Development of artificial intelligence as a modern business technology using the transport industry as an example

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Abstract. The article is devoted to the development of artificial intelligence, which is a form of various technological solutions and methods that can create programs in the likeness of human intelligence. The role and importance of artificial intelligence in modern business. The directions in which artificial intelligence and machine learning are developing are considered. The article notes the difficult moments associated with the creation of conditions (legislative framework, infrastructure, motivation of entrepreneurs, etc.) for the introduction of artificial intelligence in business. The article presents an assessment of the results of the introduction of artificial intelligence in the global and domestic business. Since technologies such as artificial intelligence and machine learning, which are important for the modern world, are attracting increasing attention, the article discusses the introduction of artificial intelligence in such a dynamic industry as the transportation industry. Considering the practice acquired by Western companies in the field of innovation and digitalization, it is possible to predict the possibility of using artificial intelligence by Russian companies in those industries where it is difficult to compete without the introduction of robotics. To enhance the process of creating and implementing artificial intelligence in Russian business, it is important to know and be able to evaluate the problems that hinder the development of new technological solutions. In this regard, the article discusses the barriers to the active implementation of artificial intelligence in the transport industry.

1. Introduction
The term “artificial intelligence” is very popular today. Currently, artificial intelligence, as a modern technology is very popular in a variety of industries. Artificial intelligence is the ability of a digital computer or a computer-controlled robot to perform assigned tasks, which are often associated with intelligent creatures. This word often applied to a project for the development of systems endowed with intellectual processes characteristic of a person, such as the ability to reason, generalize or learn from experience. Moreover, the definition of “artificial intelligence” comes down to a description of a...
set of related technologies and processes, such as, for example, machine learning, virtual agents and expert systems.

What are the prospects for the development of artificial intelligence? How it perceived in business? What hinders the development of artificial intelligence? These questions need to be answered. The most intensive implementation of artificial intelligence is in the field of medicine, science and transport. Currently, the development of artificial intelligence technologies is the driver of the transport industry. Now, a large number of automakers around the world and a number of leading IT companies have begun to make a serious bet on unmanned vehicles. Considering the development of unmanned automobile transport, it is worth noting that at present, the first unmanned bus route is planned to be launched on the territory of the Skolkovo Innovation Center, and by 2025 unmanned vehicles should be integrated into urban traffic, becoming a familiar thing for everyone. Monitoring the condition of roads, detecting pedestrians or objects in the wrong places, autonomous driving, cloud services in the automotive industry - these are just a few examples of the application of these latest technological solutions in transport.

The purpose of the publication is to analyze the scientific literature, the regulatory framework and the results of scientific research on the development of the latest technology - artificial intelligence in the transport industry.

2. Study methodology
Scientists such as Caris, A., Kakhrimanova, D., Kudlac S., Kurenkov P., Lambert B., Mesko P., Pokrovskaya O. and others devoted their works to the development of artificial intelligence. Currently, employees of large laboratories and leading world corporations are involved in the creation of artificial intelligence.

In the research process, the following research methods used: system analysis, retrospective analysis, comparative analysis, analysis of official statistics.

The study includes the following steps:

1. Conducting a comparative analysis of the development of the global and Russian market of artificial intelligence.
2. Conducting research in the field of implementation of artificial intelligence technologies in Russian business
3. A study of foreign and Russian experience in the introduction of unmanned vehicles.
4. Conducting research on the introduction of artificial intelligence technologies by logistics companies.
5. Identification of the problems of introducing artificial intelligence technologies in Russia in order to make promising decisions.

The hypothesis of the study is that without the introduction of artificial intelligence technologies, the further development of the transport industry is impossible.

Currently, the work on the introduction of artificial intelligence in the transport industry has noticeably intensified, without the development of which it is impossible to imagine the effective work of related industries - industry, trade, communications, construction, etc.

3. Assessment and results
Currently, artificial intelligence (hereinafter - AI), as a modern technology, is very much in demand in various fields, including the digital economy. Truly serious scientific research of autonomous driving with the attraction of multimillion investments began only in the 1980s. The problem of creating an unmanned vehicle is multifaceted and is not limited to technical aspects. The problem under consideration includes a number of serious issues:

- legislative requirements and regulations in the field of unmanned vehicles;
infrastructure for unmanned vehicles;
• economic and social issues of unmanned vehicles
• (state support and participation of business), etc.

More recently, UAS (unmanned vehicles) could only be see in science fiction films and sometimes in news reports about testing individual UAS systems. However, everything is changing, and already two cities - Singapore and Pittsburgh can boast of the presence of an unmanned taxi, something that an ordinary person can use.

