THE STATE OF DEVELOPMENT OF ARTIFICIAL INTELLIGENCE IN THE DIGITAL ECONOMY

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Abstract

This article examines the history of artificial intelligence in the context of the digital economy, neural networks and machine learning - the basic concepts of artificial intelligence, the economic scale of artificial intelligence in the global economy and the areas of application of artificial intelligence.

Keywords: Digital economy, artificial intelligence, patent, global economy, Facebook, Google, Amazon, Apple, Microsoft, Baidu, McKinsey..

Introduction

Today, the economy is undergoing significant transformation across various sectors, driven by digitalization and the mobilization of these processes, as well as the introduction of artificial intelligence technologies into industry. Currently, the digital sector accounts for approximately a quarter of the global gross domestic product (GDP). Under these circumstances, the opportunities for global economic development are becoming even more apparent.

Today, rapid digitalization has created a "new economy." This understudied and increasingly entrenched market segment offers producers optimal ways to successfully sell goods and services at minimal cost and maximize profits. It provides consumers, shoppers, and clients with high-quality service and convenience. This range of opportunities goes beyond simply ordering lunch online during rush hour, hailing a taxi via a mobile app, or sending money to a distant relative, and encompasses cross-border business collaboration, e-commerce, and remote work.

The concept of a digital economy has recently emerged in economic theory and practice in a number of countries. It is characterized by the rapid development of digital technologies, a revolution in the information sphere, and the acceleration of

economic globalization. The efficiency of their use has translated into increased knowledge, and socioeconomic ties are expanding.

The development of digital culture is the key driver of digital transformation in the activities of market participants. At the current stage of socioeconomic reforms, the environment shapes the specific features of society's institutional structure and, on this basis, creates opportunities for the development of new concepts and approaches.[1]

According to analyses conducted by reputable international organizations, the digital economy will increase GDP by at least 30 percent while simultaneously eliminating the shadow economy. International practice shows that today's digital economy is not limited to e-commerce and services, but is rapidly penetrating all aspects of life, including healthcare, science and education, construction, energy, agriculture and water management, transportation, geology, cadastral surveys, archives, online banking, and other areas, yielding high results in each. Providing governments with electronic services and products to their citizens is a key part of the digital economy.

Level of understanding of the problem: There are many definitions of the digital economy. Most of them focus on its individual manifestations, ignoring the holistic process.

The concept of a "digital economy" was proposed in 1995 by Nicholas Negroponte, an American computer scientist at the Massachusetts Institute of Technology, who used the metaphor of moving from processing the atoms that make up physical matter to processing the bit-processes that make up software code.

Other experts point to the work of Canadian economist Don Tapscott, who published his book "The Digital Economy: Promise and Peril in the Age of Networked Intelligence" in 1994 (or, according to some sources, 1995). Tapscott describes the impact of ICT on business and public administration systems, using examples from developed countries, and predicts how digital technologies may change the way we do business. He also briefly defines the digital economy as one based on the widespread use of ICT.

In 1999, Neil Lane, in his article "The Development of the Digital Economy in the 21st Century," defined the term "digital economy" in his own way: "The digital economy is the convergence of computer and communications technologies on the Internet, the advent of ICT, and the massive changes in organizational structure that

are stimulating the development of electronic commerce." In other words, the author focused on electronic commerce.

In the same year 1999, Lynn Margerio, in her work "The Evolving Digital Economy," does not provide a precise definition of the digital economy, but for the first time identifies its components:

1. Expansion (spread) of the internet.
2. E-commerce between businesses.
3. Digital delivery of goods and services.
4. Retail trade of physical goods.

