The role of artificial intelligence technologies in long-term socio-economic development and integrated security

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ABSTRACT

The symbol of the second decade of the 21st century is the renaissance of artificial intelligence technologies. Today, the consequences of introducing such systems are still not fully understood (especially when the results prepared by the neural network are completely incomprehensible to humans, unlike the results of the logical conclusion of an expert system) in the informational and technological processes of modern society, but the question already concerns such issues as the "ethics of machine intelligence", about a person's readiness to transfer the right to make decisions to artificial intelligence instead of himself. The object of the paper is to study strategic documents that determine the prospects for the development of artificial intelligence technologies, primarily in the largest economies of the world to determine the contours of global socio-economic and technological development. In the framework of the system-structural and institutional approaches, a comparative and conceptual analysis of the strategies of the leading countries in process of development of artificial intelligence was carried out. The mechanisms for implementing the strategic priorities of the most advanced countries are identified and described. Authors noted the intensification of international competition in the field of development and implementation of artificial intelligence technology and, accordingly, the transformation of complex security threats.

Keywords:	Scientific and technological progress, Supercomputer, Robotics, Development work, National interest.

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1. Introduction

The first experience of their applied use dates back to the 1980s, when expert systems became the dominant trend – a trend associated with attempts to "transfer" the expert's knowledge and competencies to the digital environment using special techniques and software systems based on the Lisp and Prolog logical programming languages, available to knowledge professionals. The peak of this technological stage can be considered the fifth-generation Japanese project of electronic computing machine (computer) – a large-scale state program for

the computer industry and artificial intelligence (AI) development [1]. The program started back in 1982. The goal of the program was to create an "monumental computer" with supercomputer performance and powerful AI features [2].

For a variety of reasons, the project was unsuccessful. When analyzing errors, it is possible to mainly point out erroneous forecast estimates of project initiators and the general low (at least insufficient for project implementation) level of technologies for creating computer facilities and programming methods [3]. However, it's important to highlight two points:

1. functioning systems were created, which were introduced in a number of projects on the decision support circuit (including in the field of military and state planning), i.e., artificial intelligence systems were considered an element of decision support systems when a decision was nevertheless made by a person, and their conclusions and recommendations were understandable to a person;

2. by the result of the application of expert systems, no state of the world has initiated work to consolidate the obtained results in strategic planning documents, which excluded the influence of this technology on state-level decisions.

These two conclusions suggest that there was no "social interest" for changes: the scientific and practical groundwork was still quantitative, but not qualitative, and the person was not yet ready to transfer his unique right to "make decisions" to program or machine. Rapid scientific and technological progress in the first decade of the 21st century has led to a restructuring of the global socio-economic system. The same transition of quantitative changes to qualitative. According to the anniversary report of the Club of Rome, in the context of the modern "full world", limited resources, a strategic role is played by technologies that allow the development of socio-economic and, accordingly, political processes in a new plane. Such technologies include developments in the field of artificial intelligence, which, according to experts, in 10 years will provide at least 1.2% of the increase in world gross domestic product (GDP) – more than all the implemented technologies before [4]. Artificial intelligence is considered as the main component of research and development (R&D) in the field of modern robotics and includes technologies such as machine learning, deep learning, natural language processing, computer vision, machine reasoning and strong AI capable of independent self-modification. If we follow the wording of the report of the Club of Rome on the "full world", embraced by the globalization process, and fully oriented towards the implementation of the capitalist model of the "inflationary" economy without "white spots" like the USSR. Today, a new "Wild West" is vital – a new development space. And this space could become an information space, and the new "working class" – artificial intelligence systems [5-8].

With the AI technologies in technological processes, it becomes obvious that the global race for leadership is happening in which the main actors are states. Despite the significant role of the commercial sector in modern technological development, the definition of strategic priorities and long-term directions for the development of advanced technologies, to which AI belongs, has been and remains the competence of states. In addition, it is possible that current officials feel the danger emanating from a new layer of technology that can change the very essence of the state of the future (how about the question: should we give androids voting rights in the future?). It is obvious that the second stage of interest in artificial intelligence systems is different from the first.

