ORIGINAL PAPER

DOI: 10.26794/2220-6469-2024-18-3-6-16
UDC 338.3(045)
JEL D20

AI Tools in the Digital Transformation Programmes of Industrial Enterprises

N.M. Komarov[a], S.S. Golubev[b], D.S. Pashchenko[c], A.G. Shcherbakov[d]
[a,b] All-Russian Research Institute "CENTER", Moscow, Russia;
[c] Independent researcher in the field of software development, Moscow, Russia;
[d] ASPI group of companies, Moscow, Russia

ABSTRACT

This article is devoted to the study of the prospects for the development and implementation of AI in industry in the context of digital transformation. Autonomous factories, integrated supply chains, and autonomous vehicles is a real proof of technological advances that AI brings to life. The article highlights a number of problems and challenges for Russian industry based on the results of applied research conducted in November-December 2023 at 18 medium and large industrial enterprises. The main conclusions include not only the identified systemic problems and risks (shortcomings in digitalisation methodology, ambiguity in calculating economic parameters, lack of technical expertise), but also the most promising areas for the development of AI technologies. The study finds significant potential for enhancing the technologies of the Industry 3.0 and Industry 4.0 paradigms using AI tools. Also, it describe the necessary changes in enterprise management and regulatory government activities aimed at realising the identified potential. In conclusion, the article emphasises the need to optimise parallel imports, develop human capital and adequately analyse the economic parameters of industrial enterprises' digital transformation project. The authors emphasise the relevance of studying the prospects for the development of AI in industry for Russian economic science in the period 2024–2026.
Keywords: industry 4.0; artificial intelligence; digital transformation; technology

For citation**: Komarov N.M., Golubev S.S., Pashchenko D.S., Shcherbakov A.G. AI tools in the digital transformation programmes of industrial enterprises. *The World of the New Economy*. 2024;18(3):6-16. DOI: 10.26794/2220-6469-2024-18-3-6-16**

INTRODUCTION AND FORMULATION OF THE RESEARCH PROBLEM

The use of artificial intelligence (AI) represents a pivotal technological trajectory in the ongoing digital transformation of industry. The term artificial intelligence was introduced in the mid-20th century, coinciding with foundational research and experimental endeavors aimed at delineating the types of tasks AI could perform with greater speed, precision, and reliability than human counterparts. Distinct from robotics, AI was conceived to address specifically "human-centric" tasks — creative yet logically structured and amenable to algorithmic representation. The initial practical efforts of A. Newell and H. Simon in the late 1950s sought to develop software systems capable of emulating human cognitive processes, such as mathematical theorem proving or engaging in dialogues with other systems. This approach ensured the algorithmic functionality of AI but necessitated the integration of tens of thousands of dependencies and rules within the software architecture. Concurrently, from the mid-1960s, an alternative paradigm emerged, focusing on programming algorithms not for the direct operation of AI but for its ability to learn — a concept analogous to neural networks in the human brain. This line of inquiry culminated in the development of the first perceptrons, artificial neural networks capable of learning and performing tasks analogous to the functions of biological neurons. Contemporary AI tools employed across economic sectors, particularly in industrial applications, amalgamate these two approaches. For example, expert systems incorporate extensive rule-based dependencies within their codebase, while advanced AI methodologies in domains such as computer vision or digital twins undergo extensive training on large-scale datasets. By the close of the 20th century, AI tools had achieved significant specialization, both at the industry and niche levels, enabling them to solve distinct classes of problems with efficacy comparable to that of human experts [1]. This acceleration was facilitated by the resolution of a critical limitation — insufficient computational power. By the dawn of the 21st century, machine learning had evolved into a highly intricate discipline, equipped with a robust suite of automation tools, and emerged as an independent technological domain within the broader framework of artificial intelligence. Its efficacy has witnessed continuous enhancement over the past 25 years, marked by significant milestones such as the formulation of principles for self-learning neural networks, spanning from early deep learning methodologies in the 1980s to the current analysis of big data [2]. Among the most transformative developments in neural network research has been the realization of multilayered architectures. At present, multilayer neural network architectures constitute the most prominent and thoroughly researched approach. Such networks are capable of modeling complex processes and addressing a wide array of industrial challenges, with the number of layers and the neurons per layer directly influencing the complexity and adaptability of the system's functional capabilities [3].