In 2000, Rob Kling and Robert Lamb, based on a report by Lynn Margerio for the US Department of Commerce, identified the main components of the digital economy, including: Digital goods and services: This component includes the provision of goods and services (such as software sales and online education) using digital technologies. Here, the authors include the provision and sale of physical goods and services; According to the European Parliament, the digital economy is a complex structure consisting of n-order numbers connected by an infinite and continuously growing number of nodes. In 2016, the World Bank offered the following definition: "The digital economy is a new paradigm of rapid economic development, the fundamental basis of which is the exchange of information in real time. It is a set of socio-economic and cultural ties based on the use of digital ICTs."

The United Nations Conference on Trade and Development offers one of the most precise definitions: "The digital economy is the widespread use of digital technologies in the production and trade of goods and services."

In the early 1980s, scientists Barr and Feigenbaum proposed the following definition of artificial intelligence in the field of computational theory: "Artificial intelligence is the field of computer science concerned with the development of intelligent computer systems—that is, systems that possess the capabilities we traditionally associate with human intelligence—language understanding, learning, reasoning, problem solving, and so on."

According to the World Intellectual Property Organization (WIPO), artificial intelligence is a program that can analyze, perceive, act, and adapt.

According to B.A. Begalov and M.K. Abdullaev, the digital economy is an activity in which the main factors of production are information presented in digital form, which, when processed and used in large volumes, including during its direct formation,

allows for a significant increase in the quality and productivity of various types of production, the efficiency of storage, sales, delivery and consumption of equipment, technologies, goods and services in comparison with traditional forms of management.[1]

Analysis and discussion of results: Today, we encounter artificial intelligence on a daily basis. Digital economy experts compare it to electricity, which about 100 years ago transformed not only industry but also human life. Similarly, artificial intelligence is all around us, and we are deeply dependent on it. Artificial intelligence encompasses a wide range of "smart" technologies that self-learn and even perform creative activities. Artificial intelligence can encompass a wide range of technologies, from a simple spam filter in an email inbox to more complex models and algorithms that analyze a user's browsing history and recommend only those videos that match their tastes. At the enterprise level, artificial intelligence can be used to create marketing models, optimize production processes, set prices, and provide customer service.

According to a McKinsey Institute study, by 2030, artificial intelligence will contribute $15.7 trillion to the global economy, leading to the loss of 85 million existing jobs. By that time, approximately 47% of current jobs will disappear in the US and 77% in China [2]. According to Autonomous Next, by 2030, AI will save $1 trillion in the banking, investment, and insurance sectors, $447 billion of which will come from banking alone. According to McKinsey research, end-to-end digitalization of key processes in traditional banking, whether selling new products or providing services in branches, can reduce costs by 40-60% and speed up banking operations.

If we look at the history of artificial intelligence, the first to develop the philosophy of artificial intelligence was the renowned scientist Alan Turing. In his works in the mid-1930s, he described the creation of a device capable of independently solving complex problems. He was the first to put forward the idea that "a machine is intelligent if it is indistinguishable from a human being when interacting with it." Today, Russian companies use voice bots, and 92% of customers who speak to them over the phone believe they are real people within the first seven minutes.[3]

In 1956, a six-week conference was held at Dartmouth University (USA) to discuss artificial intelligence, with the participation of scientists such as McCarthy, Shannon, and Turing. It was at this meeting that the term "artificial intelligence" first appeared.

Later, in 1959, D. McCarthy provided a more logical definition in his work "Programs with Common Sense." He clearly described the goal of the work: "Our primary goal is to create programs that learn from experience and work as effectively as people... we wanted to improve behavior corresponding, for example, to a machine's discovery of the principle of contradiction in checkers."[5]

After the 1980s, there were no significant advances in artificial intelligence, and disappointment even outweighed expectations. It was only between 2005 and 2008 that new mathematical models emerged in the scientific world of artificial intelligence, which subsequently led to the discovery of machine learning and the implementation of real principles of self-learning in computers.

According to the World Intellectual Property Organization (WIPO), artificial intelligence is broadly defined as "a field of computer science whose primary goal is to create machine systems capable of performing tasks with minimal or no human intervention." Two terms are commonly used: deep learning and machine learning.

