Innovative technologies and digitalization in radio electronics

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Abstract. The purpose of this study is to consider the concept and value of the digital economy in the electronic industry. Attention was focused on digitalization of the full life cycle of radio-electronic products ensuring not only maximum efficiency and coherence of all business processes, close interaction of suppliers of equipment components, manufacturer and consumer, but also in the global sense contributes to increase of competitiveness of Russian radio-electronics. The development of the digital economy is necessary to strengthen economic relations between actors in order to simplify and accelerate the work of people, to conduct processes in a simple and transparent manner; In addition, digitalization will increase the need for skilled electronic equipment. The article reveals a certain aspect of innovation in the development of radio electronics and Internet technologies, which would make them competitive in modern economic conditions.

1. Introduction
The state of affairs in the electronic industry is constantly in the field of attention and generally contribute to the formation of mechanisms for the sustainable development of import substitution processes of industrial enterprises, as well as has a fundamental importance and a strong impact on the entire national economy. An important task of the economic strategy, both at the macro and micro levels, is the formation of an institutional environment, the development and production of original models under Russian brands, which should improve the efficiency of enterprises. A number of factors are of particular importance for the economy of the country as a whole, far exceeding the sum of private economic effects for specific enterprises, the production of high-quality, competitive compared to the best world analogues of electronic equipment, including the premium segment [1].

Electronic devices, systems are the basis of the modern digital world. The ability of the national economy to produce technology, create and reproduce largely determines the prospects for digitalization of the economy as a whole and its global competitiveness [1].

The Russian radio electronics market is growing steadily. By 2030 - its volume will grow 2.5 times and will exceed 8 trillion rubles. Production growth is increasing and its growth in Russia in the first half of 2018 amounted to 21%, compared to the first half of 2017, that is, growth by one fifth. In 2017, 87% of all industry enterprises were involved in the execution of state contracts. The situation in the civil sector is fundamentally different. It costs quite a long time by purchasing the appropriate amounts of equipment and components abroad.

Domestic goods are not enough. Last year, the share of Russian companies in the radio electronics market was somewhere 22%. Some technologies and products in Russia are not produced at all. Russia depends on imports. Foreign opponents influence not only by economic methods, which is natural in a
competitive world, but also by political methods, through sanctions. And this makes the Russian market very vulnerable [2,3].

![Figure 1. Dynamics of Russian radio electronics market, trillion rubles.](image)

Russian manufacturers are entitled to resist for increasing their share in the electronic equipment market. Technological developments of Russian military radio electronics and civilian resources are in demand. There used to be a direct transfer of defense technology to civilian. Now sometimes civilian technology comes into the defense industry [4].

One of the main current trends in the world electronic industry is the creation of universal platform solutions, which can be applied in different sectors and spheres of the economy. In this regard, there is a range of incentive measures in support of domestic electronic solutions, on the basis of which digitalization processes in high-tech sectors will be developed.

One of the directions is the info-telecommunication infrastructure of high-speed transmission, processing and storage of large volumes of data [5].

In the modern concept, an enterprise is a digital ecosystem in which physical processes are integrated into a single information space. This integration requires standardization of all business processes, all enterprise value chains. The main directions of import substitution: heavy industry with radio electronics and agriculture, without which the military-industrial complex is unthinkable. Economists by competition mean the competition of firms among themselves for the consumer. As a rule, the more firms in the market are present, the higher the competition will be. In most cases, an increase in the number of firms in the market will result in more goods in the market and lower prices. Therefore - yes, the increase in competition leads to lower prices [5,2,3].

Don Tapskott [6, 7] was among the first authors who anticipated a lot of things from what is understood as digital economy today. The digital economy is the system of the economic, social and cultural relations based on use of digital information and communication technologies. Development of technological infrastructure and use of big databases caused large-scale digital transformation of our society. This stage is distinguished by integration of a wide range of digital services, products and systems. All these phenomena radically change the scheme of the global system including the possibilities of consumers, structure of the industries, the role of the states [5].