The emergence and development of the "Industry 3.0" technological paradigm at the turn of the century coincided with the evolution of artificial intelligence (AI). Adherence to the "Industry 3.0" concept implies extensive use of electronics and automation, with the AI tools of that era classified primarily as expert systems. For instance, at the beginning of the 21st century, Volkswagen Group utilized machine learning technology to monitor product quality. By analyzing historical production process data, AI identified potential defects during manufacturing, thereby increasing the reliability of vehicles. Around the same time, advancements in robotics among industrial leaders and increased computational power enabled the application of AI in robot management. For example, Hyundai

Heavy Industries has successfully deployed AI-equipped robots for over a decade to service ships and ports. These robots, capable of autonomous movement in complex environments, perform a wide range of tasks, including loading, equipment installation, and maintenance. One of the earliest projects in Russia aligned with the "Industry 3.0" paradigm was the integration of AI into drilling rig management processes by Gazprom Neft. This implementation enhanced the safety and efficiency of drilling new wells.

The modern "Industry 4.0" paradigm represents the next stage in the technological evolution of industry, combining AI, the Internet of Things (IoT), and big data analytics to create fully automated and intelligent production systems such as "smart factories", "smart mines", and "smart warehouses". The accessibility of "Industry 4.0" technologies — including IoT, computer vision, industrial Wi-Fi, data warehouses, and non-relational databases — enables real-time processing of vast data volumes. This capability significantly enhances the mechanisms for AI learning and improvement [4]. Moreover, the "Industry 4.0" paradigm has already introduced new concepts that are transforming various sectors, including:

- Intelligent Internet of Things (IIoT);
- AI-driven engineering;
- Predictive systems based on big data.

AI systems are actively being developed today, with their economic efficiency serving as a key vector of competitiveness in the global economy. For instance, in Germany, so-called "smart factories" are being created. Siemens is developing control systems that automatically regulate production processes in real time based on data about demand and equipment status. This approach significantly enhances production efficiency and reduces costs. Similarly, Mercedes has constructed a fully autonomous automobile manufacturing plant where AI systems manage robotic vehicle production in real time. These systems process vast streams of data from all production lines, warehouses, raw material inventories, and even sales and logistics processes. Another notable example is autonomous vehicles, whose movement and operation are managed by AI systems capable of analyzing the surrounding environment and making safe navigation decisions. These technologies are central to the future of transportation. Companies such as Hyundai in South Korea, KAMAZ in Russia, and Tesla in the United States have already developed pilot models for use on public roads.

At the same time, the continuous reduction in the cost of training and operating AI tools will eventually make such solutions standard for enterprises operating within the "Industry 4.0" paradigm. Understanding the current state of affairs, objective barriers, and associated risks is critical for Russian economic science, emphasizing the relevance of the research goal: to assess the demand for and prospects of AI technology adoption in industrial enterprises under conditions of digital transformation. The development of AI tools involves not only simplifying and reducing the costs of these technologies but also designing optimal usage scenarios and creating conditions under which these tools will be most effective, given existing constraints. The economic factors outlined above enable an analysis of the prospects for the development of AI tools within the context of industrial digital transformation during 2024–2026.

APPLICATION OF AI TECHNOLOGIES IN THE DIGITAL TRANSFORMATION OF INDUSTRIAL ENTERPRISES

To address the outlined scientific objectives, an applied study was conducted in October–November 2023. The study involved 18 medium-sized (up to 1,000 employees) and large industrial enterprises from the following regions (listed in descending order of representation): Moscow, Moscow Region, Novgorod Region, Saint Petersburg, Udmurt Republic, Sakha Republic, and Krasnodar Territory. The goal was to identify key challenges in the practical implementation of AI technologies and elements into the production and business processes of industrial enterprises, focusing on insights from ongoing digital transformation projects.