Machine learning is the process of analyzing statistical data ("big data") and then identifying patterns that can be used to make predictions, perform tasks, and create necessary algorithms (parameter tuning, neural networks) based on them. There are two main approaches to machine learning: supervised and unsupervised.

Deep learning is a machine learning method in artificial intelligence. It incorporates an advanced set of machine learning algorithms that significantly outperform many of their predecessors in their ability to recognize text and images. Deep learning is currently a dynamically developing field of artificial intelligence, with applications expanding to include speech recognition, computer vision, and natural language processing. It utilizes multilayer neural networks and large amounts of data to train them.
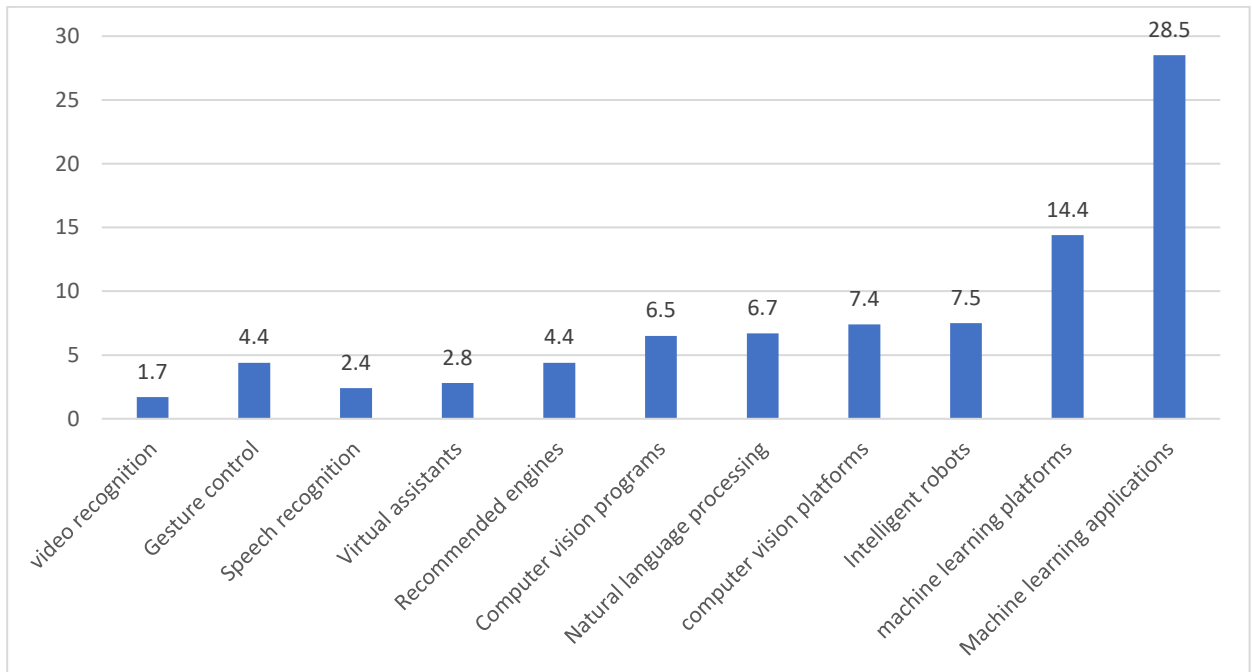
Diagram 1 Public volume of deposits and development of artificial intelligence in 2019 by category (billion dollars)

As the graph above shows, the largest amount of investment in AI in 2019 was in video recognition, at \$1.7 billion. The highest amount was invested in machine learning applications, at \$28.5 billion.

The economic scale of artificial intelligence in the global economy. The artificial intelligence industry is one of the fastest-growing and most capital-intensive industries. Today, it generates over \$40 billion in annual revenue, with over 3 billion voice assistants in use worldwide. Nine out of the top 10 global companies are investing in AI technologies, and 37% of US companies and organizations use AI in their work.

