regain the trust of customers. Therefore, the main strategic objectives of a company in the field of e-commerce marketing strategy are to acquire brand recognition and ensure high customer loyalty; their fulfilment will allow to capture and retain the desired market share and ensure high competitiveness.

As it was mentioned above, e-commerce requires high professionalism of human resources, so the HR management strategy is of great importance, which should be linked to the overall strategy. E-business requires targeting the increment of intellectual capital and the formation of an intra-company knowledge pool, which will eventually ensure the growth of the company's capital. Modern HR management strategy interacts with innovation strategy. Increase of competences, level of professionalism of employees allows to stimulate the introduction of new developments, because in the course of development of their own skills the employees of the enterprise generate new ideas that can ensure its development.

Such ideas will then be realised within the framework of the production strategy and disseminated in the market through the marketing strategy, which in turn is defined in the context of the competitive strategy. All these processes and their promotion take place within the framework of the main guidelines set by the corporate strategy. As a result, all levels of each strategy are interconnected both horizontally and vertically. At different points in time, under the influence of external and internal environmental factors, certain types of strategies may be prioritised.

The main principle in the preparation and implementation of strategic decisions should be to take into account the effectiveness and focus of actions. E-commerce provides for the use of omni-local approach, which allows to work on several platforms of contact with the target consumer (both online and offline tools are involved), which, according to A. P. Ivashchenko, allows to increase the efficiency of impact on customers [5].

USE OF BLOCKCHAIN-BASED TOOLS IN E-COMMERCE

The term 'blockchain' is associated with the publication of a paper known as 'Bitcoin: A System of Digital Peer-to-Peer Visibility', the authorship of which has never been disclosed[4] [6]. The essence of blockchain technology is understood in the publication as a system of online transactions that exclude trust. The scheme of transactions does not provide for identification — they have a simple structure, each node of the chain (a transaction consisting of a large number of mini-transactions — nodes) is an independent participant and possesses only part of the information.

Blockchain provides for registration of the transaction in the chain of nodes,[5] confirmed by the participants of the transaction. A transaction is structured data whose contents include the subject of the agreement and the will of the user. When the latter confirms the transaction, it cannot be cancelled — it is recorded in its own block, which has a unique code. Such a record makes it possible to determine the moment of the transaction to the nearest second. Since encryption is used to reflect its data, the possibility of falsification is excluded.

Blockchain technology, directly linked to 'Internet money', generates a new form of settlement, essentially eliminating financial intermediaries [7]. In the legal literature, blockchain is considered as a decentralised distributed database implemented in cryptocurrency and making payments without intermediaries due to the irreversibility of transactions [8].

It should be noted that blockchain is one of the variants of distributed ledger network functioning,

[4] Satoshi Nakamoto's name was used in the article, but the true author or group of authors is unknown. According to RBC experts, it is very likely that the authors are of Russian origin. Blockchain: what it is, features of the technology. RBC Trends. URL: //https://trends.rbc.ru/trends/industry/5f05c0a79a7947aac5c7577a

[5] Node — a node in the blockchain whose main function is to verify and validate a transaction.

as there are examples when the latter do not use blocks (Ripple platform, which mainly performs interbank transactions).[6]

Cryptocurrency is issued through mining (adding new blocks to the chain), which involves the issuance of new coins. The first participant who does this becomes a miner and is rewarded.

Cryptocurrency can be purchased for fiat money and other cryptocurrencies on special platforms; transactions involving cryptocurrency require digital keys, which are used to create a wallet (public) and to carry out transactions (private).

The first bitcoin was issued in 2009, when 50 new monetary units were issued; in 2010, the first cryptocurrency exchange Bitcoin Market was launched, mining started to develop [9], and transactions to purchase real goods for bitcoins began to take place.[7] The rate of this digital currency at that time grew 10 times.

In the future, the history of bitcoin developed ambiguously. In May 2010, it was exchanged for real goods — two pizzas, which were received by a U.S. citizen L. Hanech for 10,000 bitcoins [10]. In early 2011, the value of bitcoin was almost equal to the dollar value, setting a world record of growth — 1,300 times.[8] Bitcoin's history is very mixed and dramatic, from ups in 2015, 2017 to a complete collapse in 2022.

One of the popular cryptocurrencies, Ether, is often used to generate smart contracts [11] and differs from bitcoin in the way that in it a unit is an account rather than a financial transaction. The Ethereum environment has three levels of users [12]:

- the first is the user interfaces; this is where smart contract developers, users and miners operate;
- the second level is the Ethereum environment with minimal user interfaces; this is where smart applications are deployed for all users;
- the third layer is the blockchain data store.

The Ethereum platform, developed by V. Butarin, M. Wood et al. — is an open platform for generating smart contracts, eliminating the existing limitations in writing unique codes, and using the possibility of executing short blockchain-based programmes.

In the Ethereum environment, there is a fee on miners' activities. As a result, it turns out that the use of blockchain is associated with costs that are distributed differently than in traditional financial intermediation. In addition to Ethereum, users actively use the platforms Aeternity, Hyperledger Fabric, Cardano [12].

It is worth agreeing with the available opinions regarding the advantage of smart contracts in connection with the constant generation of backups. According to Western researchers in the field of digital economy, blockchain will allow to:

- reduce costs on IT infrastructure of companies [13];
- ensure transparency of banking services [14];
- create a new culture of collaborative consumption [15].

The listed advantages testify to the revolutionary and 'breakthrough' nature of the new tool, and some authors call it a 'basic' tool [16].

Next, let us consider how broad the possibilities of modern technologies are and how 'costless' the process of using them is. A number of scholars are quite justifiably reserved about the revolutionary nature of blockchain, noting that this technology is not associated with a scientific breakthrough [16], and the investments already made in its development do not correspond to the scale of their practical application. We believe it is possible to share this balanced position regarding the large-scale prospects for the restructuring of the financial system due to the application of blockchain. The blockchain allows to increase

[6] Overview of cryptocurrencies, ICOs (initial coin offering) and approaches to their regulation. Bank of Russia. URL: https://www.cbr.ru/Content/Document/File/36009/rev_ICO.pdf

[7] Bitcoin History. Bitcoin Wiki. URL: https://bitcoinwiki.org/wiki/bitcoin-history

[8] Bitcoin History. Bitcoin Wiki. URL: https://bitcoinwiki.org/wiki/bitcoin-history

the efficiency of financial transactions due to increased reliability, permanence, and immutability of the latter [17]. *Figure 1* summarises the uses of blockchain technology.

Their use for the issuance of cryptocurrencies has already been discussed above; with the help of such mechanisms, investment of startups, microfinance, crowdfunding are facilitated [18]. The authentication of identity, rights to various assets is used in cadastral registration, generation of a dated digital signature [19].

Another modern technology that can change the structure of the financial market with the help of blockchain is 'smart contracts', or 'smart' or 'intelligent' contracts. Its author Nick Szabo in 1994 put forward the idea of conducting transactions by digitally representing a set of obligations between the parties, including a protocol of their fulfilment [20].

A common example of such technology implementation at the present stage is autopayments (for example, for housing and utilities). Financial intermediaries in this variant of transactions are excluded, they are replaced by software codes, which have the characteristic of immutability [21]. Distinctive features of a smart contract are self-execution and self-sufficiency [22], which essentially excludes traditional intermediation.

There is also a narrower understanding of this type of contract, as set out in the analytical review prepared in 2018 by the Central Bank of the Russian Federation, which gives as an example the implementation of a vending service — the purchase of coffee in a vending machine.[9] This study applies an extended understanding of smart contract to include the use of blockchain technology.

The terms and objects of a smart contract as its integral components are shown in *Fig. 2*.

Another important characteristic of a smart contract is the use of a programming language for its execution. The execution of the contract takes place through cyber means, but at the same time it mediates the relationship between people, so we can say that smart contracts are a type of cyber-social technology. The programme acts as a financial intermediary.

In most cases, such contracts are developed using the Solidity language — with its help, the code is transformed into Ethereum byte-code, and subsequently transformed into a transaction, which is assigned an address [23]. The simpler Vyper language is also used [24].

[9] . Analytical review on the topic 'Smart Contracts'. Bank of Russia. 10.2018. URL: https://cbr.ru/Content/Document/File/47862/SmartKontrakt_18–10.pdf

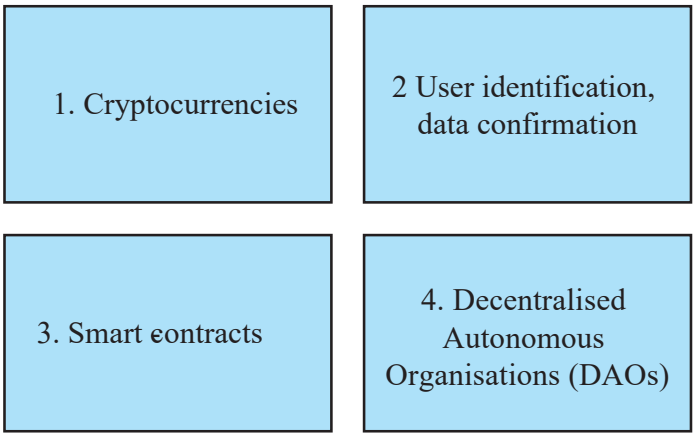

Fig. 1. **Directions of using blockchain technologies**

Source: compiled by the authors based on [17, 31, 33].

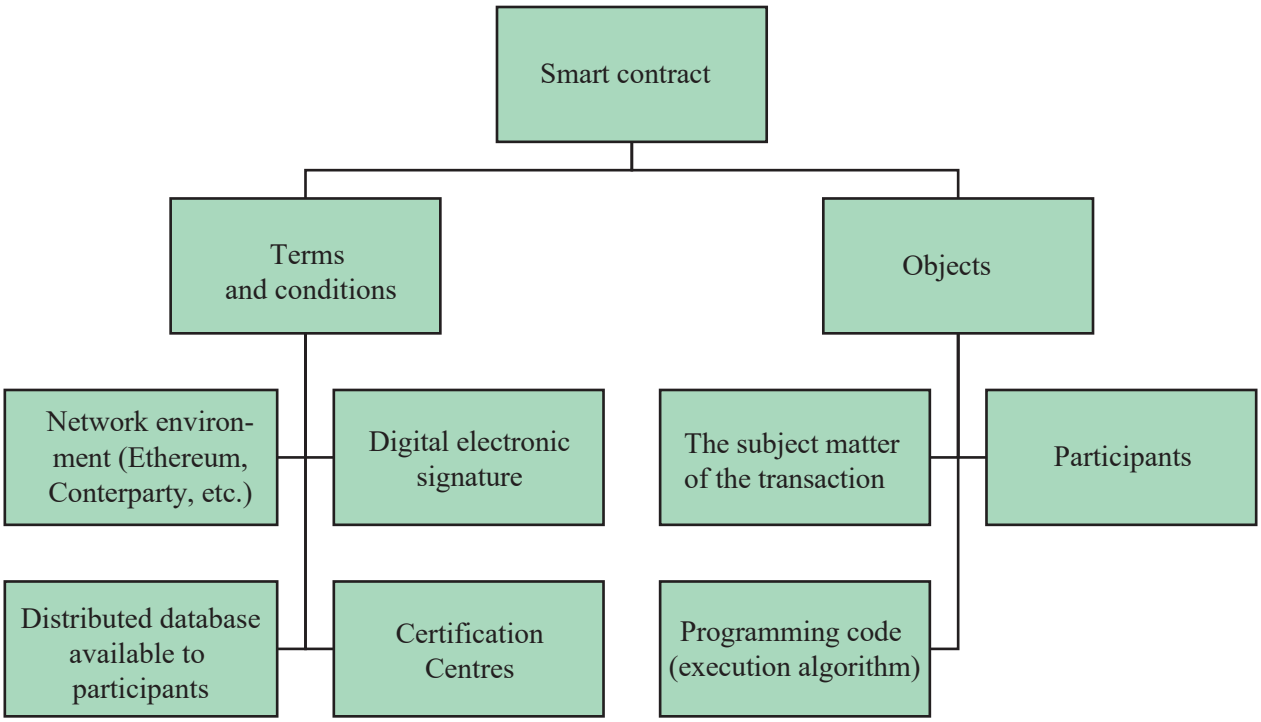

Fig. 2. **Components of a smart contract**

Source: compiled by the authors based on [12, 22, 24].

The authors of the study consider the most understandable and financially related definition of a smart contract as an algorithm that operates on the basis of blockchain technologies and ensures compliance with the terms of the agreement.

The directions for the use of smart contracts as elements of financial intermediation can be presented as follows:

- insurance area (insurance accounting and document flow, insurance claims processing, insurance compensation payments in typical cases, for example, to customers automatically when flights are delayed according to the experience of AXA [25]);
- banking sphere (automation of settlement processes, small business lending);
- settlements via a system similar to SWIFT [26];
- settlement and clearing schemes [28];
- operations with digital assets (cryptocurrencies, tokens);
- financial services (exchange trading, auctions, etc.).

In some cases, for example, when concluding mortgage transactions, the application of smart contracts will not require the inclusion of a commercial bank as a counterparty to the agreement [29].

The wide possibilities of such contracts and the prospects for their use in insurance (medical, accident, natural disaster, car and cargo insurance) are actively discussed in the scientific literature [30], since insurance involves the execution of a large number of documents. By automating this work, transaction costs can be drastically reduced.

Automatic verification through smart contracts allows to save significantly on costs (including those related to network creation) [31].

