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**INDUSTRIAL DIGITAL PLATFORMS IN THE DEVELOPMENT
OF A CLUSTER DIGITAL ECONOMY**

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Abstract

The foundation for the formation and development of the digital economy should be the key elements - clusters and technology parks that determine the essence of the digital transformation of business and the economy, industrial industries and services. In 2020, industrial clusters are already recognized as the most effective tools for the development of investment and industrial policies. Territorial industrial clusters, forming in certain regions, create a high added value of products, significantly replenish regional and federal budgets. Industrial clusters determine the socio-economic development of the constituent entities of the Russian Federation in which they are formed. The industrial revolution, oriented towards industry 4.0, will entail systemic changes that will require new forms of organizing the work of all its participants. This concept removes the boundaries between physical, digital and biological technologies. The implementation of industry concept 4.0 should contribute to the increase of labor productivity, economic growth and competitiveness of its leading countries. The fourth industrial revolution will cause an inevitable redistribution of the role of economies in global competition on the world stage. Industry 4.0 offers great opportunities and prospects for Russia with the aim of changing its role in the global economy and avoiding commodity dependence. The solution of the main problems of increasing the competitiveness of business entities is everywhere connected with the accelerated introduction of innovative methods of organization and management of enterprises on the basis of digital technologies and wide socialization.

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Keywords: Cluster, cluster regional policy, contract company, digital industrial platform, grocery startup



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1. Introduction

The realities of the world economic landscape are such that international global competition boils down to competition between individual regions based on emerging digital platforms. The foundation for the formation and development of the digital economy should be the key elements - clusters and technology parks that determine the essence of the digital transformation of business and the economy, industrial industries and services. It is necessary to change the structure of the economy, the introduction of cluster and digital approaches in improving the activities of industrial enterprises and the development of the economy as a whole. It is necessary to create conditions for the formation and development of the digital potential of industrial enterprises in modern market conditions. Today, competitive advantages are almost entirely due to digitalization in the technologies of production, management, organization based on a cluster economy.

Scientific and educational departments, scientific schools and laboratories are the core of digital clustering of the economy. They form a set of competencies in a certain subject area of science and technology, the organization of production. The Digital University platform is aimed at building scientific, educational and technological trajectories, forming communications in resource management for this activity. The restructuring of educational and research processes is expected. The goal of such a digital transformation in the field of education and science is the development of various technological and engineering centers on the basis of the university, the creation of a professional environment for the development of the maximum number of competent specialists. At the same time, it is important to give new knowledge not only to current students in the broad sense of this concept, but also to those specialists who now work at traditional enterprises undergoing digital transformation. The formed digital platforms can support scientific services - supporting publication activity; business planning, research information support; platform for joint development. They can also support educational services, library services for searching, access and obtaining information from a wide range of electronic libraries in different countries, as well as computing services for scientific calculations.

2. Problem Statement

The challenges of maintaining and strengthening the competitive position of business structures are constantly exacerbated by the following conditions:

- continuous and development of processes of conceptual, institutional changes of the model of reproduction activity;
- continuous change of process stages.

There is a compelling argument for changing the nature of economic growth and the sources of modern enterprise competitiveness. This makes it necessary to identify modern forms of organization of entrepreneurship and industrial activity, to find factors of their successful implementation in conditions of rapid development of modern "subversive" technologies. The economies of developing countries have come to the forefront of the world by no accident. In these countries, entrepreneurs are not burdened with obligations in relation to previous strategies. They effectively change the structure of global production chains and accelerate major changes in the balance of economic capacities of states.

3. Research Questions

This study considers theoretical and practical aspects of digital development of industrial enterprises. The issues of improving the digital potential of industrial enterprises through the development of industrial clusters are being studied. Application of theoretical and methodological provisions and practical recommendations of the study will allow to make informed decisions in the field of innovation-technological and digital development of industry industrial enterprises. This will allow to more effectively solve the problems of formation and interaction of regional industrial clusters. In the modern conditions of development, the Russian economy needs a comprehensive implementation of digitalization in the shortest period. The processes of decentralization of industrial production, the introduction of a modern model of open contract production are becoming more and more relevant. Obviously, this will contribute to the achievement of large-scale results on a radical reduction in costs at enterprises of various sectors of the Russian economy. Further research in this area will expand the understanding of the possibilities of applying theoretical and methodological provisions and practical recommendations in the field of increasing innovation, digital potential of industrial enterprises.