The market for self-driving cars, powered almost exclusively by artificial intelligence, will exceed \$600 billion in five years. Netflix implemented artificial intelligence in its movie recommendations in 2019, allowing the company to double its revenue from \$344 million to \$709 million in one year. Therefore, tech giants such as Facebook, Google, Amazon, Apple, Microsoft, Baidu, and several other companies are actively investing in AI research and are currently utilizing various developments in their

operations. According to McKinsey, nearly 60% of AI investments are focused on self-learning, as this is the core of AI technology.

In the future, the largest economic beneficiaries of AI will be China (20% GDP growth by 2030) and North America (14.5% growth), equivalent to $10.7 trillion and accounting for about 70% of global economic growth.
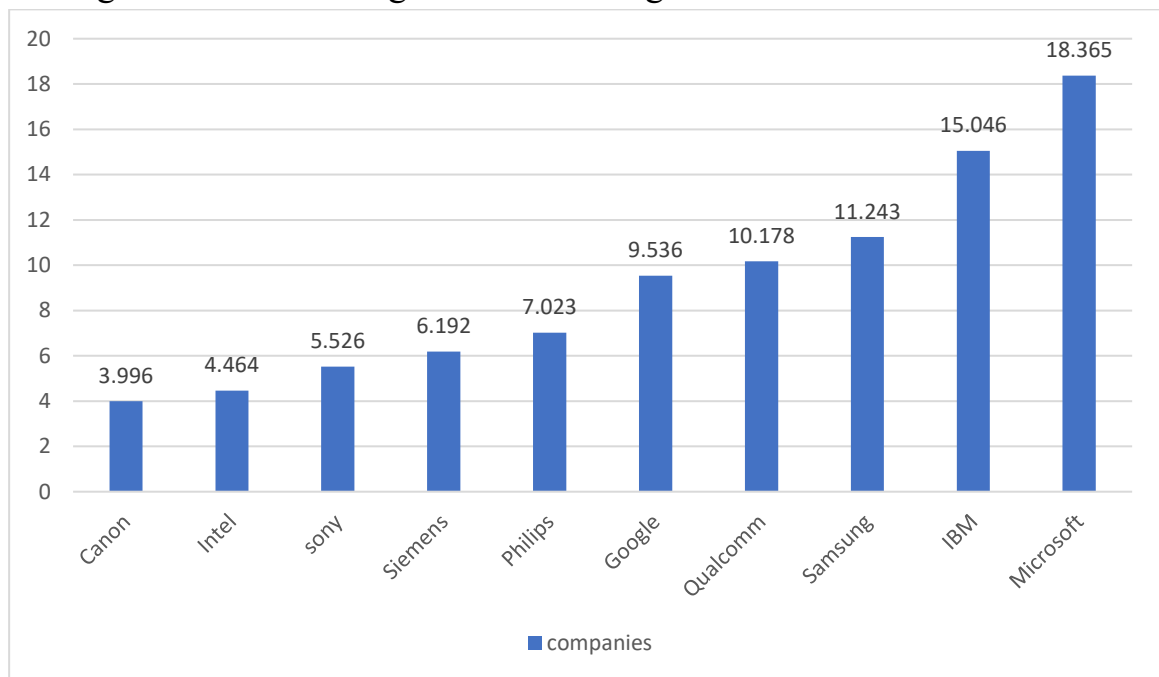

Diagram 2 Companies with the most AI patents in 2019

In 2019, Microsoft topped the list of companies with the highest number of patents in the field of artificial intelligence, with 18,365 patents. Canon has 3996 patents, Intel - 4464, Sony - 5526, Siemens - 6192, Philips - 7023, Google - 9536, Qualcomm - 10178, Samsung - 11243 and IBM - 15046 patents.[6]

The most popular types of artificial intelligence:

1) computer vision - search, tracking and classification of objects, photographic and video editing;

2) processing of natural language — understanding of written language and creation of written text;

3) rekomendatelnye sistemy i sistemy podderjki prinyatiya resheniy — pomoshch v vybore reshenia, prognozirovanie interesov uzovatelya na osnove ego profilya.