The research employed a two-round expert panel method, synthesizing opinions and experiences from employees and managers of industrial enterprises: 1) Remote opinion collection via Google Forms 2) Feedback collection on structured findings from participating experts (including objections, comments, and additions). The general results revealed that:

1. AI tool adoption in industrial production remains fragmented, with various risks and challenges, such as:

- The digitalization methodology is underdeveloped, with unclear scenarios for calculating return on investment, insufficient understanding of the technical aspects of AI tools' operation and development, and poor integration of AI technologies into enterprises' broader IT landscapes.
- The average cost of AI implementation projects needs substantial reduction. This requires addressing hardware and software shortages, overcoming the isolation of Russia's technological sector, and reversing the brain drain of IT specialists.

2. Existing technologies from the "Industry 3.0" paradigm, such as automation, robotics, and expert systems (developed since the late 20th century), can be significantly enhanced by AI tools. However, for more than half of the enterprises studied, these advancements have not yet been implemented.

3. Technologies from the "Industry 4.0" paradigm face similar challenges. Despite isolated successes, particularly in implementing Artificial Intelligence of Things (AIoT) and AI-driven engineering concepts, the overall situation requires substantial investment in technological infrastructure and, specifically, AI tools for over two-thirds of the enterprises surveyed.

In this article, in line with the outlined scientific objectives, the focus is placed on expert forecasts regarding the short-term prospects for the development of AI technologies in industrial digital transformation projects. Two key success factors for such programs were identified:

- Understanding the real objectives of digitalization programs by participants — 47% of experts;
- Economic feasibility of digitalization projects — 42% of experts.
- Two primary barriers to implementing AI systems in industrial processes were also identified:
- High costs of AI-driven digitalization projects — around 60% of experts;
- Lack of personnel, knowledge, and adequate digitalization methodologies in industry — around 53% of experts.

The optimal balance between the speed of implementation (and associated costs) and potential economic benefits determines the most promising development paths for AI technologies in industry. Over the planning horizon of 2024–2026, these are:

- Data analysis (including telemetry) and decision-making support — 84% of experts;
- "Smart manufacturing", including AI-driven engineering — 58% of experts;
- Autonomous management (of workshops, machines, and equipment) — 42% of experts;
- Smart industrial safety systems (for personnel, equipment, and facilities) — 42% of experts.

Additionally, the most critical ideas and observations to improve the success of AI implementation practices in industry were agreed upon. For instance, there is a need to find optimal solutions to address increasing risks of various kinds. Some issues are being temporarily resolved (e.g., parallel imports enable the supply of hardware), while others cannot yet be addressed (e.g., replacing U.S.-developed AI solutions that lack equivalents in Russia or China). Regulatory pressures related to import substitution have become an additional risk factor for some industrial enterprises, negatively affecting current business performance and reducing the likelihood of rapid digital transformation across industrial sectors. Furthermore, existing methodologies for calculating the profitability of AI implementation (and broader digital transformation projects) require improvement. Overall, the profitability of AI tools in industry remains a contentious issue, heavily influenced by unpredictable macroeconomic factors. This underscores the need for more reliable evaluation methodologies and risk mitigation strategies to unlock the full potential of AI in industrial applications.

Experts also noted a moderate increase in investment volumes (adjusted for inflation) in industrial digital transformation projects involving AI technologies. Approximately one-third of experts reported a significant rise in investments, surpassing the previous peak of 2019–2020. In the short term, around 80% of study participants associated the development of all AI tools with government investments in the sector, aimed at promoting hardware import substitution. According to roughly half of the experts, such substitution is essential for advancing AI technologies.

At the same time, the participants demonstrated a strong commitment to developing the most promising AI technologies in the industrial sector, including:

- AI-driven engineering;
- Big data processing and decision-making support.

Both technologies are considered the most promising applications of AI tools in the industry, offering substantial potential for enhancing operational efficiency and innovation.

PROSPECTIVE ANALYSIS OF AI TOOL DEVELOPMENT

The prospects for the development of AI tools for digital transformation projects in industrial enterprises are based on operational and tactical management of numerous risks, which have become even more relevant following the pandemic and the Ukrainian crisis. The pressure from these risks makes long-term strategic planning and goal-setting less effective but allows for the structuring of the following approaches to the development of AI tools in Russia's digital economy:

- Accelerated digitalization of the economy and overcoming the risks of an "AI winter";
- Transition from declared to actual import substitution;
- Creation of a significant HR capital[1] for the operation of digital technologies.