An important advantage of such contracts is the invariability of records that constitute the contractual terms [32]; the initial public offering of digital tokens (ICO), which is a special way of attracting investment resources, is also

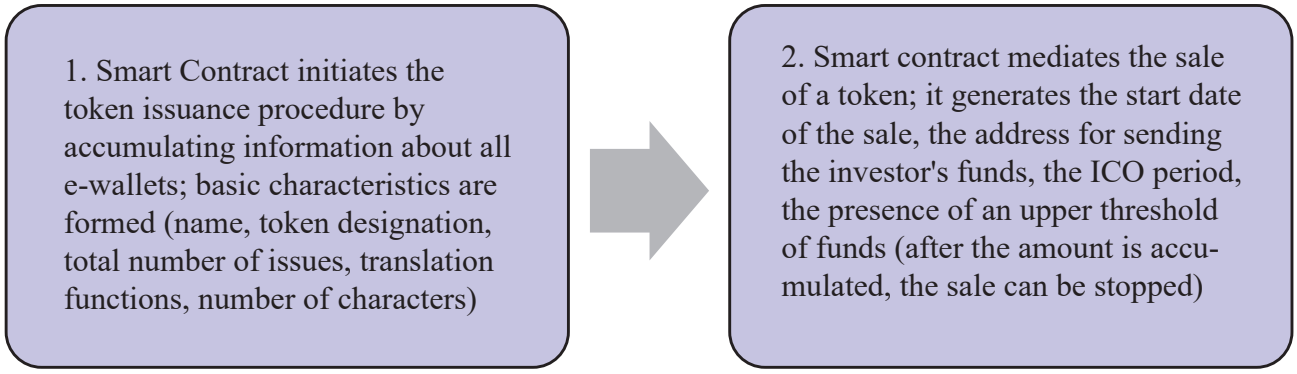

Fig. 3. **ICO scheme on the Ethereum platform**

Source: compiled by the authors based on URL: https://cbr.ru/Content/Document/File/47862/SmartKontrakt_18–10.pdf

called a promising area of smart contracts application.

An ICO can be carried out in two stages (two contracts are involved) (*Fig. 3*).

Another form of using blockchain technology in financial management is decentralised autonomous organisations (DAOs), which allow for the distribution of corporate rights, asset management, logistics, and the formation of global value chains.

The main characteristic of DAOs is the presence of an internal unit of account — token. D.V. Kirillov interestingly compares DAOs with collective farms in the USSR or Chinese communes [33]. Inside the company tokens play the role of money and, in addition, are motivators of efficient work and elements of 'profit participation'. In the framework of DAOs, interactions are cemented not by labour agreements, but by smart contracts.

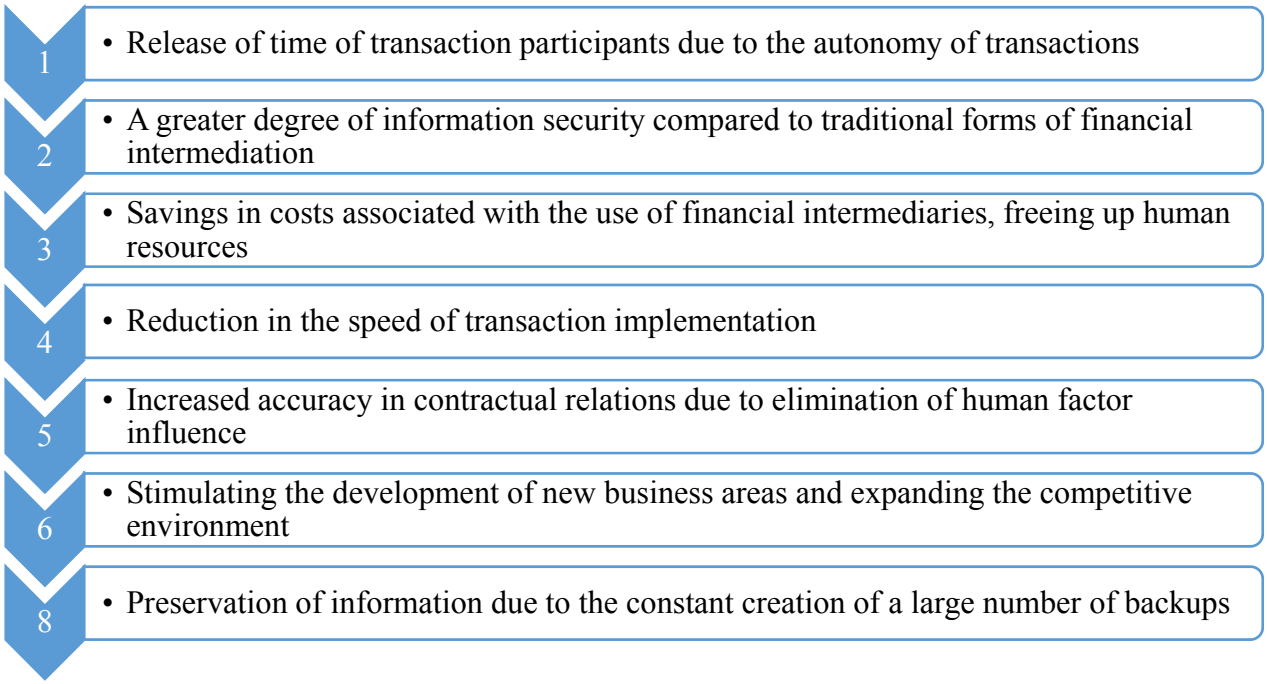

Fig. 4. **The possibilities of blockchain technologies and smart contracts in e-commerce**

Source: compiled by the authors based on [12, 13, 20, 24].

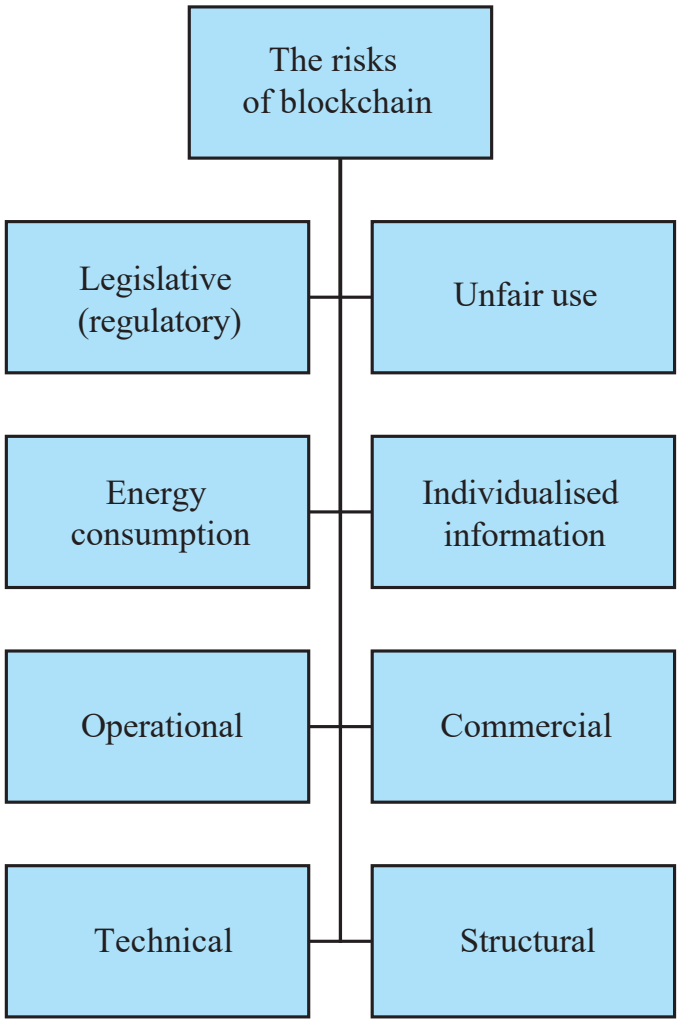

Fig. 5. **Classification of blockchain risks in e-commerce**

Source: compiled by the authors based on [27, 34].

ADVANTAGES AND RISKS OF BLOCKCHAIN TECHNOLOGIES IN E-COMMERCE

The main advantages of blockchain technologies in terms of their use in e-commerce can be grouped as follows (*Fig. 4*).

Despite the great opportunities offered by decentralised finance, as in any financial mechanism the effect correlates with risks, the classification of which is presented in *Fig. 5*.

Some of them are quite correctable, such as commercial and individual information. Others (legal, energy-related) are very difficult to manage. Let's consider the presented risks in more detail.

Legal risks in the use of smart contracts are rather high, as they are not fixed in the legal field. Regulatory risks are especially evident in cases where there are cross-border or international agreements, and entities from different countries must determine which right to use.

One of the ways to reduce the uncertainty of the legal status of smart contracts is to amend the existing legislation, which has already been done by such post-Soviet states as Belarus and Estonia.

At the same time, the world legal practice has not yet developed a unified approach to understanding the legal status of a smart contract — it is just being formed. There are several models, which

some researchers group as follows: technology-oriented, transaction-oriented, mixed, neutral [34].

Since blockchain technologies are inherently anonymous and do not depend on the public administration system, but are conditioned only by software tools, they can be used to implement:

- financing of illegal activities;
- improper disclosure of information in connection with 'cyber-attacks', hacking of systems;
- ignoring the will of users after their registration in the chain.

These risks of unfair use can only be reduced through government intervention, determining the legal status of the technologies used and establishing a legal regime.

The commercial risks of blockchain technologies are associated with situations where the costs associated with the implementation of these mechanisms are higher than their benefits. To operate digital tools, significant funds are needed to purchase software, train specialists, negotiate with partners to carry out transactions in the new form, etc. Storing and maintaining information using blockchain involves costs that increase with the scale of operations. Energy costs are also increasing significantly, and in some cases can be critical to projects. Finding new energy-saving modes in the software domain will avoid energy dependency in the future. It is necessary to apply financial planning and foresee the cost-effectiveness of projects that will be carried out with blockchain technologies.

Another problem is the lack of scalability, i.e., the lack of capacity of existing systems to process large amounts of information simultaneously, resulting in slower processing speeds.

Like any information system, blockchain technology is susceptible to hacking. Earlier, the development of bitcoin showed that fraudsters are quite capable of 'infiltrating' software codes. The first DAO could not resist a software bug and was hacked.

In order to reduce technical risks, it is necessary to involve highly qualified specialists in the process of writing smart contracts and use modern software tools.

CONCLUSIONS

The experience accumulated by researchers can be used in the development of the company's development strategy in the field of e-commerce.

The specifics of the development process include the need for quick decision-making, the availability of highly qualified specialists working with the consumer, and the use of analytical capabilities to calculate the best options in terms of risks. Companies working in the field of e-commerce must have the most up-to-date information in the field of settlement systems, electronic currencies, modern trends in the introduction of blockchain technologies. The issues of legal registration of transactions are of no small importance, as not all aspects of legal relations related to digital technologies currently have a clear legislative base, which makes the competences of management personnel all the more demanding. When applying digital technologies in work, it should be taken into account that not all service users have the skills and experience to use complex e-services. It is necessary to balance functionality and simplicity in the digital tools offered in order to increase the popularity among customers. In addition, e-commerce companies must be able to form an ecosystem of synergies in order to realise an expansion strategy in the market. Along with this, functional strategies such as innovation, marketing, and human resource strategies are also important. The source of development for e-commerce enterprises is innovation, search for free markets, which corresponds to the 'blue ocean strategy'. Competitiveness is achieved by increasing the intellectual capital and reputation of the company.

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The Impact of Cognitive Distortions on Decision Making in Agile Project Management Frameworks: Current Positions and Perspectives in the Academic Community

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ABSTRACT

The purpose of the study is to review the current positions and views of the scientific community regarding the influence of cognitive distortions (both individual and group) on decision-making within such an approach to project management as agile framework. The article defines the concepts of "project", "project management", "agile project management framework", "heuristics", "cognitive distortions"; it describes what kind of decisions (according to the hierarchical structure) can be made when using agile project management frameworks. On the basis of analysis of a number of scientific works, the existence of the problem of success (efficiency) of implemented (including IT) projects even if modern flexible frameworks of project management are used is fixed. The author of the study considers the concept of heuristics and cognitive distortions (both individual and group), describes the manifestation of individual and group cognitive biases, gives examples of individual and group cognitive biases' impact to decisions taken in Agile project management. As a result, the author proposes a classification of likely to manifest individual and group cognitive biases at each of the three levels of decision-making in Agile (according to the hierarchical structure): operational decisions, tactical decisions, strategic decisions. The author also provides an overview of the development of decision-making theory and describes three main approaches to the consideration of the empirical decision-making process: according to D. Kahneman and A. Tversky (*heuristic approach; behavioral economics*), according to G. Gigerenzer (*ecological rationality approach*), according to G. Klein (*naturalistic approach*). The author also identifies a possible further vector for the development of research in this direction. The result of the work was the classification of probable individual and group cognitive distortions at each of the three levels of decision-making in flexible project management frameworks (according to the hierarchical structure): operational, tactical, and strategic.

Keywords: cognitive biases; group cognitive biases; individual cognitive biases; Agile project management; the impact of cognitive biases to decision-making; heuristic; decision-making in Agile project management; classification of cognitive biases; mistakes in project management; efficiency of Agile teams

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INTRODUCTION

Today, the development of information technologies and their deep integration into all areas of life and activity are becoming more and more tangible. As a result of digitalisation, new segments in business are emerging and developing, in particular, projects to create digital products.

At the same time, there is a dramatic increase in the amount of information that is freely available and updated lightning fast. This has both obvious advantages and less noticeable disadvantages: a flood of unreliable data and fakes appears in the information field, the level of uncertainty increases, the process of searching for necessary information becomes more complicated, and the time for making managerial decisions is reduced.

Most of the scientific community agrees that the changes affecting both society as a whole and each individual in recent decades occur (including those influenced by information technologies) at a pace faster than the speed of response to them (i.e., the speed of adaptation). It is important to note that this judgement is also true in the context of project management: the existing approaches to the latter are transformed and altered in relation to the changes mentioned in the previous paragraph much slower than the changes themselves, therefore, in practice, decision-making, including in flexible project management frameworks, usually takes place under conditions of uncertainty.

It is for this reason that the author considers the decision-making process of a small group working in agile project management frameworks as the *object of the study; the subject of the study* is cognitive biases arising in this process, which influence the quality of decisions made and the effectiveness of the results obtained.

