

## The Main Driver for the Development of Innovative Entrepreneurship in China is Artificial Intelligence

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### ABSTRACT

*Today, countries that value and understand the need for the formation of innovative ecosystems come to the fore and become the drivers of the world economy. China has identified the development of artificial intelligence as one of the main driving forces of the national economy at the present stage. The article discusses the main directions of the development of artificial intelligence in China, as well as global trends in this area. Particular attention is paid to the latest developments in China in the field of artificial intelligence. The forecasted values of the volume of the artificial intelligence market in China are estimated. It has been proven that despite a significant increase in the volume of the artificial intelligence market in China in 2020-2025, the growth rate is gradually decreasing. Due to the growing technological and economic confrontation between China and, first of all, the United States, the question of China's global leadership in the field of artificial intelligence remains open.*

**KEYWORDS:** *China, AI, digital economy, patents, market, innovation, factors.*

China in the 21st century is recognized as unprecedented in history in terms of the pace of development of science and the introduction of digital technologies. The historical four great inventions of ancient China - the compass, gunpowder, paper and typography - made it the innovative leader of the world for centuries. Today he added four more inventions to his money box - high-speed railways, bicycle sharing, the Ali Baba e-commerce system and the Alipay electronic payment system.

The Chinese economy is called innovative because it strives for technological independence. To achieve this goal, six factors contribute:

- a large number of the population and, thanks to a good education system, a rapidly growing quality of human capital;
- an efficient labor market for highly qualified specialists;
- financing system of scientific research supported by the state and business;
- the current system of incentives;
- effectively built system of knowledge transfer in technology;
- the world diaspora of scholars of Chinese origin, a significant part of whom operate in China, and the rest, as far as possible, helps their country.

The digital economy is booming in China with a legally approved information security doctrine. The innovative breakthrough of China, referred by analysts as the "Chinese innovation miracle", is a

serious achievement due to the hard work, energy, education and dynamism of the Chinese nation.<sup>1</sup>

Based on the rating of the main IT trends of 2021, compiled at the end of 2020 by the agency CNews Analytics, the most rated IT technologies are - big data analytics, cloud solutions and artificial intelligence<sup>2</sup> [4, 5].

China is on the 2020 Southeast Asian Innovation Leadership List and the Top Venture Capital Leaders, which is undoubtedly a positive development as it could bring the venture capital market back to normal by 2021. These costs are driven by the need to transform companies.

Innovation is concentrated in scientific and technical clusters of various high-income countries, most of all in China. The global innovation landscape is shifting eastward.

From 2018 to 2019, China is in 14th place (GII (Global innovation index) - 53.3) and at the same time remains the only country with an average income in the top thirty of the GII ranking. The GII ranking also identifies the world's leading countries in competitive areas of innovation, such as venture capital, high-tech manufacturing and scientific research. China in this case ranks third. According to the assessment of the balance of the innovation system, in the GII 2020 ranking, China lags behind only in the "infrastructure" category<sup>3</sup> [22].

The second rating that will be discussed in this article is the Nature Index. China is not only among the top 50 countries leading in AI research in 2020, but also ranks second (281.2), ahead of the UK by almost two times (43%)<sup>4</sup>[23]. The index value increased by 52.4% compared to 2019.

Due to Tsinghua University China ranked 9th (46.8) in the top 10 organizations leading in AI research in 2020 and 6th in the top 10 global universities leading in AI research.

Following the global innovation trends, China is betting on the development of artificial intelligence, planning to invest huge funds in this project by 2030 – \$ 1.6 trillion [11]. The Chinese government expects a lot from the development of technologies in the field of artificial intelligence. First of all, the recovery of entire sectors of the economy after the COVID-19 pandemic [1] (Shen, Marvin, While, 2020).