2. Material and methods

Today, the consequences of introducing such systems are still not fully understood in the information and technological processes of modern society, but such issues as the "ethics of machine intelligence", about a person's willingness to hand over the right to make decisions to artificial intelligence are already discussed. And, most importantly, over the past five to seven years, practically all the significant states of the world have developed and adopted their own artificial intelligence development strategies as state strategic planning documents.

In the framework of the system-structural and institutional approach, the authors studied the decision-making system in the above countries. In the course of the study, the authors applied the provisions of the theory of integrated safety and security [9; 10], in the framework of which issues of the strategic impact of AI

development on the nature of the security of socio-technical systems are addressed [11]. At the same time, transnational corporations, despite their involvement in global technological development, have limited subjectivity.

Long-term goals, as well as mechanisms for their achievement in the international space, were studied on the conceptual basis of the basic theory of national interests of the scientific school of neorealism [12]. The analysis of international AI development strategies was previously studied by British and Chinees scientists [13; 14], however, due to the dynamism of scientific and technological progress and the updating of a number of regulatory documents, this study appears extremely relevant. The study of approaches to the long-term development of AI technologies is of considerable interest in the framework of the study of integrated security issues, the transformation of the global socio-economic system under the influence of technological developments in this area leads to a qualitative change in the nature of threats to the safe development of socio-technical systems [15].

3. Results and discussion

3.1 China's AI strategy

The fundamental document in the field of AI development in the PRC was published in July 2017 and is called the "Next Generation AI Development Plan". According to the document, having implemented the three-stage plan, by 2030 the market for machine learning systems in China will reach 147.8 billion USD. The strategy continues the government's "Made in China + Internet" program, adopted in 2017, aimed at digitalization and intellectualization of the industrial sector and a significant increase in the share of high-tech production. So, the text of the document emphasizes the aggressive policies of other countries in this area, which "consider the development of artificial intelligence as the main strategy to increase the country's competitiveness and ensure national security" [16].

The plans of the Chinese government are focused on the 2030 and beyond, in this regarding AI are integrated into the strategic goal-setting system in all areas. The "Next Generation AI Development Plan" is interlinked with other strategic documents, and AI development issues are ranked sixth among 69 main tasks. Three reference points are indicated in the document: in 2020, 2025 and 2030 (Figure 1).
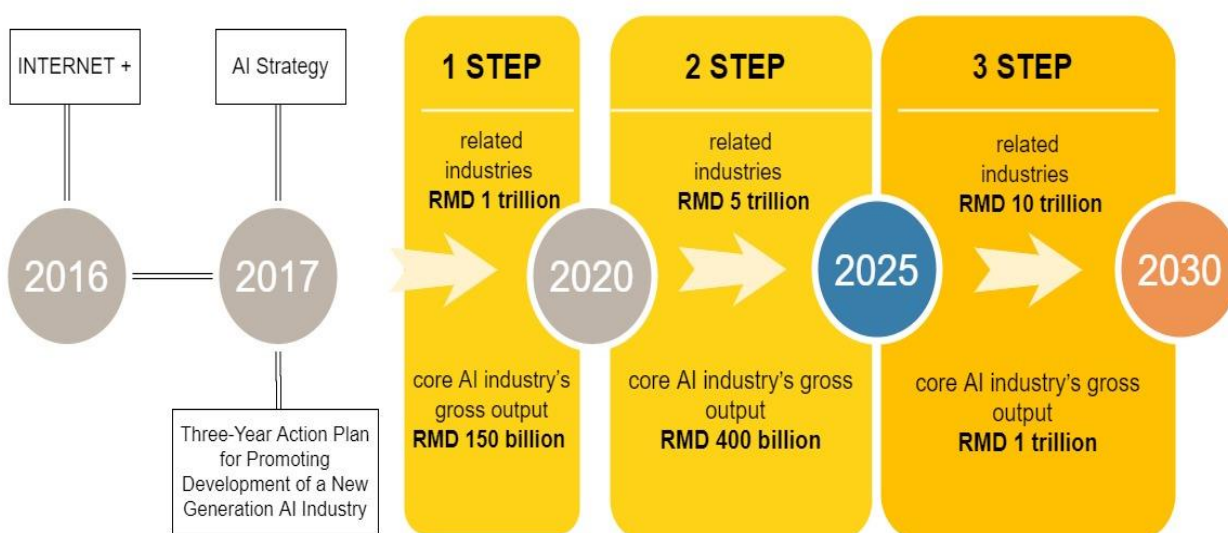