Despite the seemingly obvious existence of subjectivity in decision making in IT projects (including those managed with agile frameworks) under uncertainty [largely based on individual characteristics and properties of decision makers (DMs)], as well as a large number of different factors affecting the success of projects, the author, based on the results of his previous work[1] believes that it is the cognitive biases of decision makers that have the greatest impact on decision making. If we proceed from this judgement, we can notice their common patterns and, on this basis, propose a method for optimising decision-making in IT projects managed with agile frameworks under conditions of uncertainty.

The author has identified the following *research question* within this paper: what cognitive biases arise in small group decision making in agile project management frameworks?

AGILE PROJECT MANAGEMENT FRAMEWORK

In order to give a qualitative characterisation of the designated object area, it is necessary to first define such concepts as "project", "project management" and "agile project management framework", and then find out what kind of decisions can be made in agile project management frameworks.

Thus, according to C. Heldman, "a project is a temporary activity with clear start and end dates. It creates a unique product, service or result and is considered completed when the goals and objectives have been achieved and approved by the project stakeholders" [1].

One of the first mentions of the concept "project" can be considered its use to describe various plans and proposals in the work of F. Bacon [2] written in the XVII century.

Many experts [3–6] agree that at the initial stages of development of new products (in particular, digital products) there are quite a lot of questions (controversial points, nuances). In order

[1] Khamitov D.A. Influence of cognitive biases on decision-making in projects of digital products creation under conditions of uncertainty. Master's thesis. Moscow: RANEPA; IBDA; 2022.

to make the work done from the day the idea of creating a new product is conceived to the beginning of its actual use as effective and productive as possible, project management techniques are used, which are universal to a large extent and can be successfully used in various fields.

At the same time, it is important to note that each specific area has its own unique aspects affecting the organisation of the processes of managing the projects implemented in it.

The information technology sector (due to its specificity) is no exception. Based on the judgement that it is multifaceted and includes many different areas, it is fair to assume that the most complex projects in terms of implementation and management can be singled out. According to V. I. Grekul, "in the IT sphere the most complex and large-scale projects are the projects of development and implementation of information systems — the project of creating IT solutions" [7]. We believe that digital projects (digital product creation projects) belong to the same group of projects: they have a number of peculiarities determined by the digital product being created, the organisational structure of the enterprise, the solution development team, and the object of automation.

Even taking into account the fact that today the importance and complexity of digital projects is quite obvious, and various proven methodologies are used to manage them, the statistical indicators of the success of such projects are disappointing.

Thus, the article by A. Shenhar and D. Dvir describes the following results obtained in the study of various project management practices: about 90% of the total amount of work is performed under budget (at the level of 50%) and under schedule (at the level of 70%) [8], which clearly indicates a decrease in the effectiveness of the existing approaches to decision-making in the course of project implementation (including IT). This thesis is confirmed in the 4th edition of the Project Management Body of Knowledge Guide (PMBOK Guide),[2] according to which the success of projects is measured by the following indicators: timeliness, budget compliance, product quality and customer satisfaction.

According to D. Ozkan and A. Mishra, agile frameworks (Agile project management) are becoming more and more of a priority for digital project management because they allow to increase the speed of project implementation [9]. According to the data obtained by these researchers, the majority (71%) of organisations believe that projects managed using agile frameworks are 28% more successful than those managed using traditional methods.

In the study by R. Hoda, N. Salleh and D. Grundy it is mentioned that according to the results of the widely known and the longest survey of its kind "State of Agile",[3] by 2018, 97% of respondent companies used agile project management frameworks, although in 2007 their number was 84% [10].

R. Mokhtar and M. Khayyat called the agile project management framework "a repeatable strategy that helps to manage digital product development projects by improving them with bug fixes through continuous feedback from the customer" [11]. Agile project management frameworks are characterised by short, time-limited project cycles (sprints), daily "stand-up" meetings (dailies), as early as possible demos and retrospectives, continuous analysis of possible improvements, and rapid adaptation of project team resources to solve problems to achieve optimal results [12].

In February 2001, at a meeting of 17 representatives of various digital project management practices (calling themselves the "Agile Alliance"), an Agile manifesto of 12 principles

[2] A Guide to the Project Management Body of Knowledge, 4th ed. USA: Project Management Institute; 2008.

[3] An annual survey with respondents from thousands of IT professionals around the world to explore current trends and developments in the application of Agile.

was developed, united by the cross-cutting idea of the need to adapt to change in order to create a quality product.

PROJECT TEAM AND COGNITIVE BIASES

In agile project management frameworks, the project team (development team) plays a particularly important role, which, according to A. Poth, is the key that ensures the creation of customer value [13].

We agree with P.B. Paulus who believes that such a team is a small group consisting of "two or more individuals who have common goals and established relationships, as well as interdependent on each other to a certain extent and perceive themselves as part of this group" [14].

Moreover, according to the study of N.B. Moye [15], in agile frameworks it is especially important for a project team to be autonomous, in this regard, we can say that it independently (according to the hierarchical structure described in [16, 17]) makes quite a large number of decisions, including:

- operational: prioritisation of improvements, task decomposition (modular design);
- tactical: planning — for example, estimating the labour required to perform each task, distributing tasks among project team members, setting deadlines;
- strategic: decisions about switching to other development tools, optimising current team processes.

It is also important to note that in agile project management frameworks, contrary to professional attitudes that suggest giving the project team the opportunity to make decisions independently [18], in practice, managers/leaders periodically do not observe this rule and leave the last word to themselves.

According to D. Kahneman, the factors affecting the success of the project are some cognitive biases inherent in decision makers (in case of agile project management frameworks — all members of project teams) [19].

A. Vikhman and A. Popov believe that "the irrationality of our consciousness can manifest itself not only in simple, automated actions, but also in the performance of complex thought operations that require conscious control. For example, the decision-making process in a situation of uncertainty is saturated with cognitive biases and heuristics. Heuristics are subconscious techniques to simplify the process of analysing complex situations and probabilities. <...> cognitive errors and heuristics are not mere defects in thinking, but universal properties of the thinking system, operating autonomously or in parallel with intelligence and critical thinking" [20].

As is known, the process of human decision-making affects the "reptilian brain", which is responsible for the most basic functions necessary for survival (breathing, sleeping, etc.), which, due to its specificity, tends to accelerate information processing and minimise time for decision-making by developing patterns of thinking that take into account previous experience. We also believe stereotypes and form certain patterns of behaviour for different situations, and then, getting into them, we do not look for a new strategy every time, but resort to already known (ready-made) options.

These are cognitive biases. But it should be noted that they are not some kind of brain malfunction or brain disease — they are an inherent feature of the brain, a response to environmental conditions. The term "heuristics" is used to denote a pattern of thinking that takes into account previous experience (one's own or someone else's), a stereotype and pattern of behaviour in a certain situation, used unconsciously by a person. And cognitive biases can be defined as gaps (resulting from the use of heuristics) between normative (rational) and heuristically determined behaviour.

The concept of "cognitive biases" was introduced by D. Kahneman and A. Tversky. In 1972, they demonstrated a number of reproducible pat-

terns of behaviour in the course of experiments: people made decisions different from those falling under the theory of rational choice [21].

It is important to note that cognitive biases are typical for all representatives of human society without exception: it is a basic property of the brain, independent of the level of intelligence and education. However, knowing the nature of such biases, the subject is able to minimise their impact on the objectivity of perception of the surrounding world and, consequently, make better decisions. By 2019, more than 175 cognitive biases have been identified [22], the article by A. I. Yakovchuk [23], published in 2022, already refers to almost 2000s, and this list continues to expand. At the same time, according to N. I. Loginov and A. S. Aleksandrova, one of the topical issues in this subject area remains the determination of the status of two-process and two-system decision-making models [24].

It should also be emphasised that, in addition to the individual cognitive biases discussed above, the decision-making process is influenced by the group biases described by R. Barron: "The willingness of individuals to view themselves and others as members of groups that determine their actions is an inherent characteristic of human experience, so that psychologists have introduced the expression 'fundamental attribution error' to denote this characteristic" [25]. Indeed, it is common for humans to underestimate the degree of influence of the group they are in at a given time on the decisions they make. Moreover, the degree of our confidence in whether a particular answer is correct, and an approach is correct depends on the people we are talking to at that moment and the position they occupy in the group. If our views are confirmed by the group's opinion, our confidence in the correctness of the answer (according to R. Orive [26]) will increase.

L. Festinger in his works [27] on the theory of social comparison notes that group members tend to be in agreement with each other; in case of disagreement, they will try to change each other's minds, and if they fail, they will reject the opinion (even the most optimal one in a given situation) that goes against the opinion of the majority.

S. Ash, conducting a classical experiment in which groups of Haverford College students (each consisting of one real subject of experiment and the experimenter's assistants) were required to compare the size of the "control" line with three others; the subject answered after listening to other group members who, according to the experiment, gave the same wrong answer. As a result, it was proved that it is characteristic of human beings to demonstrate conformity to what is accepted as a norm at the group level [28] — when the majority comes to a group consensus (multiplication of sources of influence occurs), conformity increases. It is important to note that such a manifestation of social pressure on the individual fulfilled important social functions, providing the group with tools of control, and increasing the probability of the subject's perception of its interests on a par with his own, and thus increasing the probability of group survival. However, in the modern realities of project management and decision-making, conformism can lead to negative consequences.

Another example of group cognitive bias is the "enveloped" thinking described by I. Janis [29]. This term refers to the regular inability of a person to express his or her own judgement after other members of the group in which he or she is a member (and especially its leader) have expressed an opinion different from his or hers: as a result, "dissent" or "dissidence" is suppressed or restrained, and the group begins to feel that from the point of view of morality it acts correctly and is invulnerable.

It is also worth citing the words of D. Stoner about the phenomenon of group polarisation [30], which manifests itself in the following:

Table

Classification of cognitive biases in Agile project teams

		Nature of manifestation of cognitive biases	
		Individual	**Group**
The level of decisions according to hierarchical structure	Operational	Exaggeration of danger	Group thinking
	Tactical	Overconfidence effect	Group conformism
	Strategic	Maximalism	Group polarisation

Source: compiled by the author.

in the framework of collective discussion of complex problems associated with risk, instead of smoothing out "extreme" ideas (arising among individual participants) and transforming them into more "soft" decisions, on the contrary, riskier (compared to the decisions that in similar cases are made individually) decisions are made.).

EXAMPLES OF COGNITIVE BIASES AT DIFFERENT DECISION LEVELS

Based on the above, we can conclude that each of the three categories of decisions (operational, tactical, strategic) made by the project team in agile project management frameworks is characterised to a certain extent by the occurrence and manifestation of both individual and group cognitive biases.

For example, in operational decisions when decomposing tasks or prioritising them, enveloped thinking can "*work*" which leads to "dumping" (accepting options that are not always optimal, especially if they were voiced by the most experienced or authoritative member of the group), as well as *exaggeration of danger* (in the context of each member of the group the importance/complexity of the task will be significantly overestimated and will not correspond to reality, as a result of which the task will be excessively decomposed and the integ-

rity of its implementation will be violated, and also during the sprint[4] the team does not fully realise its production resource).

In tactical decisions, for example, *group conformism* is possible (the more members of the group are inclined to a certain variant of the plan, the more difficult it will be for an individual to propose and defend another solution, even if it is more correct), as well as the manifestation of the *self-confidence effect* (each member of the group may overestimate his/her own abilities and skills, as a result of which in a sprint a team member will have to perform more tasks than he/she can actually realise).

There is a possibility of *group polarisation* in strategic decisions (for example, instead of "smoothing out" radical and risky decisions in the course of discussion and, as a result, refusing to switch to, say, a technological stack that has not been adopted in the company, the team will decide to make such a switch, although each of its members individually will consider such a decision to be poorly justified), as well as *maximalism* [in the context of each member of the group, under the influence of this cognitive bias, thinking is built on the basis of absolutes in assessments and judgements, and the presence of any middle ground is not allowed, which may result in a strongly *positive* ("we can do anything") or *negative* ("we can do nothing") instead of an *objective* assessment of the current state of affairs, i.e. in either case the decision will be suboptimal]. One cannot also exclude the possibility of a "superposition" of group and individual cognitive biases — for example, a point of view put forward by a group member for collective discussion may already contain an individual cognitive bias.

The *Table* presents the proposed classification of cognitive biases arising in project teams working in agile project management frameworks in terms of the nature of their manifestation (group/individual) and the decision level at which they arise in a clearer way.

EMPIRICAL DECISION-MAKING PROCESS

It is generally believed that B. Pascal with the ideas from his work "Thoughts" [31], published for the first time in 1670 (including the so-called "Pascal's Wager" about God), became one of the founders of a decision-making theory. "Decision-making theory is a theory about what to decide to do when it is not known what will happen. Making that decision is the first and most important step in any attempt to manage risk" [32].

Another influential work on this topic is considered to be D. Bernoulli's article "Outline of a New Theory of Risk Measurement" [33], that was published in 1738, and which mentions the "St. Petersburg Paradox" — it illustrates the difference between the expected optimal human behaviour and "common sense".

This idea was further developed in the series of works [34] by G. Simon as "the concept of bounded rationality", which consists in the fact that decision makers stop at a satisfactory, but not at the optimal option. That is, "the description of the decision-making process should take into account the cognitive limitations of computational power".[5]

To date, the empirical decision-making process can be viewed according to three different approaches proposed by: D. Kahneman and A. Tversky (*heuristic approach; behavioural economics*), G. Gigerenzer (*ecological rationality approach*), G. Kline (*naturalistic approach*).

"In the very first works of the founding fathers of behavioural economics, D. Kahneman and A. Tversky, the emphasis was precisely on the innate statistical ignorance of the human race" [35]. Indeed, scholars have argued that "many decisions are based on beliefs about the

[4] A short time interval (usually 1 to 4 weeks) during which a development team performs a certain amount of work, creating a finished product or part of a product (incremental).