And as a consequence of China's innovation policy, on July 8, 2017, at a meeting of the State Council of the People's Republic of China, the national strategy for technology development was approved, which includes the "Program for the development of a new generation of Artificial intelligence" <sup>5</sup>[11]. For the first time at the state level, it establishes the country's development strategy as a "scientific and technological superpower", the decisive condition for the implementation of which is China's world leadership in the development of artificial intelligence (AI).

Another urgent need to step up the implementation of AI is, in particular, the consequences of the Covid-19 pandemic. The Chinese government has high hopes for the development of artificial intelligence technologies. The COVID-19 pandemic provoked large expenditures on AI technologies in 2020 (50.1 billion \$), as it was thanks to them that it was possible to reduce the use of human labor

<sup>1</sup> Panwar G. S. Machine Learning Trends to Watch Out in 2020 and 2021. [Электронный ресурс]. URL: <https://neptune.ai/blog/machine-learning-trends-2020-2021>

<sup>2</sup> CNews: ИТ-тренды 2021. Archived. [Электронный ресурс]. [https://www.cnews.ru/reviews/cnews\\_trendy\\_2021](https://www.cnews.ru/reviews/cnews_trendy_2021)

<sup>3</sup> Reshetnikova M. Venture Capital Market in China: A New Approach to Innovation Management. [Электронный ресурс]. URL: <https://doi.org/10.5281/ZENODO.3984247>

<sup>4</sup> WIPO. Global innovation index. [Электронный ресурс]. URL: [https://www.wipo.int/global\\_innovation\\_index/en/2020/](https://www.wipo.int/global_innovation_index/en/2020/)

<sup>5</sup> New Generation of Artificial Intelligence Development Plan, State Council Document [2017] No. 35 State Council July 8, 2017 [http://www.gov.cn/zhengce/content/2017-07/20/content\\_5211996.htm](http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm)

in order to automate many business processes. According to IDC's forecast, AI spending in 2024 will exceed \$110 billion, that is, it will double compared to 2020. The average annual growth rate of AI spending for 2019-2024 will be more than 20.1%, which will allow organizations of various sizes to remain competitive in the digital economy [3].

AI technologies help Chinese entrepreneurs turn all the data they receive into valuable information, thanks to which they can talk about a global vision of various situations and make effective decisions on automating business processes. <sup>6</sup>[21].

It is obvious that the government's decision to include China in the struggle for leadership in the new field of international competition, in particular AI, has found inspired support in Chinese business. The confirmation is the target values of the volumes of the Chinese artificial intelligence market.

According to iiMedia Research Group, the gross output (GO) of goods and services in the Chinese artificial intelligence sector in 2016 was \$ 1.7 million. In 2017, its growth did not exceed 30% and amounted to \$ 2.2 million. By the beginning of the first half of 2020, the explosives of the Chinese artificial intelligence sector had reached the level of 29.5 million\$, which corresponds to a 10-fold increase in the industry in just 3 years. And this is against the background of the problems in the global economy caused by the pandemic <sup>7</sup>[13].

The reason for such a large-scale success in the development of Chinese artificial intelligence lies in government support. This is facilitated not only by the above Programs, but also by the "Three-Year Action Plan to Promote the Development of the Next Generation Artificial Intelligence Industry" issued by the Ministry of Industry and Informatization of China. (The head body on the part of the Government responsible for coordinating the actions of state structures in the development of artificial intelligence), also a legislative document of the Ministry of Science and Technology of China, with a list of 13 technological projects that ensure the development of the technological base of the artificial intelligence sector <sup>8</sup>[15].