The accelerated digitalization of the economy, including the development of AI technologies, is regulated by a set of regulatory acts and federal development programs in Russia[2] [5]. However, goal-setting must be followed by theory, methodology, and financing for numerous projects in enterprises and industrial holdings. The economically unclear results demonstrated by leaders in domestic industry and pioneers of digitalization in the implementation of AI technologies highlight the need to improve the theory and methodology of AI use in the digital transformation of industry. The current development vector, which relies on foreign technologies, the experience of Western consulting companies, and difficult-to-recover investments, is unpromising in the context of the radical reduction in the availability of all the aforementioned resources.

The experience of European and American industrial corporations shows that AI technologies are profitable and represent the main pathway for the development of increasingly complex

[1] Hereinafter, the concept of "human capital" is used in a broad sense, as a productive factor in economic development, including a highly educated part of the labor force, knowledge, tools for intellectual and managerial work, living environment and work activity, allowing to reveal and use the personnel potential of enterprises or industries.

[2] URL: https://ai.gov.ru/strategy/federalnyy-proekt-ii/

concepts within the "Industry 4.0" paradigm. However, in addition to the factor of hardware and software availability, a crucial role is played by the clear economics of each project. For Western industrial corporations, the research and evaluation phase has been completed, and AI technology projects are successful and scalable across production sites, with a clear understanding of their role in the value-added chain. These are no longer pilot or research projects, but full-scale digitalization tools for enhancing competitive capabilities. It is quite evident that the developed methodology for implementing AI tools supports key economic parameters and allows for the amortization of innovations within a realistically predictable time frame. It can be assumed that a new trend in the Russian market in the coming years will be the emergence of domestic consulting companies that will actively participate in the digital transformation of industrial sectors, developing digitalization methodologies with economically understandable justifications and repeatable AI technology implementation results [6].

In the applied research, experts linked overcoming the current difficulties in the practical development of AI technologies to strengthening government support for fundamental research in this area. There is an objective risk of an "AI winter", when the already spent investments are insufficient to achieve the set goals, and large-scale investment programs and related research are completely halted. Retrospectively assessing the history of technology development, it should be noted that such "winters" — prolonged periods of sharp reductions in investment and interest (commercial, academic, etc.) in AI technologies — have already occurred. [7]. Overall, there has been a significant increase in the cost of projects involving any technological innovations within the framework of digitalizing industrial enterprises in Russia [5]. Therefore, experts rightly noted that the most significant factor in overcoming the risks of another "AI winter" in Russia is the increase in fundamental government investments in applied AI technologies. Another significant factor is the "elimination of hardware shortages", which has been addressed in recent years through parallel imports [8].

A significant influence on the prospects for the development of AI technologies is another trend of 2022–2023 — the shift from declared to real import substitution in the field of information technology. On the one hand, this direction has been chosen and is supported by industry regulators and state institutions. On the other hand, at the practical level, import substitution in certain areas of information technology not only worsens the competitive opportunities of Russian enterprises but also seems impossible for many years. For example, in another author's study conducted in October 2023 on the topic "Strategy and Tactics of Developing Corporate IT Landscape Amid Technological Embargo and Accelerated Import Substitution", presented at the "Kutafinsky Readings MGUA 2023" conference in the "Economics" section, the experience of the Russian IT industry was analyzed from the perspective of real and declared import substitution. Information was collected through interviews with managers of Russian IT companies and corporate clients, covering brands such as Yandex, Sber, VTB 24, Bank Saint Petersburg, Nestlé Russia, Coca-Cola Russia, Dom.RF, PSB Group, Lamoda, Aukso, Open Vision, Infosytems Jet, and others. The responses were then summarized, approaches and results were evaluated, and a roadmap was created to identify management opportunities, best practices, and lessons learned from active import substitution of hardware and software in 2022–2023.

The study showed that the processes of declared and real import substitution in the Russian economy are highly dependent on three factors:

- Regulatory pressure from government authorities;
- The efficiency of parallel imports[3];

[3] Hereinafter, the optimality of parallel import means a set of

• The capabilities of the corporation itself to create software and hardware, i.e., ready-made IT solutions.