For decades, experts in the field of new technologies have been creating projects for the use of unmanned vehicles. So, for example, the well-known company Google since 2012 has been testing new modes of transport - unmanned control systems on public roads, some of which have been launched into production [1]. Since 2015, Tesla has accelerated the development of projects - the use of autopilot mode in cars, which allows them to independently perform a number of actions, but in critical situations, transfer control to the driver. In March 2016, General Motors announced the acquisition of Cruise Automation, a company that is developing technology for unmanned vehicles. In the same year, automakers Ford and BMW announced plans to create fully unmanned vehicles by 2021. At that time, Ford CEO Mark Fields reported that unmanned vehicles could also have a big impact on society, as the invention of the assembly line 100 years ago influenced. According to Business Insider forecasts, in 2020 there should be 10 million self-driving cars on the roads. The authors of the Stanford University report write that unmanned vehicles will not only be personal transport. Professor of Southern University of Texas Yi Qi believes that artificial intelligence technologies will be widely applicable in traffic management - for example, to prevent traffic jams and ensure road safety. According to Professor Qi, artificial intelligence will detect car crashes, assess their danger and provide information to road users in real time.

In Figure 1 presents an analysis of the development of the global and Russian market of artificial intelligence [2].

**Figure 1.** Analysis of the development of the global and Russian market of artificial intelligence.

To ensure the widespread practice of implementing and using artificial intelligence in Russia, it is necessary to create a regulatory and technical base based on modern approaches to issues related to the digital economy.

Last year, the topic of artificial intelligence was the main one at Russian discussion platforms and conferences, and more than other technologies discussed by domestic mass media.

The explanation for this may be such aspects: large Russian companies prepared a wide announcement for their projects in the field of AI, and President Vladimir Vladimirovich Putin approved a national strategy for the development of artificial intelligence.
The Federal Agency for Technical Regulation and Metrology (Rosstandart) in December 2019 approved the first national standards in the field of artificial intelligence - GOST R 58776-2019 “Means for monitoring behavior and predicting people's intentions. Terms and definitions” and GOST R 58777-2019 “Air transport. Airports Technical means of inspection. Methodology for determining indicators of the quality of recognition of illegal investments from shadow x-ray images.” The standard is designed to provide effective communication of intelligent robotic systems (including unmanned vehicles) with humans. The interaction of intelligent systems consists in predicting each other's intentions and determining further actions based on this forecast.

With the growth of trade, problems with the delivery of goods and the lack of modern control over traffic on highways, the use of artificial intelligence in commercial vehicles is becoming extremely important [3,4]. However, practice shows that for decades, companies have created and implemented new technologies to provide a supply network, the requirements for which at that stage of development solved many problems [5]. Today we need new, more advanced solutions that cannot be provide without the creation of artificial intelligence, because the processes in the supply chain are becoming more complicated [6]. The introduction of the latest technologies such as artificial intelligence (AI) and machine learning can be attribute to innovations that are able to solve many problems in transport. The transport industry is one of the areas in which some of the world's largest firms have begun to use artificial intelligence and machine learning logistics. [7,8]. It is important to note that not all projects were effective, some of them did not have any success; however, it was the first such projects that created the basis for moving innovation forward in the transport industry. Recently, the issue related to the creation of “smart transport” has been very actively discussed [9].

According to IBM's forecast, by 2025, 74% of cars on the roads will either be directly controlled by artificial intelligence, or include a smart assistant. This also applies to other modes of transport - air and rail or sea traffic.

ICT.Moscow made interesting conclusions by examining the results of the most attractive studies in the field of the application of artificial intelligence in Russian business (research organizations IDC & ABBYY, KPMG, RAEC, VTsIOM). These conclusions: the demand for new knowledge about AI is extremely high, the market is growing in demand for specialized personnel, and companies interested in developing artificial intelligence in their business would like to count on government support [10].

In table 1 provides information on the use of artificial intelligence by Russian business.

| Application of artificial intelligence by business | KPMG | Russian Association of Electronic Communications | IDC&ABBYY | All-Russian Center for the Study of Public Opinion |
|--------------------------------------------------|------|--------------------------------------------------|----------|--------------------------------------------------|
| Business type                                     | Big business | Big business in areas with high AI penetration | Big business | Any business, including an individual entrepreneur |
| Sample                                           | 100 companies | 120 companies | 300 companies | 800 respondents |
| Use artificial intelligence                       | 28% | 80% | 30% | 31% |
| Plan to introduce artificial intelligence         | 53% | 20% | 70% | 23% |