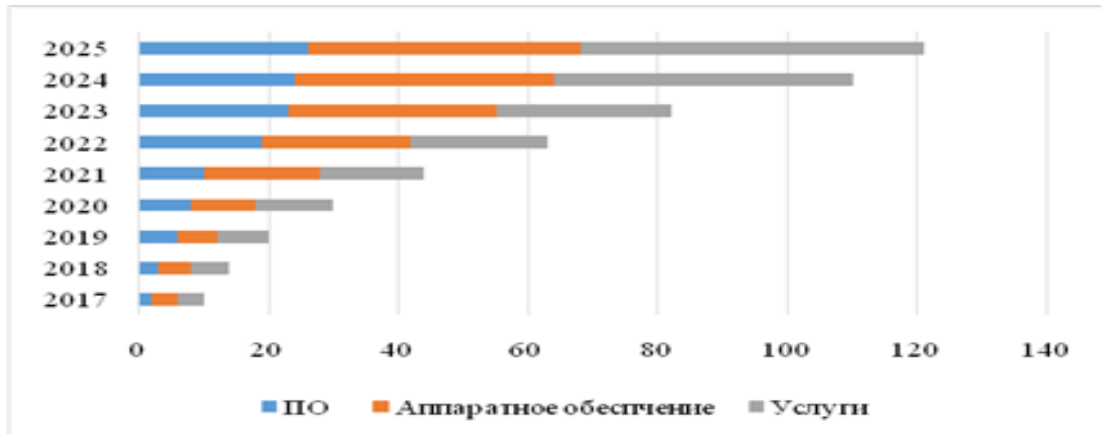
To implement such an ambitious technological breakthrough, the State Investment Fund was created under the Ministry of Industry and Informatization of China to support Chinese manufacturers of chips and microcircuits. By the end of 2019, it had already accumulated more than 31.5 billion \$. Expenditures on the implementation of the subprogram for the development of the element base of artificial intelligence by 2025 should approach 140 billion \$ (Fig. 1).

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<sup>6</sup> План развития искусственного интеллекта нового поколения в Китае. [Электронный ресурс]. URL: <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>

<sup>7</sup> Special Report on China's Artificial Intelligence Industry. iiMedia Research Group  
[http://www.sppm.tsinghua.edu.cn/eWebEditor/UploadFile/China\\_AI\\_development\\_report\\_2018.pdf](http://www.sppm.tsinghua.edu.cn/eWebEditor/UploadFile/China_AI_development_report_2018.pdf)

<sup>8</sup> Трехлетний план действий по продвижению развития отраслей искусственного интеллекта нового поколения. Министерство Информационных технологий  
<http://www.mii.gov.cn/n1146295/n1652858/n1652930/n3757016/c5960820/content.html>



**Figure 1. Government spending on the production of microcircuits for the AI sector in China, by areas, \$ million<sup>9</sup>**

The concretization of the innovative strategy for the development of artificial intelligence at the present stage has already yielded results. By the end of 2019, this sector of the Chinese innovation system is leading both in the number of research conducted and in the registration of intellectual property rights <sup>10</sup>[14].

**Table 1: AI patents obtained in China by inventive activity<sup>11</sup>**

Patents by type of inventive activity, units.	2015 year	2017 year	2019 year
Total patents	10 890	12 740	30 000
Patents for inventions	220	294	600
Utility model patents	6050	6985	16500
Patents for industrial designs	4620	5461	12900

Their scientific and practical competences have also significantly increased. China's breakthrough leap in registration of intellectual property rights for developments in artificial intelligence is evidence. In 2019 alone, the country filed 30 thousand patent applications on artificial intelligence, which is 2.5 times more than the same indicator in the United States (Table 1).

The development of business ecosystems of artificial intelligence and related industries is also favorable. The government has identified technology giants that dominate the artificial intelligence market and are controlled by government agencies. These are donor companies. Today there are four major donor companies.

- This is Baidu (self-driving vehicles);
- Alibaba (smart cities);
- Tencent (computer vision for medical diagnostics) - BAT group;
- iFlyTek company (voice assistance).

<sup>9</sup> Решетникова М.С., Пугачева И.А., Лукина Ю.Д. Тенденции развития технологий искусственного интеллекта в КНР // Вопросы инновационной экономики. – 2021. – Том 11. – № 1. – С. 333-350. – doi: 10.18334/vinec.11.1.111912.