[5] Herbert Simon's concept of bounded rationality. Big Russian Encyclopaedia. 2022. URL: https://bigenc.ru/c/kontseptsiia-ogranichennoi-ratsional-nosti-gerberta-saimona-dc2d9a

probability of uncertain events — such as, for example, the outcome of an election, a defendant's guilty plea in court, or the future exchange rate of the dollar". These beliefs are usually expressed in statements such as "I think that…", "the probability is…", "it is unlikely that…" "it is highly likely that…", etc. Sometimes beliefs about uncertain events are expressed numerically as odds or subjective probabilities. What determines such beliefs? <…> …people rely on a limited number of heuristics that reduce the complex tasks of estimating probabilities and predicting values of quantities to simpler judgement operations. Generally, these heuristics are quite useful, but they sometimes lead to serious and systematic errors.' [19]. R.I. Kapelyushnikov in his work says that "according to D. Kahneman and other behaviourists, the unconscious part of our psyche (System-1 in their terminology) prevents the conscious part (System-2 in their terminology) from acting rationally, and it is because of this that the decisions we make often turn out to be far from the best and poorly compatible with each other" [35].

Thus, this approach gives a negative (from the point of view of rationality of choice) assessment to the use of heuristics, because the substitution of optimisation procedures for heuristics in decision making leads to a significant number of cognitive biases and errors. That is, according to D. Kahneman and A. Tversky, in the decision-making process a person unconsciously (through the use of heuristics) substitutes a complex problem with a simple one for which he has a formed heuristic, and as a result faces cognitive biases and errors that reduce the quality of the decision made.

Despite the fact that "in modern economic science, the dominance of behavioural economics ideas associated with the names of D. Kahneman, A. Tversky and R. Thaler in the study of decision-making processes of individuals is almost absolute, <…> in modern psychological science there is a largely different situation" [35]. Indeed, supporters of the concept of ecological rationality, the most prominent among whom is the German psychologist G. Gigerenzer, consider D. Kahneman's ideas quite critically, which is most clearly manifested in the attitude to heuristics. Thus, according to the approach of ecological rationality, heuristics for a person with his limited rationality in difficult situations act as accessible "supports" or "crutches" with the help of which adequate decisions are made and although not the best, but satisfactory results are achieved.

At the same time, G. Gigerenzer does not deny that an unsuccessfully "chosen" heuristic can cause losses in welfare; what is important is that heuristics cannot be bad or good (irrational or rational) — everything is based on their adaptation to the characteristics of the specific environment in which they are applied [36]. In general, the scientist says that instead of perceiving heuristics as sources of cognitive biases and errors, they should first of all be seen as adaptive tools that help to ensure effective and sufficiently accurate decision-making in certain situations.

In turn, G. Kline expresses the following point of view: "Most studies of decision-making based on artificial laboratory tasks treat subjects as inexperienced individuals with biases that interfere with their decision-making processes" and suggests a naturalistic approach, suggesting that "people gain experience that allows them to use intuition combined with analysis when making decisions". <…> a decision is a choice point in which there are several reasonable options, and the commander could have chosen a different option. In other words, even if no other option was consciously considered, if at least one was available and known to the commander, then the decision was made. <…> If decision-making is defined as the judicious selection of one plan of action from several competing plans of action, the study of decision-making may lose relevance to most forms of everyday activity. A growing

body of evidence indicates that people rarely compare options among themselves. <…> Naturalistic decision-making researchers tend to doubt that errors can be easily isolated and attributed to flawed logic. D. Reeson of Manchester University has coined the term "latent pathogens", which he uses to refer to problems such as deficits in technique, poor training and bad procedures that can go unnoticed until the operator is trapped. It's easy to blame operator error, but problems that developed even earlier made the error almost inevitable' [37].

Thus, G. Kline says that when making a decision a person does not choose among several options, but goes through a series of thought procedures, as if "drawing" a scenario (making a mental simulation): if such a scenario is acceptable for him/her, then he/she stops there, if not — "simulates" the next one, etc.

CONCLUSIONS

Despite the growing popularity of using agile management frameworks, the problem of success of implemented projects does not lose its relevance. One of the significant factors that have such an impact is cognitive biases (individual and group). They can manifest themselves at each of the three levels of decision-making: operational, tactical, strategic. There are three different approaches to considering the empirical decision-making process (behavioural economics, the concept of ecological rationality, naturalistic approach), but they all agree that a person most often makes not the most rational decisions possible in each particular situation.

As a further vector of research development on this topic, in our opinion, it is necessary to choose:

- design of the experiment (including vignette and field experiments to identify the fact and degree of influence of individual and group cognitive biases arising during the work of small groups) and its subsequent implementation on target groups through cooperation with Russian accredited IT companies using flexible project management frameworks;
- analysis of the experimental results and development of recommendations to minimise the occurrence of individual and group cognitive biases in teams, which can be introduced into existing project management processes to improve their success rate.

The work carried out by the author of the article can serve as a starting point for further scientific research in this subject area, as well as a stimulus for the development of new and existing project management frameworks.

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Behavioral Segmentation of Personnel in the Human Resource Management System of Universities

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ABSTRACT

In the conditions of modernization of higher education, the importance of effective methods of managing the personnel potential of universities and higher education institutions is increasing. The use of segmentation allows you to form an effective strategy for personnel management of various categories, minimize personnel risks, save time and financial resources. The purpose of the study is to identify the technologies of behavioral segmentation of the organization's personnel and to consider the possibilities of their use in the management of the human resources potential of higher education institutions. The analysis of the data of sociological surveys indicates the presence of significant difficulties in conducting behavioral segmentation of university teachers, which is due to a wide range of objective and subjective factors that determine the specifics of professional strategies of teachers. Based on the research results, a variant of behavioral segmentation of teachers is proposed, taking into account two factors: on the one hand, the level of *expectations* from work, requests to the employer, the most significant for teachers, on the other hand, the level of *practical implementation* of requests and expectations from the professional activity of teachers. The general characteristics and boundaries of the segments allocated depending on behavioral characteristics can become the basis for the development and implementation of a differentiated personnel policy, the formation of an effective system of motivation of employees of different categories. The behavioural segmentation of teachers, proposed by the author of this study, is based on general marketing approaches to the analysis of motivational orientations and preferences of a specific category of employees; the article considers a wide range of factors that determine teachers' satisfaction with their work. The complexity of the implementation of these approaches is due to the fact that there is no universal toolkit for behavioral segmentation of personnel, and the choice of criteria and methods for separating and dividing personnel should be specified each time taking into account the objectives facing managers.

Keywords: staff personnel segmentation; behavioral segmentation; human resources potential of higher education institutions; marketing of personnel; segmentation criteria; job satisfaction

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INTRODUCTION

In modern conditions the role of the human factor as a key condition for ensuring the competitiveness of organisations is increasing. Accordingly, there is an active search for new effective methods of human resources management. In the context of modern management concepts aimed at attracting, retaining and developing employees, who form the human resource core of the company, marketing approaches oriented to work with employees are becoming more popular. The main goal of such internal marketing is to optimise tangible and intangible incentives and working conditions in such a way as to ensure maximum loyalty of the members of the workforce and to encourage the most successful and competitive employees to continue working for the company in question.

A special place in the system of intra-organisational marketing is occupied by personnel segmentation, which is becoming a popular tool in various industries and spheres of activity, as it allows forming an effective strategy for managing employees of various categories, minimising personnel risks, saving time and financial resources.

The aim of the research is to reveal the peculiarities of behavioural segmentation of the personnel of a modern organisation and to consider the possibilities of using behavioural segmentation technologies in the management of human resources potential of universities.

In order to achieve this goal, it is intended to solve the following tasks:

- to consider modern theoretical approaches to the segmentation of personnel of the organisation;
- to reveal the essence and significance of behavioural segmentation in the system of higher school personnel potential management;
- to assess the possibility of using labour satisfaction parameters for behavioural segmentation of university teachers;
- to propose a variant of teachers' segmentation according to the levels of both the most significant expectations from work and their practical realisation;
- outline ways of using behavioural segmentation of teachers in the system of management of human resources potential of higher education institutions.

The possibilities of introducing segmentation techniques in personnel management are disclosed in many scientific works — experts consider these techniques as the division of employees into groups 'depending on their value for the organisation and the use in personnel planning and in general in personnel work of the features and importance of each group' [1]. The problems of personnel differentiation according to the amount of income based on the salary level are actively developed, the characteristics of professional and qualification segmentation are identified, and the competitiveness of different segments is assessed [2]. The peculiarities of working with certain age categories of employees are identified [3]; a matrix of their division depending on the value and significance of the selected groups for the company is proposed as a technology of profile segmentation [4].

Analysing modern developments in this area, it should be acknowledged that the studied problematics in the field of higher education has not yet become the subject of systematic scientific research. Some aspects are disclosed in [5], where the possibilities of using the segmentation of the teaching staff in the process of change management in the personnel of a non-state higher education institution are assessed. It is obvious that in modern conditions, when the teaching community is becoming increasingly heterogeneous in composition and diverse in qualitative characteristics, the probability of using these technologies increases [6, 7]. The dynamics of the scientific and pedagogical staff of higher education institutions reflects many general trends in the transformation of human resources potential. The problems of socio-demographic segmentation of higher education teachers are often revealed in the context of discriminatory manifestations associated with the restriction of professional

and qualification growth opportunities for certain categories of employees. This is related, for example, to gender aspects — many publications reflect the peculiarities of formation of trajectories of scientific-pedagogical and career development of female teachers [8]. The issues of age segmentation are often considered on the example of young teachers who are just starting their professional career and are relatively vulnerable in many formal parameters — for example, in terms of indicators of research and publication activity [9]. The problem of ageing of university teaching staff (increase in the share of representatives of the older age segment) is actively discussed [10, 11]. It does not always take into account the fact that due to the specifics of higher education, the accumulated experience, professional skills, and academic maturity have a special value.

It is worth noting that the problems of behavioural segmentation of university teaching staff have been reflected in a much smaller number of scientific works.

METHODS AND MATERIALS

The study of personnel segmentation mechanisms is possible only if a wide range of scientific methods is used. In particular, the study uses comparative, typological and economic-statistical types of analysis.

The empirical base is based on the results of sociological surveys and economic and statistical works on the problems of labour satisfaction and motivation of higher education employees. The author of this article uses the data obtained by the National Research University Higher School of Economics in the course of interviews with teachers of higher education institutions (the project 'Monitoring the Economics of Education') in the academic year 2020–2021,[1] which can be considered representative taking into account the main parameters of respondents — representatives of university teaching staff. The results of other sociological surveys, economic and statistical studies on the problems of introducing marketing technologies in the practice of management of human resources potential of higher education, conducted in recent years in various universities, are also analysed.

[1] Job satisfaction, career strategies and plans of Russian university teachers. Newsletter 2021. URL: https://www.hse.ru/data/2021/11/24/1448338190/ib_9_2021.pdf

RESULTS

Behavioural segmentation in the personnel marketing system

Classical marketing actively uses behavioural segmentation of consumers, within which consumers are structured and divided into separate groups depending on their motivation to purchase goods or services. In modern personnel marketing, a similar approach is used to identify different categories of potential or actual employees. Personnel segments are formed on the basis of similarity of basic expectations, peculiarities of labour motivation, as well as requirements to the employer.

A special place in the behavioural segmentation system is occupied by structuring the company's employees. Intra-organisational personnel marketing implies a personnel policy aimed at identifying and satisfying the needs of various categories of employees to the fullest extent possible. The effectiveness of strategies implemented in this area can be judged by a wide range of indicators — from staff turnover to the overall efficiency of the organisation. Behavioural segmentation makes it possible to reveal the peculiarities of individual career trajectories; to determine motivational preferences; to assess the need to develop and implement HR programmes aimed at retaining and developing individual segments; to ensure a high level of loyalty and efficiency of professional activity of the work team.

Behavioural segmentation of university teaching staff is one of the promising areas of higher education personnel marketing. The use of marketing tools in a modern university allows solving a wide range of personnel tasks in the conditions

of modernisation of higher education institutions, emergence of new forms of competition and toughening of confrontation with other subjects of the educational services market. The general marketing technologies of identifying and analysing professional preferences of individual categories of employees can be used as basic approaches to the segmentation of university teachers. In our opinion, the practical analysis of behavioural segmentation tools in this case should be based on the assessments of teachers' labour satisfaction.

In modern science and management practice there are various techniques for this purpose [12–15]. There are technologies that allow us to give a general assessment of the attitude to work based on the analysis of objective parameters of professional activity; there are tools, the use of which makes it possible to identify and reveal the features of emotional perception of individual labour functions, elements of socio-psychological climate in the team and interaction with colleagues. For the most complete and reliable analysis of various aspects of staff labour satisfaction, the methods of sociological research are actively used.

Assessment of labour satisfaction of university teachers as a basis for behavioural segmentation

The special importance of labour satisfaction (as a complex integrative indicator of personnel's attitude to their work) causes high interest in empirical studies on this issue [16, 17]. Experts pay much attention to the identification and assessment of individual factors that determine the satisfaction of teachers, including the content and nature of work, career development, financial remuneration, working conditions, etc. According to the results of such surveys, it was revealed that teachers are most often satisfied with their achievements in pedagogical activity (77.5% of respondents) [18]. Other studies reveal the motivational significance of labour satisfaction factors; at the same time, the dominant role of remuneration is questioned [19]. Some experts note that the most important aspects determining a high level of overall labour satisfaction are its content and conditions, fairness of internal working relationships [20].

In general, the data of sociological surveys of university teachers allow not only to reveal the most important factors influencing the labour satisfaction of teachers, but also to differentiate the respondents according to the peculiarities of their professional strategies.

The level of earnings (and mainly its subjective assessment) occupies a special place in the system of behavioural segmentation indicators. In general, the results of interviews with university teachers (reflected in the 'Monitoring of the Economics of Education') allow us to characterise the level of teachers' satisfaction with remuneration as acceptable [21]. More than half of the respondents note that they are 'completely' or 'rather' satisfied with the amount of income from their professional activity. Only 15.4% of respondents are not satisfied with the amount of earnings at all. Teachers' satisfaction with their income largely determines their attitude to their work in general. Among those who are completely dissatisfied with the income from their professional activity, only a minimal share (2.4%) notes that they are completely satisfied with their work; and almost ¾ of respondents admit that they are not satisfied at all. Accordingly, the share of surveyed teachers who are fully satisfied with their work is the highest among those who are fully satisfied with their labour remuneration level.

