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Innovative processes of digital transformation in radio electronics

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Abstract. The radio electronics is one of the rapidly-growing branches of industry in the world, where a great number of innovative projects is implemented. The article reflects the existing technologies representing the best world practices. It is demonstrated that digital transformation contributes to drastic increase of productivity and value of enterprises. The enterprises of electronic industry use achievements of digital era: mobility, social media, analytics, smart devices, it helps to improve capabilities of the traditional technologies. The most flexible of the leading enterprises implement the major projects of digital transformation. The significance of intellectual properly increases with successful propagation of information and communication technologies and enhancement of innovative processes in the economy development. It has been reflected that integrating the efforts of business, science and state in implementation of the priority directions of modernization and technological development contributes to creation of new technologies.

1. Introduction

The development of radio and electronic industry is one of the key directions of the modern industry, a basis for hi-tech articles of many branches of industry. The state of radio and electronic industry (REI) determines today the level of technological independence, economical, and informational security of the state. The incorporation of digital technologies opens a tremendous spectrum of opportunities for establishing competitive production facilities of radio and electronic industry. The main directions of technological modernization of radio and electronic industry have been outlined in the report of A.S. Yakunin, Director of the Department of radio and electronic industry of the Ministry of Industry and Trade “Technological modernization is the basis of increasing competitiveness of radio and electronic industry”. These include: active development and production of innovative hi-tech products, building REI scientific and production complex with a sufficient range of unique technologies. The priority innovative radio electronic technologies: technology of information transmission and distribution, access to information networks; technology of real-time management systems; components based on “System in Package” 3D production technologies have been outlined in the report of D.V. Manturov, the Minister of Industry and Trade of the Russian Federation “On the goals and objectives of the Ministry of Industry and Trade of Russia for 2018 and main results of activity in 2017”. In order to reach the objectives, it is necessary to build an information field making it possible to adopt



analytically substantiated managerial decisions for the development of radio and electronic industry and entry into international market.

Investigation goal and objectives

The analysis of using digital technologies activating development of innovative activity has been carried out on the basis of radio electronics. Investigation objectives: reveal activity of using digital technologies in various spheres of radio electronics, substantiate the role of information technologies in the emergence of fundamentally new communication systems in radio electronics, and distinguish value-conscious innovative projects based on digital technologies.

Investigation methods are based on theoretical developments, reports of the leading world scholars, reports of departments of science and industry, proceeding of symposium and conferences, proceeding of scientists.

2. Investigation

The priority focus on the development of radio and electronic industry (REI) is attributable to the fact that it makes a basis for hi-tech articles of many branches of industry. Its share in the cost of produce of different branches of national economy equals: 20% in the motor vehicle industry, up to 40% in scientific instrument-making industry, up to 55% in aviation industry. The number of organizations that have accomplished such technological innovations in electronic and radio electronic industry increases significantly as compared with the total number of manufacturers. Any final product comprises electronic components, or radio electronic assemblies, units, modules, instruments, systems. The systems associated with energy-saving, electro technical equipment, computation equipment, intellectual systems and industrial electronics are being actively built and updated. The strategic line of REI development is a technological modernization of the industry enterprises, a changeover to innovative way of development on the basis of chosen priorities, increasing innovative activity, development and incorporation of new technical aids and advanced cutting-edge technologies [1]. A special attention is paid to conducting research, design and testing work (RD&T) on the development and commercialization of industry-critical technologies, which implementation will provide establishment of high-performance competitive radio electronic produce. Summarizing the results of 2017 the total revenue of the Russian organizations of radio and electronic industry amounted to 1,107.5 bln rubles. The production volumes have grown over the last 5 years in the segment of commercial microelectronics by 85% from 7.8 bln rub. in 2012 to 14.4 bln rub. proceeding from the results of 2017 [2].