Undoubtedly, the national IT industry demonstrates steady economic growth, but this process is largely related to the increase in service prices, the need for parallel imports, and government support, rather than the creation and sale of new software and hardware to replace the departed Western suppliers (despite the declarations and speeches at large professional IT industry conferences in the second half of 2023).

In the long term, up until 2030, it is difficult to assess whether the influence of regulatory pressure from government authorities in the area of IT import substitution will have a positive or negative impact on the Russian economy as a whole. Unlike sectoral and targeted support programs or federal projects, direct regulatory pressure is perceived negatively by many participants in the study mentioned above, and the management reaction from their leaders (both in private and state-owned corporations) tends to be focused on formal compliance with regulatory requirements — at the expense of the strategic interests of the business and its clients in the short term. For example, despite obvious challenges, for a class of corporations whose activities are defined by law as critical and infrastructural for the Russian economy, import substitution processes are mandatory. For such corporations, Presidential Decree No. 166[4] is the dominant motivation for the development of informatization and digitalization, which directly affects the choice of solutions and their implementation. The study analyzed all typical types of software and hardware: from communication tools to servers, from operating systems to peripheral devices. In this chapter, we are most interested in the set of technologies for creating AI solutions.

The *Table* highlights the elements and the dominant successful AI solution for real or declared import substitution, applied by most of the corporations whose representatives participated in the study. The last column specifies alternative approaches, conditionally successfully applicable to the Russian IT market, as well as scenarios for state-owned corporations that are required to fully replace imported software by 2025.

It should be noted that in the spring of 2023, there was no mass rejection of hardware. Even in the most problematic areas (telecommunications equipment from CISCO and servers from all global brands), Russian corporations were prepared for the corresponding risks. Although there was a surge in demand for any hardware from March 2022, by mid-2023, parallel import mechanisms (including “gray” and “black” schemes) were able to meet the minimal needs of the Russian economy. It is evident that the hardware elements of AI solutions in the short term will rely on parallel imports. Summarizing the prospects for the development of AI tools within the import substitution trend, the following should be noted:

1. The refusal of Western companies to cooperate with Russian partners, regulatory pressure from the state, and the general business turbulence have led to clear interest (and budgets) for real, not just declared, import substitution in the field of simpler information technologies. However, for more complex AI technologies, this is difficult, if not impossible.

2. The development (and cost reduction) of digital transformation projects with AI technologies critically depends on the effectiveness of parallel import development: the efforts of the Russian IT industry are directed toward other goals.

3. Despite a significant human capital base and proprietary IT technologies, only a few Russian corporations (such as Sber or Yandex) have

classical economic parameters: the final cost of ownership, quality guarantees and repairs, delivery time to the end consumer, the possibility of commissioning as part of an IT solution.

[4] URL: https://www.garant.ru/products/ipo/prime/doc/403684114/

Table

Import substitution options in AI solutions

AI Solution Element	Role of the Element	Recommended Solution	Implementation Features
High-Level Business Solution (End Information System)	Processing and storing information, finding the final solution via algorithm and delivering it to the required information system	Import substitution is only required for the database management system (DBMS), recommended solution – transition to open-source software PostgreSQL	It is recommended to develop in-house or outsource to system integrators for "turnkey" solutions
Neural Network Training	Creating a working target algorithm for decision-making	Solution from Sber – Kandinsky 2.1. Solution from Yandex – YaLM –	Corporations with strong internal development create their own solutions
System Software for Peripheral Devices (sensors, cameras, network nodes, etc.)	Collecting and transporting "raw" data (digital images, signal parameters, etc.)	No options for import substitution	Typically supplied together with the devices
Hardware – Peripherals	Receiving and transporting "raw" data (digital images, signal parameters, etc.)	There are no options for import substitution. Parallel import and search for suppliers from China	Certification of Chinese equipment under Russian brands
Basic Hardware	Information processing and storage	There are no options for import substitution. Parallel import	Certification of Chinese equipment under Russian brands

Source: compiled by the authors.

been able to continue developing AI technologies after 2022. Industrial corporations (with rare exceptions) have adopted a wait-and-see approach.