But this dependence is not so obvious when it comes to the category of individuals who consider their income to be average (satisfied with some things and not with others). More than half of the individuals who give this assessment note that they are most likely not satisfied with their work.

Thus, the comparison of assessments of satisfaction with both labour and income shows that there is no clear correlation between these parameters of activity. The amount of earnings occupies an important place in the system of motivational orientations of teachers, but even a

relatively high level of satisfaction with income does not compensate for dissatisfaction with other aspects of work. The high importance of non-monetary incentives in the system of parameters (determining labour satisfaction) is one of the peculiarities of professional activity of higher school teachers.

In part, these circumstances determine the complexity and ambiguous nature of assessments of labour satisfaction of different categories of employees. Obviously, when identifying the criteria for behavioural segmentation, it is necessary to take into account a greater number of factors that determine motivational preferences and peculiarities of teachers' professional behaviour. In order to obtain the most complete information it is advisable to use the survey data, which compares two important aspects: the first is the opportunities offered by work in higher education institution (which are important for every teacher), the second is the degree of their practical realisation in the current situation.

If we consider the first one, then first of all it is necessary to note the stability of earnings and employment. ¾ of surveyed teachers expect these guarantees and note that it is very important for them personally; however, the share of those who managed to realise this opportunity is 3 times lower. It is obvious that stable receipt of a fixed (salary) part of earnings is guaranteed to all those officially employed in higher education institutions. At the same time, the complex structure of labour remuneration and the high proportion of non-fixed incentive rewards create certain preconditions for the amount received to be unstable — its value is constantly revised based on the results of reporting periods. Teachers' concerns about the stability of employment in higher education are relevant and quite understandable. Digitalisation and the significant spread of distance forms of work, the implementation of personnel policy on 'rejuvenation' of the teaching staff, tougher requirements for teachers when competing for positions — these and many other circumstances cause an increase in professional competition and destabilisation of the situation in the intra- and inter-university labour markets. In this context, we can consider the results of the sociological survey reflecting the concern and wariness of teachers who have not been able to obtain guarantees of stable earnings and employment while working at higher education institutions.

The discrepancy between the opportunities provided by higher education institutions and the measure of their realisation in terms of salaries is even more significant. It should be emphasised that a significant proportion of respondents believe that the higher education system can provide a high level of remuneration for labour. At the same time, the majority considers it bad luck that they have not managed to achieve this. 2/3 of the respondents said that working in higher education in principle provides an opportunity to earn high wages, but only every tenth respondent believes that he/she has taken advantage of it in his/her current job.

The differences were also very significant between expectations and reality regarding:

- social security (the share of those who received it while working at the university is 2.7 times lower than those who failed to do so);
- professional growth and career (the share of those who are satisfied is 2.6 times lower than those who are disappointed);
- independent planning of one's work (2.8 times fewer respondents gave a positive answer than a negative one);
- creative and innovative nature of labour (the ratio of those who agreed and denied this statement is 1:2).

However, one should not conclude that teachers are massively disappointed in their professional activity. The noticeable prevalence of negative answers when assessing such

important aspects of their work may indicate the presence of overestimated, vague, and not detailed expectations from pedagogical work in higher education institutions, as well as significant professional ambitions, which turned out to be much more difficult to realise than planned.

The differences between expectations and realities are less obvious when teachers assess the possibility of carrying out research activities, the characteristics of which are the most important parameters used in monitoring higher education institutions and determining their success. It is the scientific achievements of teachers, formalised in the indicators of an effective contract, that influence the overall position of the higher education institution, its image, and its place in the ratings. However, even in the implementation of such a significant for higher education institutions direction of activity, teachers still face problems. 46.6% of the respondents consider the opportunity to engage in research activities as one of the main advantages of working at the university and note the importance of this aspect for themselves; the share of those who manage to use this opportunity in practice is 1.5 times lower than the number of those who miss it. It can be assumed that for the majority of teachers the main obstacle to the fulfilment of scientific work is the extremely high teaching load, which does not leave time for full-fledged research. At the same time, the requirements related to ensuring the level of scientific activity of teachers are constantly tightened.

Less disappointment is associated with such aspect of teachers' professional activity as recognition, social status, the initial importance of which is noted by less than 30% of teachers; the share of those to whom the current job still gave an opportunity to feel the social and status value of their labour is 1.2 times lower. The only work parameter in which the reality has exceeded expectations is the prospect of working with young people. More than 63% of respondents note that their current work allows them to fully realise this opportunity; the share of those for whom this aspect of university work was extremely important from the very beginning is 51.8% (*Table 1*).

In fact, with the help of the survey results it is possible to classify teachers into different segments: on the one hand, depending on how high the level of initial expectations from work is, and on the other hand, what is the degree of practical realisation of these opportunities. It should be noted that unrealised expectations can be considered not as a sign of professional 'unsuccessfulness', but as a significant motivational factor determining the directions of further professional development. At the same time, it is important to take into account that in some cases we are talking about overestimated expectations, disappointment in the profession, associated with individual characteristics of perception of teaching labour and other subjective factors.

It is obvious that an important factor of differentiation of teachers' behavioural strategies is their professional and qualification status, their place in the hierarchical structure of the university. The data of the sociological survey allow us to identify and reveal the nature of dependence between the parameters of their job satisfaction and job positions. More than 2/3 of respondents occupying managerial positions (heads of departments, heads of chairs, deans, vice-rectors, rectors) are satisfied with their work. This indicator is significantly lower among employees whose positions in the hierarchical structure of the university are not so high. For example, 58–60% of surveyed teachers, senior teachers, and assistants speak about their job satisfaction. It should be noted that even lower level of labour satisfaction is characteristic of associate professors. The reason for this distribution of evaluations is probably that it is the persons occupying the position of associate professor who are responsible for the

Table 1

The most important work parameters for teachers and the assessment of the realization of the opportunities that work at the university provides (in % of the number of respondents)

Operation parameter	Working at a university provides me with this opportunity, and it is very important for me personally	My current job fully allows me to realize this opportunity
Stability of earnings and employment	73,6	25,5
High level of wages	66,6	9,9
Social security	58,4	21,7
Opportunity to work with young people	51,8	63,1
Independent planning of one's work	47,3	17,0
Creative and innovative nature of labour	47,2	22,9
Opportunity to engage in scientific activities	46,6	31,7
Professional growth and career	43,5	16,7
Recognition, social status	29,1	23,0

Source: compiled by the author based on newsletter "Job satisfaction, career strategies and plans of teachers at Russian universities". 2021. URL: https://www.hse.ru/data/2021/11/24/1448338190/ib_9_2021.pdf

bulk of teaching and methodological workload in the university, and the level of income, despite the length of service, academic degrees and titles, does not correspond to the labour costs.

In general, the analysis shows that there are significant difficulties in conducting behavioural segmentation of university teachers due to a wide range of subjective factors that determine the specifics of professional strategies. It should also be taken into account that the choice of segmentation technologies is determined primarily by the tasks to be solved within the framework of the assessment of human resources potential of higher education institutions. The general characteristics and boundaries of the segments identified depending on behavioural characteristics can become the basis for the development and implementation of differentiated personnel policy, formation of an effective system of motivation of employees of different categories.

Variant of segmentation of teachers by the level of the most significant expectations from work and the level of their practical realisation

Based on the results of the conducted research, we can propose a variant of behav-

Table 2

Segmentation of teachers by the level of the most significant expectations from work and the level of their practical implementation

The level of job expectations and requests that are most significant for teachers	The level of practical implementation of requests and expectations from the work of teachers	
	High	**Low**
High	'Effective' teachers, whose high expectations coincide with reality; they use all opportunities provided by the university and successfully implement their professional strategies; high performance results in higher income and stable positions on intra- and inter-university labour markets	Teachers, whose level of demands and expectations from work in higher education institution significantly exceeds their real personal capabilities; such employees have a low level of labour satisfaction, acutely feel their unfulfillment. Probably, it is connected with the overestimated level of expectations from work and insufficiently high personal professional potential
Low	Teachers who got the opportunity to self-realise and achieve personal professional goals to a greater extent than they had planned. This may be due to the lowered level of expectations from work in higher education institution and high personal potential, which allowed to receive relatively high income	Teachers with lower level of competitiveness, who initially had no special expectations from their work in higher education institution or mistakenly chose the field of professional activity; low level of labour satisfaction is aggravated by low income level

Source: compiled by the author.

ioural segmentation of teachers based on two parameters (*Table 2*):

- the level of job expectations, requests to the employer, the most significant for teachers;
- the level of practical realisation of teachers' requests and their job expectations.

One of the obvious disadvantages of behavioural segmentation is that employees with significantly different professional and qualification status, socio-demographic characteristics, income level, etc. may be assigned to the same group. It is possible that the sample formed on the basis of behavioural preferences and motivational characteristics turns out to be very dispersed and heterogeneous in composition. To obtain more accurate information, behavioural characteristics of personnel can be used not as the main, but as an additional differentiation factor. It is advisable to conduct behavioural segmentation among separate socio-demographic categories of employees — for example, to assess the level of labour satisfaction and motivational characteristics of representatives of the same age segment (e.g., young teachers) or professional and qualification segment (persons performing the same professional functions).

At the same time, various advantages of using behavioural segmentation can be highlighted. It is the distribution based on personal preferences and individual professional strategies that gives not a formalised but a real cross-section of the personnel situation. The evaluative, emotionally coloured nature of information significantly deepens and adds important details to the sys-

tem of knowledge about the state and problems of development of human resources potential of the organisation.

It should be acknowledged that the mechanisms for using the results of behavioural segmentation of teachers in the practice of intra-university management have not yet been definitively formed — its implementation is possible depending on the specific managerial tasks faced by researchers.

In our opinion, behavioural segmentation of teachers (for example, depending on the level of job satisfaction) can be useful for solving a wide range of problems in the field of personnel management, including:

- as a format for generalising and presenting the results of the analysis of corporate culture, professional preferences, socio-psychological climate, etc..;
- as a factor determining the differentiated nature of management measures in the development of additional professional training programmes, improvement of motivation and incentive system;
- as a basis for the formation of a personnel reserve, management of professional qualification and career development of teachers.

The analysis of qualitative and structural characteristics of teacher segments is of great importance for the creation and implementation of human resources strategies for the development of higher education institutions, identification and minimisation of risks associated with the solution of large-scale tasks in the period of active modernisation of the entire system of higher education.

CONCLUSIONS

So far, there is no reason to speak about the existence of both tested methods of intra-organisational behavioural segmentation of personnel and the existence of sufficient practical experience in this area. In our opinion, only general principles can be emphasised:

1. Scientific basis. The selection of segmentation criteria, data collection; their systematisation and use should be based on the general methodological principles of management and personnel management.

2. A wide range of applied methods of collecting and analysing information. In order to ensure its completeness and objectivity, the actual results of sociological and marketing research, psychological testing, document analysis, observation, etc. should be used.

3. Reasonableness of the choice of segmentation methods and criteria. The selection of segmentation tools should be conditioned by the tasks faced by managers, as well as the current and future needs of the organisation.

4. Ethical behaviour, sensitivity and, in some cases, confidentiality. The choice of forms and methods of data collection, as well as their use, should be made taking into account the potential risks of information sharing. Violations in this area may lead to a deterioration of the socio-psychological climate in the team, toughening of internal competition, and the emergence of conflict situations.

Thus, the possibilities of applying segmentation technologies in the management of human resources potential of higher education institutions have not yet been fully realised in practice. This study allows us to evaluate them and expand the management tools aimed at improving the effectiveness of higher education institutions' human resources strategies. The process of forming general approaches to the selection of methodological principles and criteria of segmentation is difficult due to many objective and subjective factors, including the lack of development of relevant competences of managers. The complexity of the implementation of these approaches is also due to the fact that there is no universal toolkit for personnel segmentation, and the choice of conditions and methods of dividing employees should be specified each time taking into account the goals of managers. In general, the use of behav-

ioural segmentation can play an important role in improving the efficiency of higher education institutions' human resources management in the context of higher education modernisation.

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Analysis of the Russian Market for Artificial Lung Ventilation Units

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ABSTRACT

The medical industry is strategically important for the national economy and healthcare. The COVID-19 pandemic has shown the importance of local MedTech capacity and production facilities to meet the needs of the healthcare market. **The purpose of the study** is to conduct the analysis of the Russian market of artificial lung ventilation devices (ventilators). **Materials and methods**. The analysis of customs statistics data was carried out by the Ministry of Foreign Economic Activity of the Russian Federation (RF), the Federal Customs Service of Russia (FCS Russia), Federal Tax Service of Russia (FTS Russia), Federal State Statistics Service (Rosstat), the Ministry of Economic Development of the Russian Federation, the Ministry of Health of the Russian Federation, Federal Service for Supervision in the Sphere of Health Care (Roszdravnadzor) as well as the Commodity Nomenclature of Foreign Economic Activity (FEACN RF). During the study, statistical methods were used, as well as analysis and synthesis. The author determined the number of ventilator models present on the Russian market, the dynamics of their import and export volumes (during and after the COVID-19 pandemic) in the country context. **Results.** Up to 200 ventilator models from 87 vendors are represented on the RF market. The volume of imports of ventilators in 2022 amounted to $ 32.0 million (2.2 billion rubles). After a jump in imports during the COVID-19 pandemic in 2021, the volume of deliveries fell to 43 million (–23% by 2019), and in 2022 the decline was 25% (–44% by 2019). In 2020, the imports volume of value of ventilators increased 6.5 times. In 2021, the volume of imports and exports immediately fell below the indicators of the pre-crisis period. Deliveries from Germany decreased by 52%, the USA — by 86%, Korea — by 98%, France — by 29%, Slovakia — by 36%, and from Sweden stopped altogether. China has increased the volume of imports, adding 81% by 2021, and Switzerland to 41%. The volume of exports amounted to $ 383 thousand (410 million rubles), including exports to the EAEU countries amounted to $ 88 thousand, exports to non-CIS countries decreased by 95% (from $ 6.7 million to $ 0.3 million in 2021–2022). **Conclusion.** The results of this study can be applied by Russian ventilator manufacturers to assess the growth potential, as well as by government authorities to set priorities for strategic development by segments of the medical devices market.

