High-Tech Industrial Complex: Safety and Quality of Development

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Abstract. The article analyses the most recent and advanced technologies of the present. The transition to the use of high technologies and their corresponding technology is the main link of the scientific and technical revolution (NTR). The High technology usually includes the most high-tech industries. The aim of the study is to show that like "Big Science," high technology, being an international phenomenon, covers continents embodied by the world community of the Internet. Today, an innovative economy (knowledge economy, intellectual economy) is based on constant technological improvement, production and export of high-tech products with very high value added and technologies themselves. This shows the development of the world market for high-tech products, as evidenced by the high level and positive changes in high-tech production in the basic countries where the development of related industries is observed.

1. Introduction
Today, the classification of technologies as "high" is determined by the degree of non-participation of a person in them. Initially, the Russian high-tech industrial complex was fully developed during the Soviet period. Mostly militaristic, it was an inextricable structural part of the totalitarian system and the state - the military-industrial complex (MIC) [10]. Today, an innovative economy (knowledge economy, intellectual economy) is based on constant technological improvement, production and export of high-tech products with very high value added and technologies themselves. In the modern conditions of development of high technologies, the most promising industry can be the electronic industry, which is an important component of the overall industrial picture of Russia. Many other sectors of the Russian economy depend on the production of electronic components - from medicine to space flights. The Russian electronic industry involves about 3,000 companies, 500 of which are under state control and fulfill its direct orders. The remaining 2,500 are private companies, including several dozen local branches of large international manufacturers. Private companies mainly operate in the civilian product market [7].
At the moment, there are a number of problems in Russian electronics, which are nevertheless being addressed by both government organizations and producer associations. Of the total number of companies engaged in the production of electronic equipment in Russia, 36% is for the production of purchased and custom components, 18% - for the development and marketing of modules, 30% - for the development and marketing of finished equipment, 3% - for the manufacture of enclosures [9].

5% of companies are engaged in production, and assembly and testing of modules and equipment - 8%. At the same time, the productivity of this industry is low, provided that this is what all legal entities and individuals seek. But it is not enough to be just productive and produce a lot of products, it is necessary to carry out quality control. The Ministry of Industry and Trade has developed a draft strategy for the development of the electronic industry of Russia until 2030. The strategy envisages the growth of domestic production by more than 2.5 times during this period. It is also expected to increase the volume of civil electronics sector 940 million to 4.6 billion rubles. The share of the domestic component base in microelectronics, according to the Ministry of Industry and Trade, should grow from 20 to 80%

This Strategy provides for the creation of institutions that will be responsible for its implementation and stimulate the strengthening of cooperation in the industry - strategic alliances, joint design and design centers, competence exchange programs. The strategy will have to be implemented in several stages - the first of them will pay attention to the development of traditional markets (telecommunication and navigation equipment, computing equipment, automation systems) [8]. Further, in 2021-2024, it is planned to cover markets related to technologies currently developing - the Internet of Things, 5G, intellectual energy. In 2025, the focus is planned to shift towards artificial intelligence, unmanned transport and other progressive directions. The volume of revenues of Russian enterprises in 2030 should amount to 3.26 trillion rubles, having increased almost five times compared to 2017 (which amounted to 714 billion), and their share in the domestic market - to increase from 22% to 40%. At the same time, the strategy recognizes that the capacity of the Russian market is not enough to achieve the target share in the world, so the plans - expansion abroad. Exports should grow more than tenfold: from the actual 220 million rubles in 2016 (97% - military electronics) to 2.37 billion rubles in 2030. As a result, the share of Russian electronics in the world, according to the plan, will rise from 0.6% to 1.5% [12].

2. Methods
At present, many high-tech manufacturing and modern facilities require equipment that is as reliable, durable, highly efficient, economical and easy to operate.

The methodological basis of the study is based on such methods of scientific research as: methods of classification, generalization, comparative analysis and synthesis, logical-structural, analytical, mathematical-statistical, dynamic (discounted) methods, interpretation of data, methods of system analysis, graphical.