- уход западных технологических компаний и закрытие их центров обучения;
- массовый отъезд российских IT-специалистов за рубеж;
- кратное повышение цен на услуги российских IT-компаний, в том числе в области обучения специалистов.

A critically important factor for the operation of AI technologies remains human capital the ability of industrial enterprises to engage their employees in the practical implementation and daily use of digital technologies. Organizational efforts in this direction are widely recognized: the creation of specialized organizational structures, training and retraining programs, and dedicated budgeting to strengthen the company's human capital. However, since 2022, additional risks have emerged in this area:

- The departure of Western technology companies and the closure of their training centers;
- The mass emigration of Russian IT specialists abroad;
- A significant increase in the prices of services offered by Russian IT companies, including in the field of specialist training.

In the aforementioned applied research, experts from industrial enterprises pointed out these factors. Therefore, human capital should be considered one of the dominant factors in the development of digital technologies, including AI. It is the operation (rather than the design or implementation) of AI technologies that ultimately determines their economic effectiveness, and thus impacts, at the tactical level, the continuity of funding for digitalization programs. The development of human capital remains a fundamental condition for the success of practical digitalization and AI programs.

CONCLUSION

Summarizing the results of this research, it is important to note that the field of AI is at the intersection of complex technological challenges, geopolitical uncertainty, and stringent economic requirements for the timely return on investments. Clearly, Russian industry cannot continue to implement digital technologies solely through subsidies or without recouping investments [9], which means the development of AI technologies has become a complex scientific and practical issue, as well as a subject of current research. Rapid changes in the surrounding economic reality leave little room for precise adherence to long-term plans; on the contrary, they require a flexible response to any significant changes and the adjustment of digital transformation programs to new constraints and opportunities[10]. The analysis of the main research results revealed several key aspects that serve as solutions to the scientific problem posed:

1. Limitations in the application of AI in industry

The use of artificial intelligence tools in industrial production remains fragmented. They are poorly integrated into the IT landscapes of industrial enterprises, and the results of their work are rarely processed automatically. These processes are heavily influenced by risks and difficulties related to the methodology of digitalization based on AI technologies, uncertainty in calculating the profitability and economic feasibility of innovations, as well as a shortage of technical expertise in operating AI tools.

2. Significant potential within the "Industry 3.0" and "Industry 4.0" paradigms

All digital technologies in both paradigms can be complemented by AI tools. However, many enterprises have not yet implemented the corresponding projects, which implies the need for significant investments in the development of AI technologies in the medium term.

3. Expert forecasts and prospects for AI development

In the 2024–2025 timeframe, experts identified several promising technological areas for AI implementation: big data analysis, "smart manufacturing", autonomous control of production systems, and industrial safety monitoring. The key success factors in implementing digital transformation programs for industrial enterprises include employee understanding of program goals and the economic profitability of innovations. Conversely, the main barriers to AI system implementation are high project costs, lack of knowledge among project participants, and insufficient expertise.

4. Import substitution and the role of parallel imports

Contrary to the market participants' expectations, real import substitution of AI technologies proves to be extremely challenging in the near future. The approaches used are often declarative in nature and do not constitute true import substitution, only increasing the budgets of digitalization programs for industrial enterprises. The actual development potential of the AI market in Russia largely depends on the success (optimality) of parallel imports.

5. Human capital as a key factor

Despite the complex and uncertain prospects for the development of AI technologies in Russia, human capital remains a dominant factor. The successful implementation and operation of AI technologies depend on the ability of enterprises to attract qualified and motivated employees to this field. After 2022, additional risks emerged, reducing the full utilization of human capital, which is already having a noticeable negative impact.

Considering the above, it should be emphasized that the effective development and implementation of AI in industry require significant changes in enterprise management. The key areas in this regard are the optimality and continuity of parallel imports, the development of human capital, and the methodology for digital transformation, with an emphasis on evaluating the economic indicators of relevant innovations.