4. Purpose of the Study

The world processes of large-scale modernization of science and production based on the achievements of Industry 4.0 require research in order to identify promising sources of competitive advantages of entrepreneurial structures. It is necessary to identify the time-specific relevance of digital technologies as factors of competitive advantage. Digital technologies should be introduced in enterprises as quickly as possible, within one or two years, quickly and successfully developed by specialists in the production of competitive products and services, ahead of competitors in time, efficiency, consumer value.

The following objectives and objectives are defined according to the issues and questions of the study:

- study the problems of increasing the efficiency of modern industrial enterprises, the development of innovative production and digital technologies in the regions;
- consider competition between individual regions based on emerging digital platforms;
- define the essence, role and significance of the formed digital industrial platforms;
- to propose directions of digital cluster economy development.

5. Research Methods

Methods of technological forecasting, international comparisons, meaningful economic interpretation of the studied processes from the economic practice of digitalization of enterprises were used in this study. The study suggests that the new paradigm of scientific and technological development is based on hybrid innovation. The possession of a basic asset is no longer a key factor. The development and implementation of innovative platforms with significant support from universities are becoming a key factor for success. According to forecasts, innovative platforms will be able to provide scientific and technical services for the enterprises. It will demand new knowledge and abilities as important attributes "Industries 4.0" in the conditions of global digital transformation. The experimental base of the study was

the sector of industrial enterprises of Voronezh region, namely, enterprises of the oil and gas complex. Based on the methods used, the organizational, economic and production potential of the cluster has been identified. The business model of the Technospark nanotechnological center (Troitsk, Russia) was considered.

6. Findings

Currently, the success of the world economy is determined by the concept of industry 4.0, which was first formulated in 2011. The core of the 4.0 industry is the accelerated integration of computing resources into industrial processes. As a result, a significant part of production will be carried out autonomously, using robotics, artificial intelligence and digital technologies. Concepts such as "industrial Internet of things" and "digital enterprise" are associated with industry 4.0. The industrial revolution, oriented towards industry 4.0, will entail systemic changes that will require new forms of organizing the work of all its participants (Autio et al., 2018). This concept removes the boundaries between physical, digital and biological technologies. The implementation of industry concept 4.0 should contribute to the increase of labor productivity, economic growth and competitiveness of its leading countries. The fourth industrial revolution will cause an inevitable redistribution of the role of economies in global competition on the world stage. Industry 4.0 offers great opportunities and prospects for Russia with the aim of changing its role in the global economy and avoiding commodity dependence. However, according to expert opinion, the key barriers to Russia's transition to the 4.0 industry are:

- low level of digitization of the economy;
- insufficient innovation costs for enterprises;
- low level of investment in innovative production and digital technologies.

The realities of the world economic landscape are such that international global competition boils down to competition between individual regions based on emerging digital platforms (Ghezzi & Cavallo, 2020). The foundation for the formation and development of the digital economy should be the key elements - clusters and technology parks that determine the essence of the digital transformation of business and the economy, industrial industries and services (Coreynen et al., 2017).

Industrial clusters in the Russian economy first appeared in 2015. In 2020, industrial clusters are already recognized as the most effective tools for the development of investment and industrial policies. Territorial industrial clusters, forming in certain regions, create a high added value of products, significantly replenish regional and federal budgets. Industrial clusters determine the socio-economic development of the constituent entities of the Russian Federation in which they are formed.

At the same time, the formation of territorial industrial clusters in the regions contributes to the qualitative and accelerated development of small and medium-sized enterprises. The existence of clusters allows you to:

1. Attract investment in the region and increase the investment attractiveness of the region for investors.
2. Improve the competitiveness of the region's enterprises in the Russian and world markets.
3. Increase the growth rate of production of high-tech innovative products in industrial sector enterprises.