The radio and electronic industry is characterized by a high level of scientific content of production of innovative products, the share of expenses for investigations and developments equals about 46% in total expenditures for technological innovations. The expenditures for procurement of the latest process equipment amount to around 25%. In order to activate addressing a problem of technological independence of the Russian Federation in the field of information and communication technologies and digital systems, the integrated centers of designing electronic component base and radio electronic equipment, research-and-production complexes are being established. The radio electronic produce determines intellectual capabilities of the entire final produce, it helps expand the functional capabilities and the living environment on the Earth and in space [3, 4].

Figure 1 shows innovative developments in radio electronics.

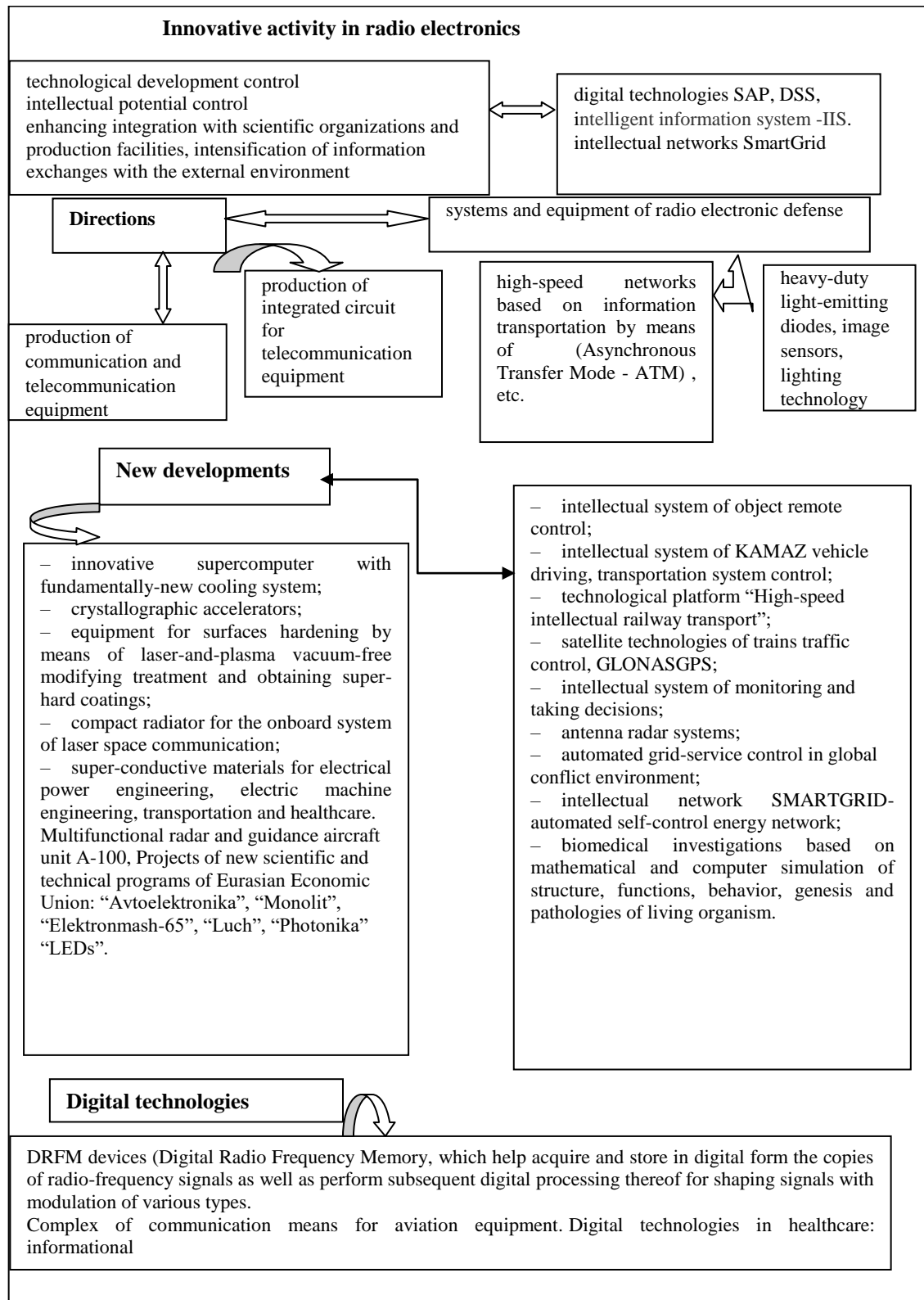


Figure 1. Innovative activity in radio electronics with the use of digital technologies.