REFERENCES

1. Brooks R.A. Elephants don't play chess. *Robotics and Autonomous Systems.* 1990;6(1–2):3–15. DOI: 10.1016/S 0921–8890(05)80025–9
2. Sabanin V.R., Smirnov N.I., Repin A.I. Automatic control systems based on neural network technologies. In: Proc. Int. sci. conf. Control-2003. Moscow: Moscow Power Engineering Institute Publ.; 2003:45–51. (In Russ.).
3. Baskin I.I., Palyulin V.A., Zefirov N.S. Application of artificial neural nets to the chemical and biochemical investigations. *Vestnik Moskovskogo universiteta. Seriya 2: Khimiya = Moscow University Chemistry Bulletin.* 1999;40(5):323–326. (In Russ.).
4. Kalatskaya L.V., Novikov V.A., Sadov V.S. Organization and training of artificial neural networks. Experimental tutorial. Minsk: Belarusian State University Publ.; 2003. 72 p. (In Russ.).
5. Dorzhieva V.V. National priorities for the development of industrial artificial intelligence amidst new technological challenges. *Voprosy innovatsionnoi ekonomiki = Russian Journal of Innovation Economics*. 2022;12;(1):111–122. (In Russ.). DOI: 10.18334/vinec.12.1.114205
6. Komarov N.M., Pashchenko D.S. Increasing the speed of innovation in industry in the context of digitalization. *Vestnik evraziiskoi nauki = The Eurasian Scientific Journal*. 2023;15(2):58. URL: https://esj.today/PDF/68ECVN 223.pdf (In Russ.).
7. Crevier D. AI: The tumultuous history of the search for artificial intelligence. New York, NY: Basic Books; 1993. 400 p.
8. Babanov A.B., Bokhan P.A., Shetov A.A. Prospects of using parallel imports in the Russian Federation. *Gosudarstvennoe i munitsipal'noe upravlenie. Uchenye zapiski = State and Municipal Management. Scholar Notes.* 2023;(1):54–60. (In Russ.). DOI: 10.22394/2079–1690–2023–1–1–54–60
9. Tukkel I.L., Yashin S.N., Ivanov A.A. Digital transformation as an important part of innovative development. *Innovatsii = Innovations*. 2019;(3):45–50. URL: https://cyberleninka.ru/article/n/tsifrovaya-transformatsiya-kak-vazhnaya-chast-innovatsionnogo-razvitiya (In Russ.).
10. Pashchenko D.S., Komarov N.M. Managing the costs of constant changes in the activities of high-tech enterprises. *Mir novoi ekonomiki = The World of New Economy*. 2022;16(3):104–112. (In Russ.). DOI: 10.26794/2220–6469–2022–16–3–104–112

ABOUT THE AUTHORS

Nikolai M. Komarov — Dr. Sci. (Econ.), Scientific Advisor, All-Russian Research Institute "CENTER", Moscow, Russia
http://orcid.org/0000-0002-2431-6195
nikolai_komarov@mail.ru

Sergey S. Golubev — Dr. Sci. (Econ.), Department Head, All-Russian Research Institute "CENTER", Moscow, Russia
http://orcid.org/0000-0001-8745-6235
sergei.golubev56@mail.ru

Denis S. Pashchenko — Cand. Sci. (Tech.), independent researcher in the field of software development, Moscow, Russia
http://orcid.org/0000-0001-9089-8173
Corresponding author:
denpas@rambler.ru

Anton G. Shcherbakov — Cand. Sci. (Econ.), managing partner of the ASPI group of companies
http://orcid.org/0000-0002-3298-1638
otadow@gmail.com

Authors' declared contributions:
N.M. Komarov — curator of the applied research "The use of Applied AI Technologies in Industrial Enterprises' Digital Transformation Projects", which results are partially presented in the article "AI Tools in the Digital Transformation Programmes of Industrial Enterprises".
S.S. Golubev — curator of the applied research "Strategy and tactics for the development of the corporate IT landscape in the context of technological embargo and accelerated import substitution" which results are partially presented in the article's chapter "Analysis of the prospects for the development of AI tools".
D.S. Pashchenko — article's general concept development, sources' selection in both applied studies.
A.G. Shcherbakov — elements' development for the applied research concept, sources' selection in both applied studies.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was received on 10.02.2024; revised on 13.03.2024 and accepted for publication on 10.04.2024. The authors read and approved the final version of the manuscript.