Figure 1. China's AI Strategy – 3 steps [14]

So, in 2020, AI technologies will become a new driver for the growth of the national economy and China will reach the level of world leaders in the field of AI development. In 2025, AI will become the main driver of the Chinese economy, and in 2030, China will become the world leader in innovation and AI development. American experts characterize the actions of China in the field of AI development as aggressive investment

[16]. The planned costs for China far exceed even the US. So, only the city of Shanghai in the next 10 years will spend about 15 billion USD for development in this area [16].

Strategic document under consideration is addressed not only to its own country, but also to the "outside world", confirming the geopolitical ambitions of the country's leadership and the intention to take the initiative in the field of global scientific and technological development. At the same time, China pursues a "open door" policy, which implies the ability to attract the latest technology and the best specialists (for example, through the acquisition of Bulgarian companies), while not allowing Bulgarian companies to gain a foothold in their own market [17].

Clause 1 of the "Next Generation AI Development Plan" notes the destructive consequences of the active introduction of AI developments, changing the nature of private life, etc. The authors of the document emphasize the multifaceted nature of the changes that are transforming security threats and making them more comprehensive. In this regard, the Chinese government focuses on the joint work between civilian and military AI developers. The conceptual boundary between military and non-military threats is more and more blurred, especially in the context of the cross-cutting nature of AI technologies.

The Chinese AI strategy can be seen as a vivid example of a neorealist approach to international processes, since AI is mentioned, first of all, as a strategic tool for ensuring technological superiority and protection of national interests. In fact, the state is the only subject of technology development in this area. The Chinese strategy is aimed at a qualitative modification of the global socio-economic system and security systems. According to the Chinese leadership, "they are witnessing another round of international technological competition" [18], however, there will be a change not only in methods, but also in the nature and essence of understanding the state's competitiveness in the global process. Chinese strategy is multi-faceted and quite aggressive in nature, while the key aspect is national security and security from complex threats.

3.2. US-European Union artificial intelligence strategy

In 2016, the National Council for Science and Technology of the United States prepared proposals for the priority areas of AI research – "The National Artificial Intelligence Research and Development Strategic Plan" [19]. Later, in 2018, the use of AI in the field of military security was covered in the "Summary of the Ministry of Defense's Artificial Intelligence Strategy for 2018" posted on the website of the Ministry. In particular, the document noted that the investments of Russia and China in the development of AI "threaten to undermine US technological advantages and destabilize a free and open international order" [20].

However, the first official decree on the development of artificial intelligence was the decree of President Trump (Executive Order 13859) in February 2019 under the title "American Artificial Intelligence Initiative". This document "restarted" the AI strategic planning system, which led to the revision and reworking of all previously issued documents in this area [21-34].

Five key points according to presidential decree:

1. changes in the structure and goals of financing (priority of investments in artificial intelligence for federal agencies in the allocation of funds);

2. providing AI research with data (data, computer models and computing resources should be accessible and convenient for AI developers);

3. development of standards for the use of AI technologies (the US National Institute of Standards and Technology has been tasked with creating standards that contribute to the development of "reliable, stable, trusting, safe, portable and compatible AI systems");

4. development of competencies in the field of AI (development and implementation of retraining and advanced training programs for mastering the necessary competencies);

5. cooperation at the international level and maintaining US leadership (using foreign policy resources to ensure the development of AI in accordance with American "values and interests") [35-46].

Despite the fact that the document does not indicate the terms and specific tasks, the US President emphasized the priority of research in the field of AI and machine learning over other scientific areas, which affected the policy of the federal administrative and budgetary administration [47-58].