<sup>10</sup> SCMP Research (2020). China AI Report 2020. Available at <https://www.scmp.com/china-ai-report>

<sup>11</sup> Решетникова М.С., Пугачева И.А., Лукина Ю.Д. Тенденции развития технологий искусственного интеллекта в КНР // Вопросы инновационной экономики. – 2021. – Том 11. – № 1. – С. 333-350. – doi: 10.18334/vinec.11.1.111912.

Companies are provided with unprecedented financial support from state program funds. These funds can only be spent on mergers, acquisitions and further development of startups that are developing in the corresponding areas of development of artificial intelligence. The Ministry of Industry and Technology alone allocated almost 978 million \$ for these purposes in 2019 <sup>12</sup>[14].

Due to such a large-scale financial support, donor companies, choosing the necessary startups, have the opportunity to practically immediately implement their developments in various products and services in the field of artificial intelligence, regardless of the prospect of success.

In addition to financial assistance, these companies receive significant government assistance in the form of granting monopolistic rights in this market.

It is worth highlighting two industries in which the largest volume of spending on AI implementation is planned until 2024: banking and retail. AI technologies in banks will focus on the analysis and study of types of fraud, and in trade, on improving the level of customer service using chat bots <sup>13</sup>[8] (Boobier, 2020).

The main goal of the AI development policy in China, as formulated in the AIDP<sup>14</sup>, is to establish China as a global center for AI innovation by 2030 and to define artificial intelligence as “the main driving force behind China's industrial modernization and economic transformation” <sup>15</sup>[20].

This development plan also highlights the importance of using AI across a wider range of sectors, including defense and social security, and focuses on the need to develop standards and ethics for the use of AI. Overall, the Plan envisions an overarching AI strategy and challenges other leading powers in many key areas, most notably the United States.

AIDP distinguishes between three key steps in AI development:

1) By 2020, China aims to remain competitive with other major powers and optimize its AI development environment. In monetary terms, China intends to create an AI industry worth more than 150 billion yuan (about 21 billion \$). Also during this period, initial ethics, policies and rules for vital areas of AI will be established;

2) by 2025, according to the Development Plan, China seeks to achieve a "major breakthrough" in AI development and to be the world leader in some technologies and applications. China also aims to increase the value of its core AI industry to more than 400 billion yuan (about 58 billion \$) and legalize ethical standards for AI;

3) by 2030, China aims to become a global AI innovation centre. By then, the mainstream AI industry is expected to have more than doubled growth, amounting to about RMB 1 trillion (approximately 147 billion \$), and further updates of laws and standards to address emerging technology and application challenges have been created.

In conclusion, we can assert that today the main strategy is an orientation towards domestic

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<sup>12</sup> Hafermalz E., Riemer K. Interpersonal Connectivity Work: Being there with and for geographically distant others // *Organization Studies*. – 2020. – № 41(12). – p. 1627–1648.

<sup>13</sup> Boobier T. AI and the future of banking. [Электронный ресурс]. URL: <https://onlinelibrary.wiley.com/doi/book/10.1002/9781119596165>

<sup>14</sup> Трехлетний план действий по продвижению развития отраслей искусственного интеллекта нового поколения. Министерство Информационных технологий <http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c5960820/content.html>

<sup>15</sup> Государственный совет Китая «План развития искусственного интеллекта нового поколения в Китае». [Электронный ресурс]. URL: <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>

consumption, which can be achieved only through accelerated internal growth based on breakthrough national technologies and become a "scientific and technological superpower" that will ensure world domination, primarily in the field of artificial intelligence.

The Chinese government-backed tech giants are striving to achieve AI leadership by building their own innovation base. But the pandemic has become a catalyst for global changes in the Chinese economy:

- forced diversification of supply chains,
- protectionist measures,
- search for alternative ways to maintain the economy in the face of uncertainty.

All these factors allow China to turn the global crisis into an opportunity to restructure the economy, to establish the production and export of high-tech goods using modern technologies. Due to AI technologies, the life of mankind becomes easier, better, more efficient.

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