Keywords: market analysis; medical device; MedTech; import substitution; medical products; competition; medical industry

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INTRODUCTION

The medical and pharmaceutical industries as components of the healthcare system of the Russian Federation are strategically important areas of the national economy. The share of imported medical devices, especially high-tech medical devices (HTMD), has always been very high, and until recently Russian medicine was largely dependent on the international market [1]. Back in 2020, more than 78% of medical equipment and components were supplied from countries that are now considered 'unfriendly' due to the current political situation in the world [2]. Understanding the volume of this market, its potentials and conjuncture is of practical interest, especially given the role of medicine in the life of society and its citizens. Researchers note 'the high importance of this sector of the economy, its investment attractiveness for both foreign and domestic producers' [3].

Medical products are "any instruments, apparatus, devices, equipment, materials and other products used for medical purposes separately or in combination with each other, as well as together with other accessories necessary for the intended use of these products, including special software, and intended by the manufacturer for the prevention, diagnosis, treatment and medical rehabilitation of diseases, monitoring the condition of the human body, conducting medical research, restoration, replacement, modification of the human body on anatomical or physiological level, and other medical products".[1]

In terms of the degree of manufacturability, knowledge-intensive industries that produce medical products can be compared with defence industry enterprises, which often start working for medicine as a result of conversion [4]. Examples of this are Roselektronika Holding[2] and JSC KRET[3] (part of "Rostech Group of Companies" State Corporation), JSC Shvabe,[4] Avtomatika Concern,[5] and other companies in the defence industry.

Experts have identified a number of factors contributing to the development of the medical industry in a particular region, such as state financing of medical device manufacturing plants, territorial concentration of labour resources and the quality of specialist training, high level of innovation and investment in science [5]. The insufficiency of the latter contributes to the high value of the HTMD import indicator [6]. For the successful implementation of the import substitution policy, it is important to provide 'cooperation between public and private structures, as well as strengthening the connection between the scientific community and the medical industry' [7].

At present, there is no legally approved definition of the concept of 'high-tech medical equipment' in the country, which makes it difficult to identify the specifics of this submarket. The criteria for classifying equipment as high-tech equipment are established by Order No. 1618 of the Ministry of Industry and Trade of the Russian Federation dated 01.11.2012 'On Approval of Criteria for Classifying Goods, Works and Services as Innovative Products and (or) High-Tech Products in the Fields related to the sphere of activity of the Ministry of Industry and Trade of the Russian Federation'[6] (Order No.1618).

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[1] Federal Law of 21.11.2011 No. 323-FL 'On the Fundamentals of Health Protection of Citizens in the Russian Federation'. Art. 38. URL: https://www.consultant.ru/document/cons_doc_LAW_121895/ddcfddbdbb49e64f085b65473218611b4bb6cd65/

[2] Roselektronika Holding (official website). URL: https://ruselectronics.ru/

[3] Concern Radioelectronic Technologies (JSC KRET) (official website). URL: https://kret.devup.cc/ru/

[4] JSC Shvabe (official website). URL: https://shvabe.com/about/

[5] Concern Avtomatika (official site). URL: https://www.ao-avtomatika.ru/about/

[6] Order of the Ministry of Industry and Trade of the Russian Federation No. 1618 dated 01.11.2012 'On Approval of the Criteria for Attributing Goods, Works and Services to Innovative Products and (or) High-Technology Products in the Fields related to the sphere of activity of the Ministry of Industry and Trade of the Russian Federation'. URL: https://legalacts.ru/doc/prikaz-minpromtorga-rossii-ot-01112012-n-1618/

According to this document, HTMD includes medical products that meet the following criteria:

- 'the goods, work and services are respectively manufactured, performed and rendered by the enterprises of knowledge-intensive industries;
- the goods, work and services are respectively produced, performed and rendered using the latest technological equipment, processes and technologies;
- the goods, work and services are respectively produced, performed and rendered with the participation of highly qualified, specially trained personnel'.

Also, according to Order No. 1618, HTMD refers to 'robots and artificial intelligence technologies (surgical robotics, robot nannies, etc.), various electron microscopes, ultrasound scanners, laser scalpels, radiosurgery equipment, endoscopy equipment, genetic research equipment, resuscitation equipment,' which [and especially artificial lung ventilation (ALV) machines] are of increased interest. Previously, experts made attempts to highlight the factors influencing supply and demand in the market of ventilators during the coronavirus pandemic, taking into account the development of in-house production, standardisation and optimisation of public procurement processes, and improvement of the quality of medical care [8–11]. However, a detailed analysis of the ventilator market with a description of the structure of imports and exports has not been conducted.

Medical devices are among the products that are characterised by complex 'buying behaviour'. Their selection is in most cases technically complex and requires the involvement of expert decision-makers. These products imply certain conditions and methods of sales, as well as sales incentives.

Sanctions imposed on the Russian Federation by Western countries have led to the withdrawal of a number of foreign manufacturers from the Russian market. The complexity of logistics chains and the sharp rise in exchange rates have affected a group of industries, jeopardising national security.

According to the Ministry of Industry and Trade, at the end of the first half of 2023, the volume of the medical devices market in Russia totalled RUB 381 billion, and the size of state purchases of medical devices reached RUB 320 billion, while the volume of the medical products market exceeded RUB 600 billion.[7] By the end of 2023, the share of domestic medical equipment accounted for 29%.

The programme 'Development of Industry and Enhancement of its Competitiveness' sets tasks to create competitive industrial production in the field of medical devices, especially high-tech ones, to develop innovations and apply advanced technologies.[8]

A lung ventilator refers to an HTMD and is an automatic device designed to partially or completely replace a patient's independent breathing pattern.

As part of the research objective, which is to analyse the Russian market for ventilators, the following tasks have been defined: to assess the significance of imports of these products for the Russian market in the interval from 2018 to 2022; to describe the dynamics of its imports and exports for the same period by month and the structure of its imports into Russia by brand; to identify the main foreign manufacturing companies represented in the domestic market, as well as countries — manufacturers and exporters of ventilators; to identify the largest suppliers in the domestic market; to determine the significance of export supplies for the Russian market (2018–2022).

[7] Medical Equipment and Products Market 2023. Business Profile Group. URL: https://delprof.ru/press-center/open-analytics/rynok-meditsinskogo-oborudovaniya-i-izdeliy-2023/?ysclid=lxuddslmke341471357

[8] Import substitution_of_medical_products. Zdrav Expert (portal). URL: https://zdrav.expert/index.php

MATERIALS AND METHODS

The timeframe of the study is 2017–2022 for retrospective analysis and 2023–2027 for market forecast. The author of this article has studied statistical data from specialised agencies (Ministry of Health, Ministry of Industry and Trade), as well as literature on the topic of the study; the author conducted the content analysis of the information posted on the websites of companies participating in the Russian market of ventilators, as well as contained in publications and speeches of representatives of these companies at industry events; conducted the analysis of customs statistics, FEACN (Foreign Economic Activity Commodity Nomenclature) of the Russian Federation, processed information from Rosstat regarding the volume of production of ventilators in Russia; reviewed the data of the Ministry of Economic Development and Trade of the Russian Federation regarding the forecasts for the development of healthcare and the medical products market in Russia. The research was based on the materials of the Ministry of Economic Development of Russia, Ministry of Health of Russia, Roszdravnadzor and other ministries and agencies, expert assessments of market specialists; monitoring of data of the main industry players, mass media (in particular, industry publications).

RESULTS

Market size and approaches to calculating demand

There are up to 200 models of ventilators of various types from 87 companies on the Russian market, including 24 domestic and 63 foreign manufacturers.

The criteria for calculating the region's need for ventilators (for budgetary medical organisations) are based on the methodological recommendations of the Ministry of Health of the Russian Federation 3.1.2.0139–1.[9]

According to this document, the following factors are taken into account when calculating the stock of ventilators:

- "the size and age structure of the population in the regions;
- morbidity and hospitalisation rates (projected number of outpatients and inpatients);
- the age structure of those who are ill and hospitalised;
- the number of groups at risk of infection and at risk of developing severe and complicated forms; the order of priority for their protection;
- age thresholds for utilisation".

Population size in the regions, age structure. In order to identify the needs of a constituent entity of the Federation for intensive care ward equipment, it is necessary to have information on the number and age structure of the population in the region, as local indicators may differ from the average for the Russian Federation.

The World Health Organisation (WHO), based on the results of analysis of the situation in different countries, determined the average percentage of hospitalisation to be 10%. At the same time, 25–30% of hospitalised patients needed intensive care and 12% needed to be connected to a ventilator.

According to data from infectious diseases hospitals in Russia, in 2009, 7–12% of hospitalised patients required artificial ventilation. The calculation of the number of ventilators (per 1 million people) is based on the assumption that 12% of hospitalised patients will need ventilators and each of them will be on a ventilator for an average of 10 days.

The need for ventilators depends on the number of intensive care beds in intensive care units — according to the Russian Ministry of Health regulations, their number should be at least 3% of the total bed stock in the country. As of the end of

[9] Criteria for calculating the stock of prophylactic and therapeutic drugs, equipment, personal protective equipment and disinfectants for the subjects of the Russian Federation for the period of influenza pandemic: Methodological Recommendations MR 3.1.2.0139–18. Moscow: Federal Service for Supervision of Consumer Rights Protection and Human Welfare; 2019. 30 p.

2022, there were 1,172,000 beds, i.e., based on the above ratio, there should be at least 35,000 reanimation beds among them (including intensive care units). According to the order of the Ministry of Health of Russia from 15.11.2012 № 919n, 6 beds of a standard intensive care ward should be provided with seven stationary ventilators and two transport ventilators — for moving patients around the hospital.[10] In other words, all intensive care beds in the country should be equipped with 52,500 ventilators.

These HTMDs are manufactured in accordance with GOST 20790–93, GOST 24264–80 standards. Their average guaranteed service life is 6 years. In the Russian Federation, the HTMDs are supplied under FEACN code 901920 'Apparatus for ozone, oxygen, aerosol therapy, artificial respiration or other therapeutic breathing apparatus'.

[10] Order of the Ministry of Health of the Russian Federation of 15.11.2012 No. 919n 'On Approval of the Procedure for the Provision of Medical Care to the Adult Population in the Profile of Anaesthesiology and Reanimatology'. URL: https://minzdrav.gov.ru/documents/9128

FOREIGN TRADE BALANCE. SUMMARY INDICATORS

The volume of import of ventilators to our country in 2022 is estimated at USD 32 million (about RUB 2.2 billion). Of these, the products worth USD 481 thousand (1.5%) came from EAEU countries, and the products worth USD 31.5 million (100%) — from non-CIS, far-away countries. The size of supplies in 2022 decreased by 25% (*Table 1*).

The volume of exports totalled USD 383 thousand (RUB 410 million), including USD 88 thousand to the EAEU countries. Exports to other countries (non-CIS countries) for the period 2021–2022 decreased by 95% (from USD 6.7 million to USD 0.3 million). In 2022, the share of EAEU countries accounted for 23% of total exports (*Table 1*).

Table 1

Russian import and export of lung ventilators for the period 2017–2022

Index	2017	2018	2019	2020	2021	2022
Cost, million USD						
Import	24.6	54.9	55.3	364.5	42.8	32.0
Exports	0.3	1.2	5.2	16.9	6.7	0.4
Trade balance	–24.3	–53.6	–50.1	–347.6	–36.1	–31.7
Share of exports.%	1%	2%	9%	5%	16%	1%
Cost,. RUB million						
Import	1441	3524	3526	26166	3145	2129
Export	3	63	301	1192	410	24
Share of exports,%	0%	2%	9%	5%	13%	1%

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

Exports account for 1–2 per cent of the country's total foreign trade in value terms.

To calculate the volume of imports in rouble terms, the customs value [includes invoice value, logistics and insurance costs, excluding VAT — in practice it is used to calculate customs payments (duties, customs fees, excise duties, VAT)] was used; to determine the value of exports in rouble terms, the actual value (invoice value) was used.

Some decrease in imports and exports in 2021–2022 was also due to incomplete description of goods in the customs database — some declarations could not be attributed to ventilators or other devices.