Thus, according to the results of a «All-Russian Center for the Study of Public Opinion» survey, 800 companies showed that no more than 23 percent of respondents intend to carry out activities to introduce artificial intelligence into their business, despite the fact that almost all of them were informed about the availability of such technology. According to the same survey, the main reason for this is the belief in the futility of using AI specifically in the industry in which their companies are members.
Artificial intelligence affects more and more different areas. It is being introduce quite actively in the transport industry, where new tasks appear in logistics management and infrastructure operation. The development of artificial intelligence technologies is becoming a driver of the transport industry, which means that we can assume that its improvement will be striking. It is important for transport companies to develop digital and intelligent technologies in the management of rail and road transportation, automotive and locomotive building, depots and repair shops, monitoring the condition of roads, detecting pedestrians or objects in the wrong places, autonomous driving, cloud services in the automotive industry [11, 12]. AI capabilities allow companies to more effectively forecast demand and build supply chains while minimizing costs. Artificial intelligence helps reduce the number of vehicles used for transportation, optimize delivery time, and reduce operating costs of transport and storage facilities.

In November 2019, IDC analysts published the results of a study of the Russian AI market. Experts predicted that in 2019, sales of solutions using artificial intelligence technologies will reach $139.3 million (see Figure 3), which is 48.2% higher than the previous year.

![Figure 2. Investment in creating solutions using AI.](image)

Forty nine percent of the costs in the AI market are invest in computing power to process large amounts of data and store it. Twenty-eight percent are software costs. IDC expects these investments to more than double by 2023 due to the growth of applications using artificial intelligence technologies.

Twenty-three percent of the Russian market for AI solutions falls on business and IT services. Internal resources often provide AI solution implementation services. Sixty-eight percent of respondents noted that the implementation of cognitive technologies and AI requires thorough knowledge, business processes in the company and industry specifics, so they do not use the services of third-party consultants.

The study participants identified two main tasks, the solution to which they see using cognitive technologies and AI systems:

- 84% - increased employee productivity;
- 81% - lower costs and increased productivity in key business processes.

Thirty eight percent of companies noted that they use AI technology in solutions for intelligent automation of data processing. Twenty six percent of business representatives use AI technology to create digital assistants for information workers [13].

Considering the tactics and development strategy of large Russian transport companies, it can be noted that most of them recognize the need to create and implement artificial intelligence considers AI as a driver for the development of the transport industry. For example, that the future of logistics is with robotics and artificial intelligence, said Farid Madani, general director of the largest carrier in Russia on a specialized platform of high-tech Digital City Forum. According to Farid Madani, digital technologies in logistics have long left the stage of “paper” projects and are already bringing real commercial results. Thus, thanks to IT achievements and process automation, the speed and efficiency
of Business Lines have increased by 30 percent over the past few years. Trackers, cargo movement control systems, mobile applications are just a small part of the implemented “numbers” in the group of companies. The greatest results brought by warehouse and fleet management systems, mathematical modeling and processing of large data arrays (Big Data), which are designed to optimize the business of senders. “One of our priorities is the use of robotics and artificial intelligence elements, which help to get away from the routine, increase the efficiency of business processes and the company as a whole. At the same time, the introduction of these technologies does not lead to staff reductions - we are switching employees to new jobs,” said Farid Madani. Business Lines also evaluate the potential impact of introducing the concept of the “physical Internet”.

Serious changes in the transport industry caused by the introduction of artificial intelligence are already taking place in ordinary practice, although they can be more subtle than cars with automatic control [13]. The reality is that vehicles without a driver are not the only use of artificial intelligence in vehicles. For example, more recently, owners had only a general idea of how they can interpret critical events reported by telematics monitoring systems. Video communications solutions currently provide the context necessary to understand the factual circumstances associated with abrupt driving events that were previously limited to interpreting numerical data. In fact, the progressive analysis skills that made possible thanks to machine learning constantly improve the accuracy of the automatic classification of the severity of an event, and now managers are notified only when the event requires verification [14]. In Yekaterinburg, based on artificial intelligence, a “smart” road system has been create. It is a mechanism for regulating traffic flows, unloading roads and ensuring uninterrupted movement of ground passenger transport. At the same time, the system records violations and sends fines. Information comes from transport detectors, photo and video recording systems, on-board equipment and other devices.

There are examples of active work of companies in the implementation of the latest technological solutions - artificial intelligence. Therefore, the Business Lines Group of Companies, which made the transition to a completely new format for processing cash proceeds, introducing the online collection service using automated deposit machines Monirron ADM 6. The introduction of online collection is a joint project of Business Lines, Gazprombank and Profindustry.

Deutsche Post DHL is a German group of companies, which includes the largest participants in the DHL logistics market. For example, the DHL Supply Chain division, which provides warehouse logistics services, has increased productivity with robotics. DHL Express will continue to implement automated solutions in regional hubs, terminals and service centers.