The key condition for an efficient development of electronic and radio electronic produce is the transition to digital technologies. The digital technologies transform the methods of social interaction, economic relations, institutes [5, 6]. Due to higher flexibility the business structures can quickly adapt

to market changes and transform into new structures, shaping at that the required level of competence for organization of production of goods and services depending on the market demands [7, 8].

Figure 1 shows the main directions of REI activity and distinguishes the unique scientific developments [9, 10].

The activation of innovative practice and acceleration of incorporation of results of scientific and technical activity are to bring about the increased share of innovative produce in radio electronic industry up to 21.2% in 2015 and up to 40.7% in 2025. The modernization of production, design and research-and-development complexes will help lay a necessary basis for the next stage of development of electronic and radio electronic industry. The analysis of the state of radio electronics by 2018 has shown the following: 1. Developed scientific groundwork in the sphere of physics of semi-conductors and production base in the field of microwave electronics and optoelectronics. 2. A network of design centers has been established and furnished with up-to-date equipment. 3. A number of production facilities for the most significant directions have been built and modernized. 4. Significant volumes of selling military produce, including export abroad. 5. High level of qualification and experience of work in the industry with the employees of organizations. Though there exist demerits, such as, the absence of a developed cooperation between industry organizations as a whole [11].

The digital transformation contributes to a considerable increase of productivity and value of enterprises. The complex solutions of re-equipment of medical establishments with up-to-date digital equipment have been adopted. The use of digital technologies in X-ray diagnostics opens prospects in decreasing radiation risks both for the patients and for the medical personnel, increasing a diagnostic value of images, building information networks and use of telemedicine. The development of telemedicine in Russia is an actively developing direction. The telemedicine is a tool for the public health services corresponding to the use of digital information and telecommunication technologies for rendering remote assistance and services. It has been summarized by the authors on the basis of [12–15].

The availability to innovations is the main criterion for assessing success of transformations on the basis of digital technologies. Figure 2 shows an interrelation of developing business strategies with digital technologies.