In December 2019, the U.S. president signed into law on the U.S. defense budget for 2020, which prioritizes AI development along with hypersonic weapons. Also, in 2019, a special National Security Commission on Artificial Intelligence Development Commission was established, for which the US Congress set the task of monitoring and evaluating British researches in the development of AI, machine learning and related technologies, as well as periodically adjusting measures necessary to maintain superiority over a likely adversary (China, the Russian Federation). In this regard, the Commission proposed the creation of a global monitoring and inventory system for the most breakthrough and effective AI solutions. The Commission included the leaders of large technology companies, university rectors, senior military personnel, employees of the American Intelligence Community, as well as representatives of political associations. In addition, a new body of the US government was created – the Joint Center for Artificial Intelligence in the status of a federal service. In a general sense, the US leadership has created an AI development cluster, which includes all commercial companies that conduct development in this area, as well as representatives of the Department of Defense [59; 60].

In June 2019, the first report of the above-mentioned expert group "Policy and investment recommendations for trustworthy Artificial Intelligence" was published, which describes the value-ethical principles, as well as the future institutional outline of cooperation between countries in the field of deep machine learning, big data and AI. So, the "strategic agenda" is implemented through international organizations and forums, for example, the Secretary General of the Council of Europe proposed to develop and harmonies the regulatory framework in the field of AI in the future until 2028, taking into account published ethical rules [61-62]. The same approach can be seen in published strategies for the development of artificial intelligence in Great Britain and France [63]. For these purposes, London has established a special Centre for Data Ethics and Innovation. Another feature of the EU strategy is the focus on attracting foreign specialists. In the section "Prepare for socio-economic changes brought about by AI" this task is marked as a priority.

Regarding the EU's AI strategy, it should be noted that since the use of technology is closely related to the issues of ensuring national security, not all states are equally ready to delegate appropriate powers to the supranational structure. Thus, many countries of the European Union (Germany, France, Poland, the Netherlands, etc.) have prepared and are implementing their own strategies that take into account national specifics and determine their "niche" in this area [64-78].

3.3 Russia`s AI strategy

The Russian scientific school of artificial intelligence methods has deep roots. In the USSR, work in the field of artificial intelligence began in the 1960s. A number of pioneering studies led by V.N. Pushkin and D. A. Pospelov were carried out at Moscow State University and the USSR Academy of Sciences. In 1966, V.F. Turchin developed the language of recursive functions Refal (Recursive functions algorithmic language is the language of manipulating symbolic objects: texts, formulas, programs, etc. A program in Refal consists of functions that can be defined through each other, i.e., recursively.), used to solve special problems of artificial intelligence. Until the 1970s in the USSR, all AI research was conducted within the framework of cybernetics. Only in the early 1980s it has begun to be discussed as an independent scientific field – "artificial intelligence". In accordance with the report "Government Artificial Intelligence Readiness Index 2019", Russia ranks 29-th in the overall rankings for government AI readiness [79-95] (Table 1).

Table 1. Overall rankings for government AI readiness

Rank	Country	Score
1	Singapore	9.186
2	Great Britain	9.069

3	Germany	8.810
4	USA	8.804
5	Finland	8.772
6	Sweden	8.674
7	Canada	8.674
8	France	8.608
9	Denmark	8.601
10	Japan	8.582
11	Australia	8.126
12	Norway	8.079
13	New Zealand	7.876
14	Netherlands	7.659
15	Italy	7.533
16	Austria	7.527
17	India	7.515
18	Switzerland	7.461
19	United Arab Emirates	7.445
20	China	7.370
21	Israel	7.348
22	Malaysia	7.108
23	Estonia	6.968
24	Belgium	6.859
25	Luximburg	6.857
26	South Korea	6.839
27	Poland	6.835
28	Iceland	6.809
29	Russian Federation	6.748
30	Portugal	6.693