4. Ensure growth of innovative products, exports of innovations and advanced technologies of non-raw materials orientation.

Obviously, the use of the existing potential of industrial enterprises should be assessed as a competitive advantage of the processes of formation of industrial clusters in the economies of the regions. Clustering of industrial enterprises in the region entails the following advantages and economic benefits for the region as a whole:

- creation of new production chains;
- productivity growth;
- increasing opportunities and access to innovation and technology;
- reduction of production and non-production costs;
- creation of new high-performance jobs.

The concept of a cluster is concentrated in the sectoral and geographical affiliation of the totality of enterprises included in its composition. Emphasis is placed on the factors of territorial proximity, the presence of common interests of cluster members (Lyytinen et al., 2016). This naturally affects the resulting cooperation in order to achieve synergies at the inter-sectoral level. A group of geographically interconnected enterprises and organizations in a cluster should operate in a certain complementary industry environment.

Scientific and educational departments, scientific schools and laboratories are the core of digital clustering of the economy. They form a set of competencies in a certain subject area of science and technology, the organization of production. The Digital University platform is aimed at building scientific, educational and technological trajectories, forming communications in resource management for this activity. The restructuring of educational and research processes is expected. The goal of such a digital transformation in the field of education and science is the development of various technological and engineering centers on the basis of the university, the creation of a professional environment for the development of the maximum number of competent specialists. At the same time, it is important to give new knowledge not only to current students in the broad sense of this concept, but also to those specialists who now work at traditional enterprises undergoing digital transformation.

The formed digital platforms can support scientific services - supporting publication activity; business planning, research information support; platform for joint development (De Reuver et al., 2018). They can also support educational services, library services for searching, access and obtaining information from a wide range of electronic libraries in different countries, as well as computing services for scientific calculations.

Technology parks should become the basis of the formed digital industrial platforms. It is worth noting that technology parks today determine the trend in the development of digital platforms and communications between business and the scientific and educational community. At the federal level, a national standard has been developed that regulates the activities of technology parks. This standard includes requirements for two types of technology parks:

- technoparks in the field of high technology;
- industrial technology parks.

Science and technology parks in the sphere of high technologies represent a complex of objects, buildings, buildings, constructions and the equipment. The task of this complex is to ensure the launch and entry into the market of innovative products with high added value, high-tech services, digital technologies. Here, territorial integration with scientific and educational organizations, support for scientific and educational services at the level of digital industrial platforms become necessary. In another version, the industrial technopark is presented as a complex of facilities, buildings, structures and equipment. The functions of such a technology park are to ensure the creation and introduction into the market of innovative industrial products and industrial technologies, including digital technologies and services in industrial industries.

Today, 107 technology parks operate and are being created on the territory of the Russian Federation. However, technology parks do not comply with all standards in all cases. It is understood that traditional business centers also become owners of the status of technology parks in some cases. It is worth noting that the industry becomes a unit of analysis in the sectoral organization of economic management at the regional level, and this forms a static picture of the economy. The cluster approach offers an alternative form of institutional organization of the region's economy (Selden & Fletcher, 2015). Such an economy of the region is based on a constant, self-replicating interaction of industries and individual economic agents. The nature and depth of the links between them become decisive in the analysis of the regional economy. Within the cluster concept, the unit of analysis and management is a cluster as an inter-sectoral entity. This lies in the variety of its forms, internal dynamics. This is also determined by the intensive multidirectional interaction of its constituent entities. Digital clustering creates the conditions for the interpenetration of various industries and the creation of new markets based on industrial digital platforms as a result of these processes. In the modern conditions of development, the Russian economy needs a comprehensive implementation of digitalization in the shortest period. The processes of decentralization of industrial production, the introduction of a modern model of open contract production are becoming more and more relevant. Obviously, this will contribute to the achievement of large-scale results on a radical reduction in costs at enterprises of various sectors of the Russian economy.