Заключение и предложения: Segodnya iskusstvennyy intellekt is completely spread and used in all areas, connected to the internet and tsifrovizatsiey. However,

the highest popularity was obtained in other countries, such as advertising, marketing, sales, marketing, banking and finance, as well as government services. In recent years, especially during the pandemic, it is widely used in education and health care.

Table 1 Oblasti primeneniya i opisanie iskusstvennogo intellecta

The area is primenenia	Description
Big data analysis, machine learning	Artificial intelligence is actively used in project development, market forecasting and analysis, various research projects, client management, and more.
When dealing with customer complaints	SI, which processes more than 60 million claims a year on the popular e-commerce platform Amazon, arbitrates disputes between buyers and sellers of goods, which is almost three times the number of claims filed through the traditional U.S. court system.
Providing digital customer service using chatbots and virtual agents.	Chatbots are changing the landscape of the IT ecosystem. They are focused on business tasks and can replace customer service staff in companies. Chatbots can provide advice on topics such as finding the best flight, choosing a personalized diet, booking a hotel, and more.
Голосовой помощник (ассистент)	Artificial intelligence applications such as Apple's Siri, Google Assistant, and Amazon's Alexa have become one of the most popular ways to use AI in everyday life. This technology enables the transition from graphical user interfaces to conversational ones.
Image, face, and text recognition (recognition)	According to Markets And Markets, the image recognition market reached $29.9 billion by 2020. Image recognition technologies include shape recognition, optical image recognition, code recognition, object recognition, and digital photo recognition. They are used both individually and in combination in areas such as security and video surveillance, image scanning and processing, marketing and advertising, augmented reality, and image search.
Speech and language recognition	According to BCCResearch, the global speech recognition market was valued at $903 billion in 2015. This market is expected to grow at a compound annual growth rate of 12.1%, from $104.4 billion in 2016 to $184.9 billion in 2021. The natural language processing market, according to Market And Markets, was valued at $7.63 billion in 2016 and is projected to grow to $16.07 billion by 2021, at a compound annual growth rate of 161%.
Finance and banking in this area.	The financial sector is the second-largest investor in artificial intelligence globally. This is particularly important for virtual exchanges and institutional investors, for example, in the areas of algorithmic trading, personal finance, and intelligent portfolio and risk management applications that predict potential changes in the securities market and stock exchanges.

In industry	One airline admitted to generating over $300 million in profits after implementing machine learning based on predictive maintenance. In industry, artificial intelligence will increasingly automate work until it completely eliminates human intervention. For example, LG plans to open a factory in 2023 that will be managed by artificial intelligence, overseeing all processes (production, delivery, quality control, and schedule compliance).
In smart homes and cities	Artificial intelligence helps make our lives as simple as possible. A smart home optimizes energy consumption, heating, and ventilation, and manages sensors and devices according to the owner's personal needs. AI monitors city traffic, manages congestion, analyzes traffic light data, and collects information on traffic density, accidents, weather conditions, and other factors.
In medicine	IBM-Watson and Google-Deep Mind Health use artificial intelligence that not only helps doctors give advice but also allows them to identify conditions beyond their control, such as determining a patient's predisposition to diseases or detecting them at the earliest stages.

In conclusion, one possible downside scenario for the development of artificial intelligence is a further widening of the technological gap between third-world and developed countries, as well as the consequences this may entail (technological dependence, trade imbalances, etc.). In the future, the development of artificial intelligence will lead to even greater and more astonishing discoveries and achievements. One of humanity's greatest challenges is learning to correctly represent large volumes of source information for education; this is a crucial factor in the future success or failure of an artificial intelligence project.

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