Given the fact that China takes the 20-th place, it can be assumed, that the compilers of the rating do not have the necessary information for individual states. So, for example, according to available data, China is already investing about 170 billion USD a year, by 2025 this figure will exceed 800 billion USD. The cost of AI in the US is about 26 billion USD a year [96-119]. It is possible that the 29-th place of Russia is due to similar reasons. Currently, in Russia there is a Centre for the National Technological Initiative on the basis of the Moscow Institute of Physics and Technology in the direction of "Artificial Intelligence". The aforementioned Centre regularly prepares the self-named almanac, in the first issue of which an expanded interpretation of the concept of artificial intelligence is given, leading foreign and Russian companies working in this area are listed, key universities in Russia and abroad are marked. So, for example, among universities, the highest publication activity was noted at ITMO. There is a "Map of Artificial Intelligence of Russia" in an interactive form [120-133]. In general, AI in Russia can be described as a dynamically developing field that received state support, and formalized by law. So, president of the Russian Federation V. Putin signed a decree of 10/10/2019 No. 490 "On the Development of Artificial Intelligence in the Russian Federation" [134], which approved the National Strategy for the Development of AI until 2030. The level of development and their practical orientation is confirmed by the federal law of April 24, 2020 No. 123-FZ "On conducting an experiment to establish special regulation in order to create the necessary conditions for the development and implementation of artificial

intelligence technologies in the subject of the Russian Federation, a city of federal significance Moscow and amending Articles 6 and 10 of the Federal Law "On Personal Data" [135].

The last twenty years of work in the field of artificial intelligence systems in Russia have formed around two nucleation sites: Sberbank (in the civilian sphere) and Rostec state corporation. The main center for development in defense field is the state corporation Rostec, in particular, the Kalashnikov concern is developing mobile unmanned aerial vehicles. In recent years, a number of developments have been carried out in the ERA technology center located on the Black Sea, near Anapa. As part of the annual international scientific and practical exhibition and conference organized and conducted by the Ministry of Defense of the Russian Federation under the general name "Army", since 2018 a section with a general focus on reports on the subject of artificial intelligence, its use in defense tasks is regularly organized.

At the other side of today's development is Sberbank. It has received the civil monopoly on commercial development using AI. Sberbank has prepared a federal project "Artificial Intelligence", which should be included in the program "Digital Economy". The document assumes expenses of 120 billion RUB for the period until 2024. The main market is Moscow, which is enshrined in the law on the special status of Moscow as a "testing ground" for testing artificial intelligence systems [136]. In general, today Russia is located between China and the United States in terms of its goals, however, the presence of two powerful centers in the civilian and military spheres can lead to a conflict of interest in the development of AI. Sberbank will receive state funding for the development of artificial intelligence systems, but the bank will retain copyright for them (the only exception will most likely be Moscow), justifying this with a trade secret. Military developments will be maximally advanced in technical terms, but will not go into the civilian sphere due to the secrecy regime. However, the problem of artificial intelligence industry in Russia is that the past achievements of Soviet scientific schools are mostly lost. For its money, the state will receive mainly instruments of control and security (such as recognition and identification systems). Sberbank is focused on earning quick profit from investments, which is achieved not by basic research, but by purchasing start-ups.

4. Conclusions

Therefore, major powers have already joined the long-term race, the strategy of PRC is notable for its initiative, focus on issues of ensuring national security and has a larger forecast horizon. In turn, the United States plans to more actively engage the private sector to implement technological developments. The investments planned by another major player, the European Union, are much more modest, but Brussels sees its role in the development of AI as an "ethical regulator" that sets norms and rules at the supranational level that apply not only to EU countries, but also to other states. In the medium term we will see the introduction of various sanctions due to the unethical use of AI technologies. AI technologies are cross-cutting, this competition affects both the economic and military, political and cultural-social spheres, deepening the hybrid nature of modern security threats at all levels.

As for the Russian Federation, it is located between the USA and China in terms of its goals. An important factor is the significant loss of the Soviet scientific backlog in this part, taking into account the general degradation of fundamental science in Russia. The documents on the development of AI adopted in Russia are largely not systemic and are not provided with the required resources, primarily, the scientific base, engineers and scientists. At the same time, the so-called "security dilemma" is launched, when the strengthening of some countries is perceived as a threat by other countries, which stimulates the latter to join the "race". At the same time, the complexity and paradox of the situation lies in the fact that the development of AI technologies should be carried out deliberately, "step by step", since there is destructive potential. However, as competition intensifies, ethical issues tend to fade into the background.

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