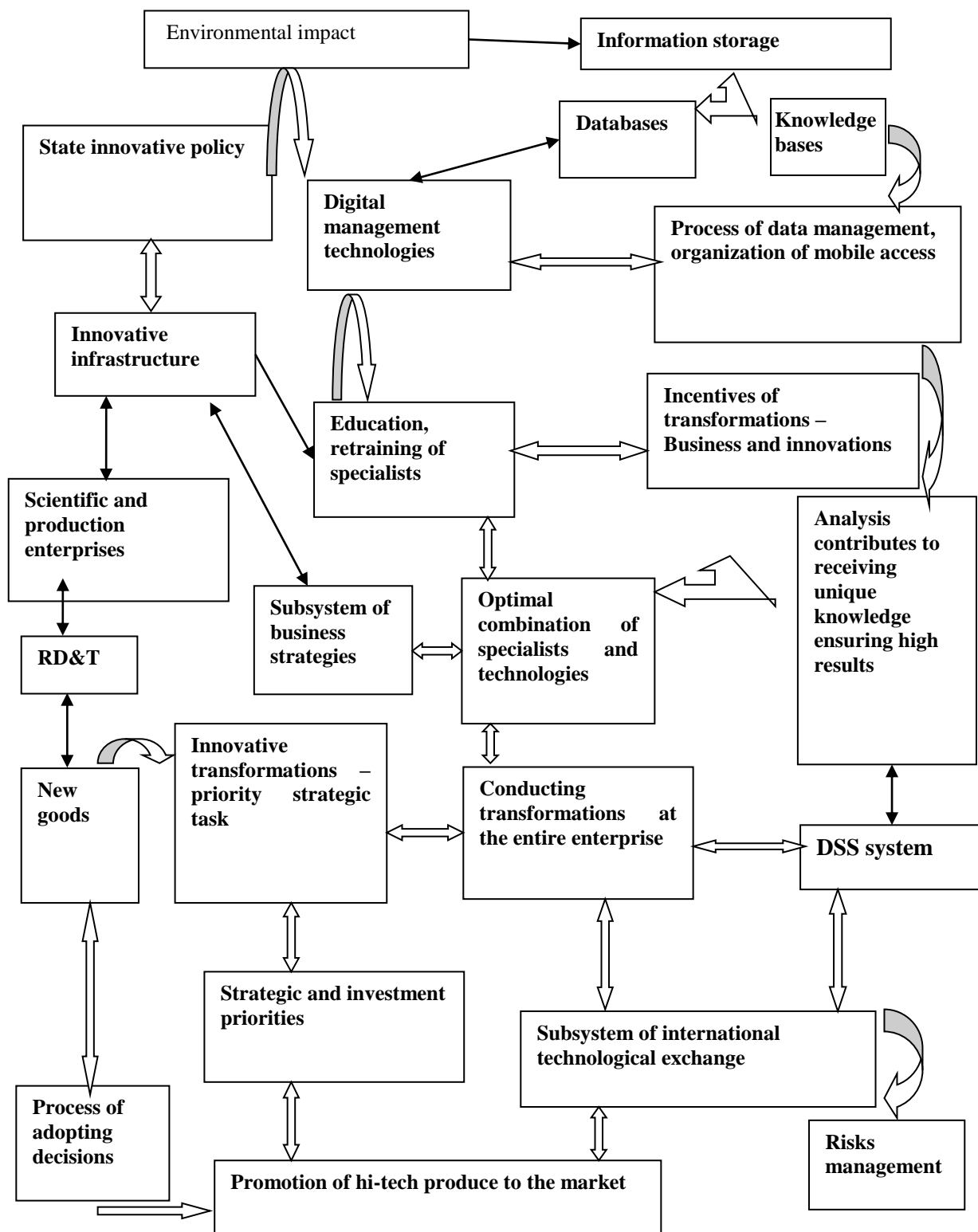


Figure 2. Processes of management of innovative activity, which are interrelated with digital technologies [10, 11, 16].

The diagram shows a process of building technological infrastructure and development of strategy of transformations on the basis of digital technologies. The integration of technologies and digital transformations at the enterprise level provide for significant improvements.

3. Obtained results

The transformation of business activity of any company into digital form makes it possible to increase economic efficiency, accelerate promotion of products and services to the market, improve quality of clients servicing and increase incomes due to more efficient data management. The following influence the development of radio and electronic industry:

- a) production automation and digitalization;
- b) growth of share of program component in the added value of final articles and services as well as growth of influence of functional capabilities of devices attained due to software;
- c) retention and enhancement of interaction in the sphere of high technologies, especially in the sphere of microelectronics.

As a result the growth of volumes of produce manufacturing in the radio and electronic industry with activation of innovative activity amounted to 10.4% in 2017 with respect to aggregate, including 7.3% in electronic industry, 11.7% in radio industry, 5% in communication industry [5, 7]. The managers in all branches of industry use digital achievements, such as analytics, mobility, social media and built-in intellectual devices as well as improve utilization of traditional technologies, such as ERP, for changing relations with clients, internal processes and value offers.

4. Conclusions

Implementation of goals and objectives of digital transformation in radio electronics considerably increases the efficiency of incorporation and development of innovative technologies, contributes to expanding the volumes of manufacture of highly-intellectual produce, more intensive application of results of intellectual activity in the industry. The availability to innovations is one of the main criteria of success of the initiatives on business transformation by means of digital technologies.

5. Directions of further investigations

Analysis of innovative business processes on the basis of up-to-date digital technologies, data-driven approaches taking place under influence of competition. The investigation of a role of cloud technologies as an important part of digital strategies of leading companies.

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