3. Main part
According to the Association of Russian Electronics Developers and Manufacturers (ARPE) [13], the annual volume of sales of electronic equipment of domestic production is 15 billion dollars. In foreign markets, Russian products are sold in the amount of $1 billion. Gross industry income is $6 billion. The industry employs 360 thousand people with an average output of 24 thousand dollars per year. In general, high-tech products are imported into Russia, the dynamics of exports-imports by country to leaders is presented in Table 1.
Table 1. Leading countries in the export of high-tech products.

| №  | Country          | Exports of goods, billions of dollars | Export of high-tech goods, billion US dollars | Imports of goods, billions of dollars USA | Imports of high-tech goods, billions of dollars USA |
|----|------------------|---------------------------------------|---------------------------------------------|------------------------------------------|---------------------------------------------------|
| 1  | China            | 2142.80                               | 554.28                                      | 1575.76                                  | 310.42                                            |
| 2  | Germany          | 1308.80                               | 185.56                                      | 1016.97                                  | 78.31                                             |
| 3  | USA              | 1510.30                               | 154.36                                      | 2272.87                                  | 297.75                                            |
| 4  | Singapore        | 377.05                                | 130.99                                      | 294.53                                   | 72.16                                             |
| 5  | South Korea      | 548.84                                | 126.55                                      | 428.55                                   | 48.85                                             |
| 6  | France           | 510.81                                | 104.34                                      | 537.50                                   | 33.33                                             |
| 7  | Japan            | 621.97                                | 91.51                                       | 627.18                                   | 70.87                                             |
| 8  | Great Britain    | 432.80                                | 69.42                                       | 625.92                                   | 48.82                                             |
| 9  | Netherlands      | 474.10                                | 59.13                                       | 389.57                                   | 50.25                                             |
| 10 | Malaysia         | 175.74                                | 57.26,                                     | 147.68                                   | 34.11                                             |
| ... | ...              | ...                                   | ...                                          | ...                                     | ...                                              |
| 27 | Russia           | 341.47                                | 9.68                                        | 192.96                                   | 15.24                                             |

Source: [7]

When considering the data in the table, it should first be noted that many of the countries mentioned as examples have a higher share of high-tech exports in the external economic balance than the corresponding share of imports, with the exception of countries such as Mexico and Russia. With regard to exports of high-tech products, the Philippines (60.46%) is undoubtedly the leader. Malaysia (32.5%), Singapore (29%), China (26%) and South Korea (23%) have rates above 20%. The third level is Western European. After similar analysis of imports of high-tech products, the composition of the group of leading countries will not change: Singapore (24.5%), Malaysia (23.1%), the Philippines (20.9%) and China (19.7%). The statistics confirm the previous view that countries in the South Asian region specialize in assembling and therefore re-exporting the final product [7].

In order for large projects aimed at the world market of microelectronics to be profitable in Russia, it is necessary to combine exclusive tax incentives for such projects along with state support for investments. At the same time, the largest manufacturers of electronic equipment in the Russian Federation define the application and requirements for these projects on the basis of export development goals and an international sectoral strategy.

Cutting taxes on electronics developers' wages, as has already been done for software developers, will boost the industry's own investment resources. This will increase the volume of frequent investments in the first year by 15%, by more than 5% per year, thanks to improved tax conditions compared to competing countries.

Today in the Russian market of high-tech production problems are observed in the field of maintaining competitiveness. Public sector companies work on a contract basis, receiving budget funding, which denies them incentives to increase the economic efficiency of their production. Private
companies are forced to compete with large international corporations, which prevent smaller competitors from fully developing due to higher demand for foreign products.

Today competition in the domestic market has a fairly simple paradigm [6]:
- with imported equipment competition is currently only possible with State support;
- the level of domestic equipment is relatively low compared to imports and does not require serious marketing competences to ensure competition between domestic equipment;
- many domestic segments develop in oligopoly mode or are monopolized (large orders re distributed among a limited number of large companies), which significantly limits competition and reduces incentives for enterprises to develop in general and in marketing in particular.

The Russian electronics market accounts for less than one percent of the world’s (0.4% according to ARPE) [13]. At such a small scale, Russian companies do not currently have the opportunity to provide the high level of guarantees and comprehensive offers needed by customers. Dependence on foreign basic technologies is too strong, increasing the risks associated with sanctions. In the development of modern equipment, we often see an attempt to reach a compromise between speed and accuracy, efficiency and reliability, in which one of the characteristics is usually inferior to the other. Therefore, devices showing high efficiency and reliability immediately attract attention.