IMPORT OF LUNG VENTILATORS

The volume of visible import of ventilators in 2022 was USD 32 million (RUB 2.1 billion) (*Table 2*). After its sharp increase during the COVID-19 pandemic, already in 2021 supplies decreased to USD 43 million (i.e., by 23% as compared to the pre-COVID 2019 level), and in 2022, it fell by another 25 per cent (or 44 per cent compared to 2019). Customs value (declared val-

Table 2

Growth rate of Russian imports of lung ventilators, 2017–2022

Index	Unit of measurement	2017	2018	2019	2020	2021	2022
Cost	USD million	24.6	54.9	55.3	364.5	42.8	32.0
	RUB million	1.4	3.5	3.5	26.2	3.1	2.1
Growth rate to the previous year	% of the amount in USD		123%	1%	559%	–88%	–25%
	% of the amount in RUB		144%	0%	642%	–88%	–32%

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

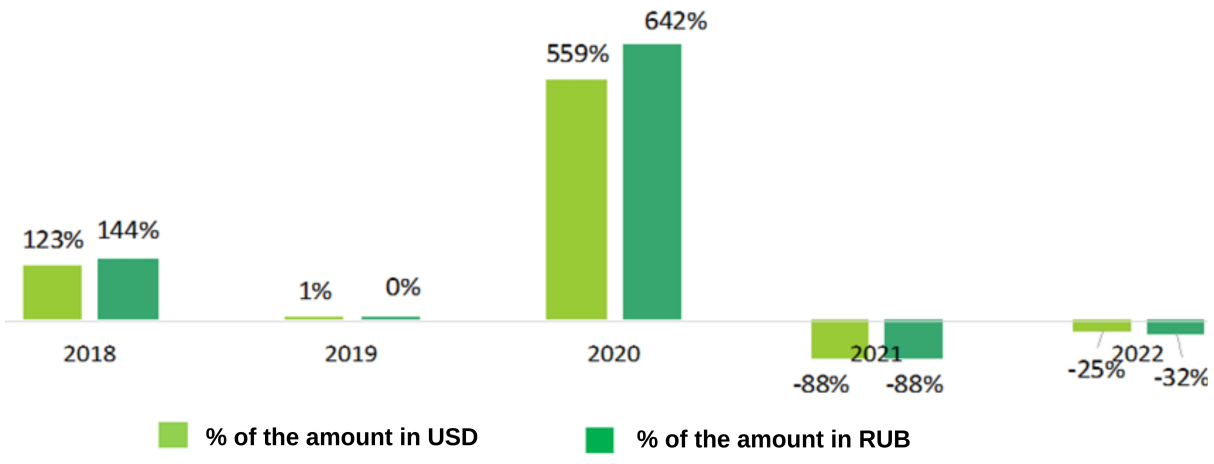


Fig 1. **Dynamics of changes in import supplies of lung ventilators as a percentage to the previous period, 2018–2022**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

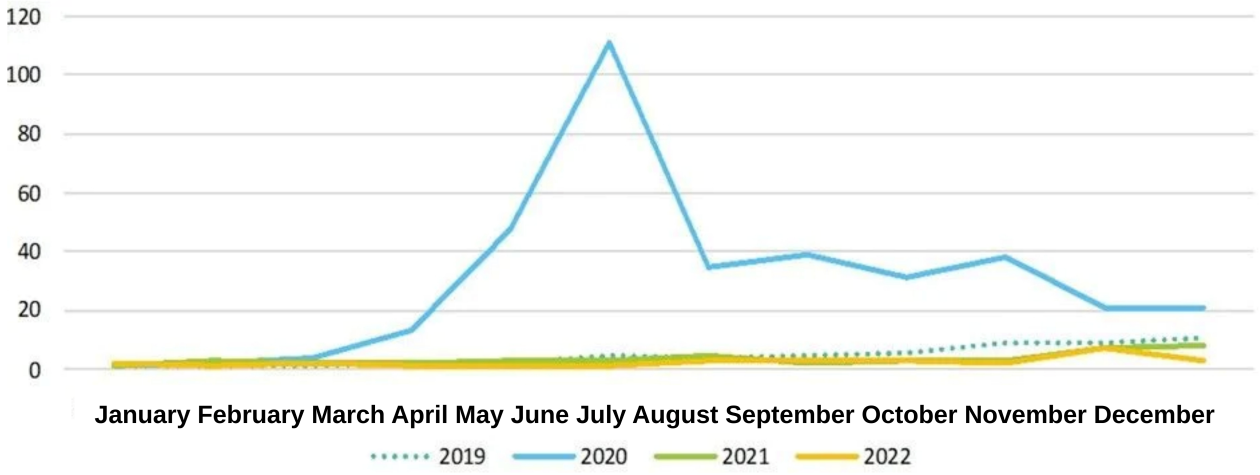


Fig 2. **Dynamics of imports of lung ventilators to Russia by month, 2019–2022, million USD**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

ue of products) was used to calculate the value of imports in roubles, and invoice value (without duties and taxes) was used to calculate the value of exports.

In 2020, ventilators became the most demanded medical product along with protective equipment — their value imports to Russia increased by 6.5 times (from USD 55 million to USD 365 million); and by 7.5 times in rouble terms. In 2021, the volume of imports and exports fell below the indicators of the pre-Covid period (*Fig. 1*).

If we consider deliveries over 3 years by month, then at the very beginning of the COVID-19 pandemic (April 2020), artificial ventilation devices worth $ 13.6 million were imported to Russia (against the previous monthly import volume of $ 5 million); in May — already $ 47 million. The peak occurred in June 2020, when imports of ventilators to Russia reached $ 111 million. From the following year, there was a sharp drop in deliveries (*Fig. 2*).

MANUFACTURING COUNTRIES

Until the beginning of 2022 (with the exception of 2020), Germany was the constant leader in the supply of ventilators to the Russian market. In the pandemic year 2020, the maximum volume was provided by China (USD 189 million), although imports from all countries increased by a significant margin (*Table3*).

In 2022, Switzerland takes the lead in shipments ($ 12.8 million), followed by Germany and China; imports from France, Israel and Slovakia are not so significant ($ 0.6–1.4 million per year each). Supplies from the USA, Ireland, Sweden, and the Republic of Korea were discontinued (*Fig. 3*).

The dynamics of import of ventilators to Russia from 2017 to 2022 in the context of manufacturing and importing countries[11] is shown in *Fig. 4 and 5*.

The author of the study found that one third of the ventilation equipment imported into Russia is manufactured in Switzerland, and half of it is manufactured in Switzerland and Germany. This picture was broken only in the pandemic year 2020, when the maximum volume of supplies was provided by Chinese manufacturers (*Fig. 5*).

[11] Devices may be manufactured in one country, but imported to Russia through other countries. This has become especially characteristic during the sanctions period, when foreign manufacturers are not always able to supply ventilators directly.

Table 3

The volume of lung ventilators deliveries to Russia by importing countries in the period 2017–2022, million USD

Country	2017	2018	2019	2020	2021	2022	Total in 2022 compared to 2021, %
China	0.3	1.5	2.8	189.0	2.1	3.8	81%
Germany	9.9	19.0	19.3	39.0	20.8	9.7	–53%
USA	5.4	10.2	9.6	52.8	2.2	0.3	–86%
Switzerland	4.3	12.4	9.3	25.2	9.1	12.8	41%
Ireland	0.8	2.6	6.6	13.2	0	0	–
Sweden	0.6	4.9	3.8	5.4	1.8	0.0	–100%
Republic of Korea	0.0	0.0	0.2	13.0	0.9	0.1	–89%
France	0.9	1.1	0.8	5.5	1.4	1.0	–29%
Israel	0.1	0.6	0.5	7.9	0.6	0.6	0%
Slovakia	1.4	0.5	0.6	2.5	2.2	1.4	–36%
Argentina	0.1	0.9	0.6	6.7	0	0.3	–
Others	0.8	1.1	1.2	4.3	1.7	2.0	18%
Total, USD million	24.6	54.9	55.3	364.5	42.8	32.0	–25%

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

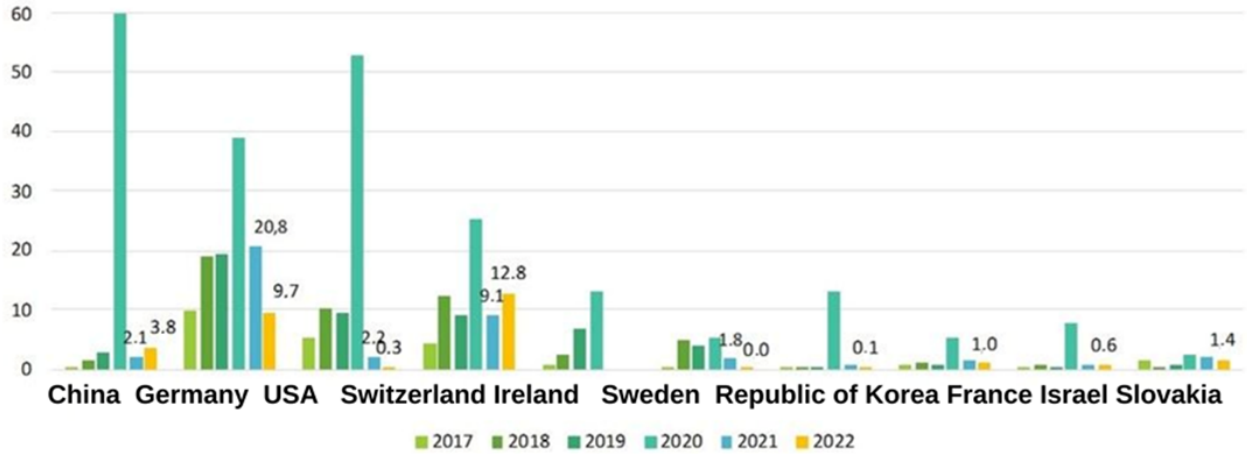


Fig. 3. **Import of lung ventilators to Russia by country, 2017–2022, million USD**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

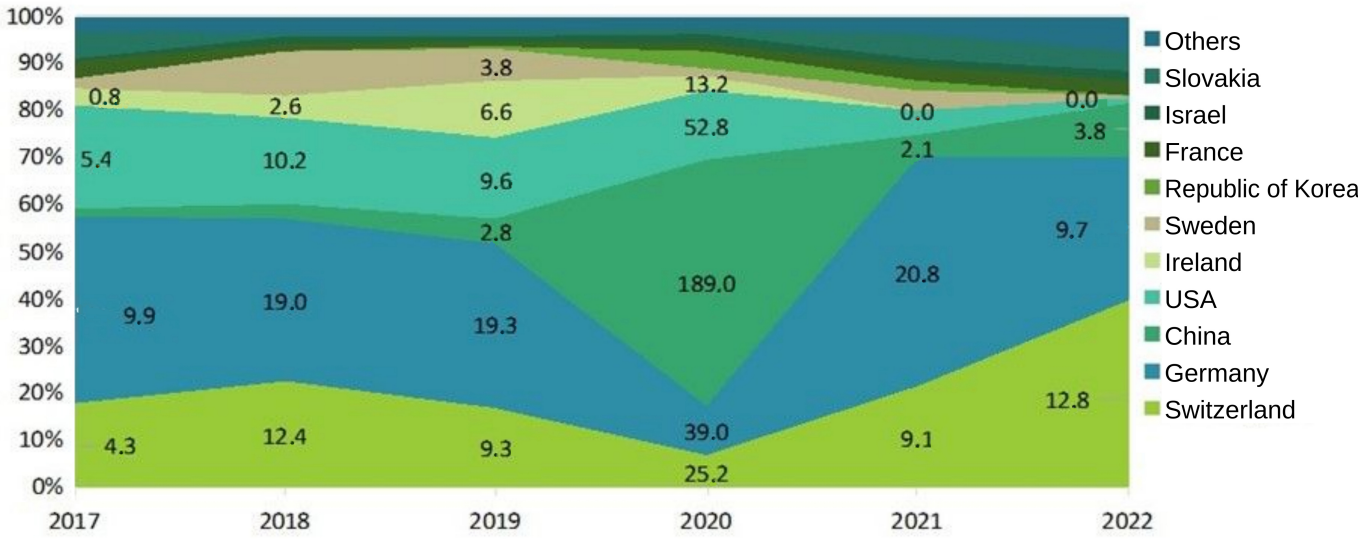


Fig. 4. **Dynamics of imports of ventilators to Russia in the context of manufacturing countries 2017–2022,%**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

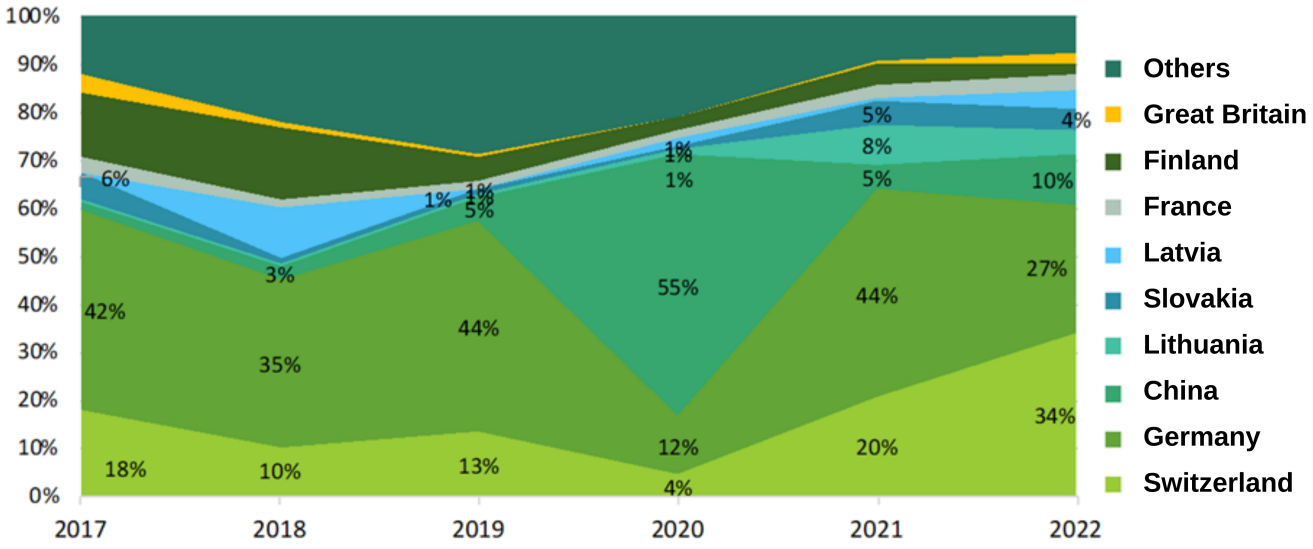


Fig. 5. **Dynamics of imports of ventilators to Russia by importing countries 2017–2022,%**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

LEADERS OF THE RUSSIAN MARKET OF LUNG VENTILATORS

The leaders in the Russian market of ventilators are the German brand Draeger and the Swiss brand Hamilton Medical. In the interval from 2017 to 2022, which is considered by the author of the study, Draeger was the leader (excluding 2020, when the Chinese trademark Yuwell prevailed). However, in 2022, the share of German devices decreased sharply (from 43% to 17%),

Table 4

Trademarks: the dynamics of imports of ventilators to Russia, 2017–2022,% of the total cost