The higher the competition in all areas of activity, the more information is available to all, the better the individual consumer. It will be able to buy a cheap and high-quality product.
Figure 2. Volume of revenues of Russian holdings producing electronic equipment.

The electronic industry has long focused exclusively on defense and security needs. And in these directions in many ways we surely compete with foreign equipment.

2. Materials
The theoretical and methodological base is formed by the fundamental paradigm of modern economic science, which form the socio-mental basis and theoretical-conceptual basis of analysis of import substitution problems [1].

3. Results and discussion
Three main segments can be identified in world radio electronics markets:

- Consumer radio electronics, including mass audio, video, computer and household appliances;
- Professional electronics used in industry, telecommunications, automotive, energy, medicine and other fields;
- Special-purpose radio electronics are equipment for different types of weapons and power structures.

In 2019, there was growth in such industries as pharmaceuticals (18%), radio electronics (9%), metallurgy (9%) and chemical complex (8%). Significant dynamics of diversification was shown by PKI: this year the share of civilian products has already reached 21%. In the future, it is planned to increase to 30% until 2025 in order to further increase this figure to 50%.

Organizations of the electronic industry do not use autonomous robots, and the development of this direction, according to respondents, is economically unfavourable due to their high cost.

In terms of expectations, 69% of Russian electronic industry organizations see digital transformation as an opportunity to develop new products, 60% - an opportunity to increase efficiency by reducing costs, changing business models and other factors, 57% - an opportunity to enter new markets [5].

The watching problems are revealed:
- The need to improve the standardization cycle, providing a mechanism for accounting for key patents and ensuring access to them by all electronic enterprises on reasonable, equal and non-discriminatory terms.
- It is necessary to create products using foreign components in order for Russian goods to be competitive in price - large orders are important to manufacturers:
  - Provision of affordable prices by manufacturers.
• No component base, no production chains.
• It is necessary to make production the most efficient, no less than other manufacturers in other countries.
• No patents, highly qualified, trained and trained personnel and developments.
• Lack of intellectual property in this direction.
• Import of technologies.
• No one is interested in selling technology abroad - it is more profitable for them to sell finished products.

![Figure 3. Dynamics of export growth by industry in the Russian Federation.](image)

![Figure 4. Share of innovative goods, works and services to the total volume of shipped goods, performed works and services of organizations of the electronic industry.](image)

Russia is a market, no one will transfer technology. Importing technology-breakthrough technology nobody produces or brings.

It is not one machine or plant-whole chain of resources to completely "disconnect" the country from the world market. Make Russian products competitive for external partners. And therefore, export indicators, according to the idea, should also report on successes of import substitution strategy a lot. As of October 2018, 64.4% of Russian exports were still fuel and energy goods (more than half of them are crude oil, gas condensate and natural gas). The categories "Food and agricultural goods" and "Machines, equipment and vehicles" have quite close indicators: 5.5% and 5.9%, respectively.

Share of innovative goods, works and services to the total volume of shipped goods, performed works and services of organizations of the electronic industry.

4. Conclusion
Comprehensive digital transformation is a necessary element of effective development of the Russian radio-electronic industry, and it would be interesting and useful for us as consumers of its products to be in this chain of digitalization. Digitalization will ensure transparency of all stages of production,
allow the manufacturer to respond quickly to consumer requests, eliminate failures and problems, if any, at any stage of product creation. The main consumers of radio electronics, such as firms, will be able to obtain the fullest possible information about the equipment and to influence its quality to a certain extent. Thus, digitalization of the full life cycle of radio-electronic products ensures not only maximum efficiency and coherence of all business processes, close interaction of suppliers of equipment components, manufacturer and consumer, but also in the global sense contributes to increase of competitiveness of Russian radio-electronics. If we develop the topic of partnership, we will not be able to say about the possible outsourcing of part of the functionality to operator companies. The fact is that the complexity of IT systems in the transition to the digital economy increases avalanche-like, and there is a need for highly qualified employees specializing in both production and engineering systems. The latter can be used as outsourcing resources from operators with much more experience in building and maintaining IT infrastructure [8-10].

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