According to the Center for Modern Electronics, the most demanded segment of the Russian market is electronics for military and aerospace equipment - the volume of sales is about 1 billion dollars (39% of the total volume). The second place is industrial electronics (500 million dollars, 20%). It is followed by communications equipment ($230 million, 10%), security systems ($215 million, 9%), lighting and signage ($200 million, 8%). The turnover of trade equipment and medical electronics is 100 million dollars per year (4% each). Consumer electronics and automotive electronics account for 3% of the market with sales of about $80 million for each industry [4].

Figure 1 shows the dynamics of the production index for high-tech manufacturing economic activities, which is decreasing annually, which indicates a decrease in Russian developments.

![Figure 1. Production Index for High-Tech Manufacturing Activities.](image)

At present, as the industry develops, it is necessary not to increase the number of projects, but to increase the complexity of the tasks, moving to the development of new technologies and materials. Thus, to try to put Russian companies in the position of technological leaders in focus directions, to prevent the loss of focus. Development in other areas is carried out through systematic borrowing, development of technologies abroad and safe supply of imported parts, reducing the share and dependence on non-binding solutions and closed technologies [2].

It is necessary to support internal demand from developers and manufacturers of electronic equipment, as well as the development of many supplier companies in various technological spheres. Especially those activities, that may be based on private investment and the domestic market.
4. Discussion
As the analysis of foreign practice shows, the level of state support for domestic producers of electronic industry is often significantly lower than that adopted in advanced countries. Additional support measures that can be taken: accelerated depreciation of both tangible and intangible assets, tax discounts on R & D, tax holidays for new development enterprises, regulation of land and other taxes on natural resources in places of supposed creation of high-tech industries, stimulation of infrastructure development of small and medium-sized enterprises engaged in promising works in the field of high technologies.

Industry is getting harder. Another important trend is the intrusion of industrial technology into new industries, like IT. This trend is particularly evident in developed countries, where there are practically no footwear or clothing factories left. The main factor in the labour market is the availability of the labour force. In this sense, developing countries will benefit: it is in them that the age group of 15-59 years will grow in the coming years. In total, this age group will be supplemented by 450 million people, 120 million of whom will live in India. Share will not change in China [5].

This is already hitting China's competitiveness, with wages on the coast rising faster than productivity. From 2005 to 2010, the average salary in China grew by 19% per year, compared to 5% in the United States. This is due not only to labour shortages, but also to China's changing economic model: the economy is moving towards consumption and production of more complex products. As a result, industry mixes inland and into other poor countries, such as Vietnam, India, Bangladesh and Indonesia [11].

The automotive industry has a key role in the technological, social and political development of the planet. In the world, 90 million people - 5% of the world's total workforce - are involved in car creation. If the automotive industry were a separate country, it would be among the top ten largest economies in the world. Each additional created workplace in the automotive industry results in five additional jobs in related sectors. In the last decades of the last century, there was a real revolution in pharmaceuticals: it became easier to open new medicines, public demand for health products increased, and many countries began to invest in health systems. In recent years, however, serious problems have begun to emerge in this model [3].

Global foreign direct investment (FDI) continued to decline in 2018, falling by 13% to $1.3 trillion. FDI flows to developed countries reached their lowest level since 2004, falling by 27%. Investment flows to Europe halved to less than $200 billion due to capital outflows from several major receiving countries due to the repatriation of funds and a significant drop in investment in the United Kingdom. Capital inflows also declined to the United States with a 9% decline to $252 billion [4].

The ongoing coronavirus pandemic today also strongly affects many States and forces them to take extreme measures in the form of almost forced "self-isolation of citizens" [1]. In turn, this has shown how important computer technology and telecommunications are. Online services were in a favorable position, the number of users. Due to events that forced people to stay at home for an indefinite period of time, businesses were forced to switch to remote interaction between their employees. In turn, many services responded to this trend and developed new programs or paid more attention to existing projects for remote management. Many aspects of people 's lives can be expected to change in the future. The conditions created by the pandemic were able to show the need to invest in the development of high technologies.

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