Trademark	2017	2018	2019	2020	2021	2022
Draeger	35%	27%	27%	6%	43%	17%
Hamilton Medical	11%	19%	15%	6%	21%	40%
Mindray	0%	1%	3%	7%	3%	7%
GE	6%	2%	9%	6%	3%	2%
Covidien	3%	5%	13%	3%	0%	0%
Lowenstein	2%	3%	4%	3%	5%	10%
Maquet	2%	9%	7%	1%	4%	0%
Superstar	0%	0%	0%	6%	0%	0%
Chirana	6%	1%	1%	1%	5%	4%
Carefusion	9%	3%	3%	2%	0%	0%
Air Liquide	4%	2%	1%	1%	3%	3%
Yuwell	0%	0%	0%	20%	0%	0%
non-branded	4%	6%	1%	9%	3%	5%
others	18%	22%	16%	30%	10%	12%
Total, million USD	24.6	54.9	55.3	364.5	42.8	32.0

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

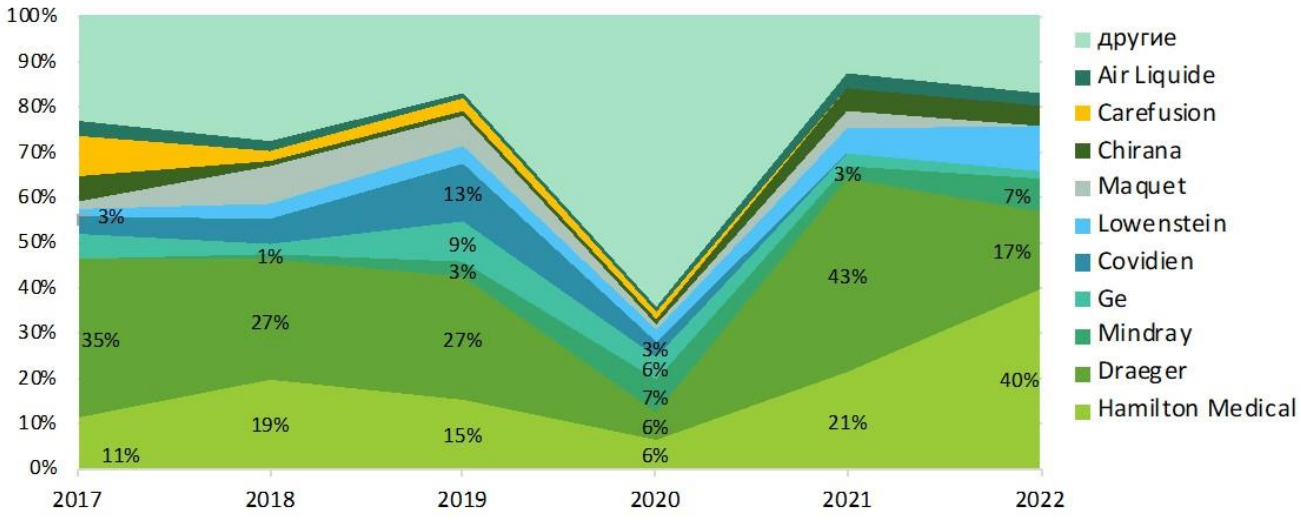


Fig. 6. **Trademarks: dynamics of import shares to Russia, 2017–2022,% of value**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

and the leadership went to the Swiss company Hamilton Medical.

In addition to the two leading manufacturers, we can mention about 10 foreign manufacturers that supply medical equipment for lung ventilation to our country almost every year. Among them are Mindray, GE, Covidien, Maquet, Chirana. In 2022, the share of Lowenstein brand doubled (up to 10%) (*Table 4*, *Fig. 6*, *7*).

Table 5 shows import indicators by TOP-30 trademarks and manufacturing companies.

In addition to the brands already mentioned, which came to Russia from Germany, other brands were also imported — Carefusion, Datex and Philips (*Fig. 7*).

Table 5

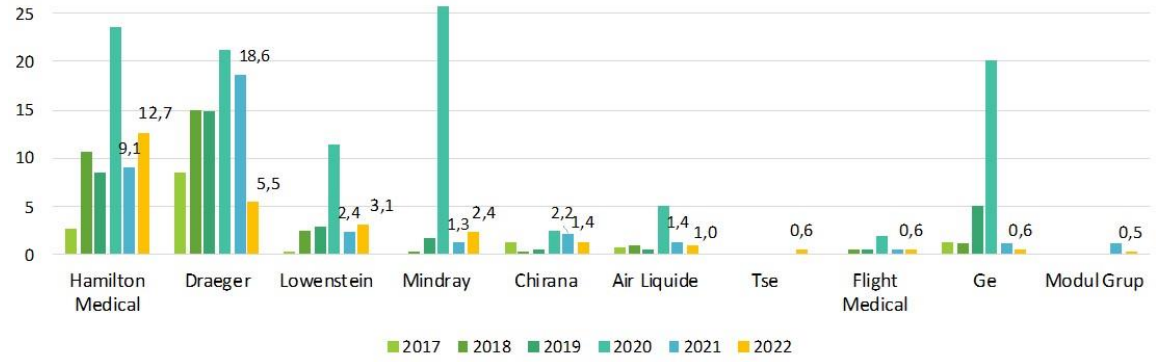
The volume of deliveries of ventilators to Russia in 2019–2022 by manufacturers, countries of origin and brands, million USD

Manufacturer	Country	Trademark	2019	2020	2021	2022
Hamilton Medical Ag	Switzerland	Hamilton	8.5	23.5	9.1	12.7
Draegerwerk. Kgaa.	Germany	Draeger	14.8	21.1	18.6	5.5
Loewenstein Gmbh	Germany	Lowenstein	2.9	11.5	2.4	3.1
Shenzhen Mindray Ltd	China	Mindray	1.8	25.7	1.3	2.4
Chirana A.S.	Slovakia	Chirana	0.6	2.5	2.2	1.4
Air Liquide S.A.	France	Air Liquide	0.7	5.1	1.4	1.0
Tse Systems Gmbh.	Germany	Tse	-	-	-	0.6
Flight Medical Ltd	Israel	Flight Medical	0.5	1.9	0.6	0.6
Datex-Ohmeda Inc	USA	Ge	5.2	20.1	1.1	0.6
Modul Grup	Turkey	Modul Grup	-	-	1.3	0.5
Tecme S.A.	Argentina	Tecme	0.5	6.5	-	0.3
Resvent Medical Technology Co. Ltd	China	Resvent	-	1.0	0.3	0.3
Vyaire Medical Inc.	USA	Vyaire		2.2		0.2
Sle Limited	UK	Sle	-	-	-	0.1
Plasti-Med Plastik Ltd	Turkey	Plasti-Med	-	-	-	0.1

Table 5 (continued)

Manufacturer	Country	Trademark	2019	2020	2021	2022
Mekics Co, Ltd.	Korea	Mekics	0.2	13.0	0.9	0.1
Bmc Medical Co. Ltd	China	Bmc	0.1	8.4	0.2	0.1
Acutronic Medical	Switzerland	Acutronic	0.9	1.7	-	0.0
Maquet Critical Care	Sweden	Maquet	3.6	4.8	1.7	0.0
Inovytec Medical Solutions Ltd	Israel	Ventway, Inovytec.	-	3.0	-	0.0
Beijing Aeonmed Ltd	China	Aeonmed	-	3.9	-	-
Covidien Ltd	Ireland	Covidien	7.0	13.2	-	-
Beijing Aeonmed Ltd	China	Dixion	0.4	5.7	-	-
Carl Reiner Gmbh	Austria	Carl Reiner	0.2	1.5	-	-
Respironics Inc.	USA	Respironics	-	1.5	-	-
Mederen Neotech Ltd	China	Mederen	0.5	1.2	-	-
Imtmedical AG	Switzerland	Bellavista	-	-	-	-
Nanjing Superstar Ltd	China	Superstar	-	21.6	-	-
Datex-Ohmeda Inc.	USA	Datex	1.4	3.0	0.5	-
Ms Westfalia Gmbh	Germany	Ms Westfalia	0.0	4.7	-	-
Event Medical Ltd	USA	Event Medical	0.3	4.1	-	-
Suzhou Yuyue Ltd	China	Yuwell	-	71.6	0.0	-
Shenzhen Prunus Ltd	China	Prunus	-	10.8	-	-
Carefusion Inc.	USA	Carefusion	1.4	5.7	-	-
Total, million USD			55.3	364.5	42.8	32.0

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing



Puc. 7 / Fig. 7. **Trademarks: import of ventilators to Russia, 2017–2022, million dollars**

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

Table 6

Dynamics of exports of ventilators from Russia in the period from 2017 to 2022

Index	2017	2018	2019	2020	2021	2022
Cost, thousand USD	256	1217	5156	16871	6663	383
Cost, RUR million	15	63	301	1192	410	24
Ratio of exports to imports volumes in USD,%	1%	2%	9%	5%	16%	1%
Export growth in USD compared to the previous year,%	-	375%	324%	227%	–61%	–94%
Export growth in RUB compared to the previous year,%	-	323%	375%	296%	–66%	–94%

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

EXPORT OF LUNG VENTILATION DEVICES

The volume of export of ventilators from Russia in 2022 totalled only USD 383 thousand (RUB 24 million). This is almost 20 times (by 94%) lower than the previous year (*Table 6*).

Such a sharp decline was caused primarily by the temporary ban on the export of foreign medical devices from Russia,[12] which prevented their deficit against the background of sanctions imposed by unfriendly states.

The share of Russian-made products in the total volume of exports of ventilators in the 2017–2021 period averages 90%. In 2022, all exported devices were manufactured in our country.

Most of them were manufactured by the enterprises JSC Ural Instrument-Making Plant and Firm Triton-Electronics LLC. The volumes of export deliveries of ventilators from other Russian

[12] Resolution of the Government of the Russian Federation of 06.03.2022 No. 302 'On the introduction of a temporary ban on the export outside the Russian Federation of medical devices previously imported into the Russian Federation from the territory of foreign states that have decided to impose restrictive economic measures against the Russian Federation'. URL: https://www.alta.ru/tamdoc/22ps0302/

Table 7

Destination countries: Dynamics of exports of ventilators from Russia, 2017–2022, thousand USD

Destination country	2017	2018	2019	2020	2021	2022
Peru	-	-	33	99	1670	197
Indonesia	-	11	152	786	742	58
Kazakhstan	-	-	-	-	-	43
Belarus	-	-	—		-	33
Moldova	-	-	43	187	23	27
Kyrgyzstan	-	-	-	-	-	13
Pakistan	-	-	-	-	-	9
Uzbekistan	162	378	3933	5202	32	3
Serbia	-	-	-	6658	-	-
Ukraine	-	22	33	65	1977	-
India	-	398	18	13	558	-
Lithuania	17	13	-	-	849	-
China	-	-	-	682	-	-
Malaysia	-	11	28	205	413	-
United Kingdom	-	-	13	414	-	-
Azerbaijan	-	59	298	9	15	-
Latvia	-	4	-	300	-	-
Switzerland	-	-	-	285	-	-
Bangladesh	-	-	51	89	43	-
South Ossetia	-	-	74	18	73	-
Tajikistan	28	58	51	8	-	-
Others	49	262	205	406	261	-
Unspecified	-	-	226	1444	-	-
Total, thousand USD	255	1216	5156	16 871	6657	383

Source: compiled by the author based on data from the Federal Customs Service of Russia (2012–2022) and the Federal Customs Service of the EAEU (2022). URL: https://drive.google.com/file/d/11fwcs-1yniVzCXwsIRDuCf_90bs0Sg7O/view?usp=sharing

manufacturers [(JSC PO UOMZ (Urals Optical and Mechanical Plant)], TMT LLC (TMT Production Enterprise),[13] Medprom LLC, Krasnogvardeets OJSC, Dixion LLC, Aksion Concern LLC, etc.) are noticeably smaller.

The countries — recipients of products are presented in *Table 7*. In 2022, the largest volume of ventilators was supplied to Peru (almost USD 200 thousand and USD 100 thousand and USD 1.7 mil-

[13] TMT Production Company (official website). URL: https://www.tmt-medtech.com/

lion in previous years). In 2021, the largest buyer was Ukraine (and now the new Russian territories of LNR and DNR) — for USD 2 million. The largest destination countries in the pandemic 2020 were Serbia (for USD 6.5 million), Uzbekistan (USD 5.2 million), Indonesia (USD 0.7 million).

CONCLUSIONS

The current decrease in the volume of imports of ventilators is due to the end of the pandemic and, as a consequence, the reduced need for this equipment. Thus, shipments from Germany decreased by 52%, USA — by 86%, Korea — by 98%, France — by 29%, Slovakia — by 36%, and from Sweden stopped altogether. In contrast, the scale of shipments from China increased significantly (by 81% compared to 2021). Switzerland also increased its shipments to 41%, which can be explained by the high degree of commitment of the Russian medical community to the brands belonging to this country, whose products are characterised by a wide range and high quality.

The volume of exports to non-CIS countries decreased by 95% due to low demand for Russian ventilators and the introduction of a temporary export ban.[14] The share of EAEU countries in the market in 2022 was 23%.

The obtained results of the analysis of the market of ventilators correlate with the indicators of other segments of the high-tech medical equipment market, where there is a gradual reduction in the volume of supplies from Europe and the USA and an increase in the share of manufacturers from Asian countries [12].

The results of this study can be applied by Russian manufacturers of artificial ventilation equipment to assess the growth potential, as well as by authorities to set priorities for strategic development by market segments. In order to fully understand the priority areas for further work, a number of similar studies on other strategically important segments are required.

[14] Resolution of the Government of the Russian Federation of 06.03.2022 No. 302 'On the introduction of a temporary ban on the export outside the Russian Federation of medical devices previously imported into the Russian Federation from the territory of foreign states that have decided to impose restrictive economic measures against the Russian Federation'. URL: https://www.alta.ru/tamdoc/22ps0302/

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