In early December 2018, DHL announced it had invested $300 million to upgrade its warehouses by adding robots and sensors. Robotic process automation and software designed to reduce delays in work processes should help the logistics company increase the efficiency of order picking [15]. By early December 2018, robots were being use at 85 DHL Supply Chain sites (the logistics division of DHL) in North America or every fifth in the region. After the implementation of the planned investment program, robotics will be use at 350 sites or 60%. As Scott Sureddin, CEO of DHL Supply Chain North America, told VentureBeat, the company has not yet selected suppliers and manufacturers of robots. Negotiations are ongoing with the 25 largest players in the robotics and process automation market, said Jim Gehr, president of the retail supply chain DHL Supply Chain. Locus Robotics robots known to be used at some DHL order centers. According to Jim Gera, thanks to the joint work of people with robots, the sorting of orders at DHL has been improved by 100%, and the company has not achieved such results in the last decade.

DHL is committed to actively introducing robots into the work that form a new management system and reduce costs in business processes. The new warehouse robots that DHL Supply Chain is planning to implement will be primarily used in parcel sorting operations and will be able to perform a number of tasks, ranging from the joint selection of goods with people and ending with the transportation of items throughout the warehouse for subsequent processing by people. Robotization of warehouses is currently a necessity for any logistics company, which is why DHL used Yaskawa Motoman MH180-120, equipped with an industrial 3D-vision system, to automatically complete
orders for industrial robots. DHL Supply Chain has ambitious innovation projects for warehouse automation, automated forklifts, and robotics. One of the difficult tasks is manual sorting of goods when forming sets of electronic commerce orders. In order to automate the relevant processes, DHL has established cooperation with Robomotive, a company that has experience in industrial automation in the Netherlands. The system integrator has created a robotic cell designed for unloading pallets, forming and executing orders using the 3D-vision system. The order picker is based on the Motoman MH180-120 industrial manipulator and the Zivid One 3D color digital camera.

The main feature of the DHL and Robomotive project is that grabs are carry out without the need for preliminary training of the robot in grabs of one or another product. This is very important because, as a rule, logistics companies are face with the fact that even for products for which there is the necessary data, they are not accurate. In addition, for most products, preliminary data is not available at all. Robomotive developed software that allows the manipulator to separate all types of products without relying on any preliminary information.

There are a number of complex obstacles to introducing solutions using AI technology into the practice of Russian companies; these are lack of understanding by the top management of state-owned companies of the place of AI in business, insufficient government support for technology, and the lack of information on basic research in AI in the business. Such problems were identify by representatives of the business community at the round table held at the Analytical Center under the Government of the Russian Federation [16, 17].

4. Conclusions
If we talk about the problems that hinder the development of artificial intelligence in Russian business, then they are almost identical for all industries, including transport. Problems) can be conditionally divide:

- social and ethical;
- are common.

The first group includes:

1. The inability of most managers and employees to accept the very idea of creating and implementing artificial intelligence because of a simple misunderstanding of their future prospects.
2. The inability of company personnel at this stage to reorient to a new life form - behavior, activity, etc.
3. Difficulty in understanding how fabricated machines (systems) can transform production processes, replacing the work of people.
4. Others.

The second group includes:

1. The absence of the necessary platform, without which, in principle, the process of creating and implementing artificial intelligence cannot be, activated everywhere:

   - the system of business processes is not perfect for all companies;
   - doubts of senior employees about the prospects of introducing AI, as well as the lack of skills in the field of creating high-tech solutions, including machine learning;
   - lack of sufficient funds (budget) to conduct such a serious campaign as the introduction of AI;

2. The lack of a strategy in the field of digitalization for the long term, and hence the inability to determine how the actions of structures and substructures in business should be coordinated [18].
3. In continuation of paragraph 2, the inability to guarantee the absence of risks, which means a reduction in the chances of resolving all issues related to ensuring business security.

4. Underdevelopment of the regulatory framework in the field of creation and use of intellectual property, machine learning and neural networks.

5. Not all company leaders, including, first, large business, are ready to single out AI as a priority goal.

6. Lack of wide demand in the Russian market (by industry, by scale of business, etc.) for AI.

7. Lack of a modern base for training and retraining of personnel in sectors of the economy in case of activation in the field of creation and implementation of AI.

8. Lack of common practice and experience in the interaction of business and a new market, not yet explored and untested - the AI market.

All signs indicate that progress in AI, and its impact on all industries, continues to grow. Specialists in the field of IT technologies (IDC) forecast an increase in global spending on cognitive and artificial intelligence systems by 38% by 2022.

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