As part of the development of the digital cluster economy, modern concepts of market relations between suppliers and consumers of goods and services are carried out on the so-called platform business models. The efficiency of platform business models is achieved through:

1. Reduction of time and resource losses for interaction between participants.
2. Cooperation and collaboration without borders to create new products and services.
3. Opportunities to build appropriate ecosystems through end-to-end technologies.

The formation of conditions for qualitative changes in the field of science and education is the main goal of creating platform business models. The goal is to increase the ability of the state to effectively respond to the so-called large challenges - a set of problems and threats of great scale and complexity that cannot be solved only through a quantitative increase in resources. It should be noted that progress in this area is a crucial factor in the successful development of the nation and is a supplier of sovereign-forming technologies (Zastupov, 2019).

As an example, it is recommended to consider the business model of the Technospark nanotechnological center (Troitsk, Russia). All companies are divided into product manufacturers and

contract production in the business model of this center. The task of product manufacturers (product startups) is to create, produce and implement an innovative product. Product companies are prohibited from having their own laboratory and production facilities. Such grocery companies include 80% of the companies of NC Technospark. Investments in their development make up 20% of the investment portfolio of the Center. Product enterprises (startups) work in a variety of areas of production activity. This is the production of composites, laser equipment for medicine, flexible electronics, industrial microbiology, etc.

Further, contract companies are prohibited from having their own product. They develop and produce only customer products. 20% of the companies of NC Technospark are contracted, while investments in their development make up 80% of the investment portfolio of the Center. Contract enterprises provide services for the production or development of products for other companies. The specialization of their production is based on innovative industrial technologies, flexible electronics. The product startups of NC Technospark, like any other companies, can turn to contract enterprises. This structure of specialization of enterprises in the Center contributes to the autonomy of production processes and the creation of an innovative product. Digitalization of product development and production processes allows modern entrepreneurs to build product companies without investing in production capacities. This saves resources, time and finance for enterprises. You can distinguish the following competitive advantages of product technology businesses directly working in contact with contract companies:

1. The ability to collaborate with several contract companies at the same time in the production of an innovative product. This reduces dependence on any production or specific development.
2. Focus on improving the quality of the innovative product and its competitiveness in the market. This process is not related to the accelerated updating of production technologies and the acceleration of scientific and technological progress.
3. Management of optimal pricing of an innovative product, based on the choice of contract developers and manufacturers.
4. Manage the release period of new generations of innovative product. It is associated with the selection of contract developers and manufacturers with a faster performance of tasks.

According to experts, contract companies achieve the best industrial indicators of labor productivity. The competitiveness of the contract company does not depend on customers and suppliers (Selden & Fletcher, 2015). Open customer orientation allows you to significantly reduce overhead. For example, the company VDL ETG (Netherlands, European Union) showed the following result in 2019:

- annual contract growth of 25% in 2019;
- round-the-clock download 100% 6 months ahead;
- annual income per employee - 30 million rubles and annual income per system engineer - 175 million rubles per year.

The digital cluster approach can be defined as forms of territorial-sectoral organization of production. These forms facilitate the implementation of various entrepreneurial projects of economic development using digital technologies. They also lead to a synergistic effect of interaction with scientific organizations and with the interested participation of state and municipal governments. The functioning of cluster digital systems involves the following elements:

1. Enterprise as an element of the system that determines the innovative, investment and other strategies of the entire regional economic system based on an industrial digital platform.
2. Territorial localization of the main economic entities involved in the formation of the cluster digital system.
3. Coordination of cluster digital system elements within existing regional investment, innovation and digital development programmes.
4. Enterprise systems for managing and controlling digital business processes.

Modern competitive advantages are almost entirely due to the capabilities in production, management, organization of production and the provision of services based on the introduction of digital business models. The effective development of the competitiveness of the economic system is possible with the integrated use of the cluster mechanism and modern concepts of innovative digital development. The world practice of the most advanced economic systems proves this. The drivers of new digital technologies provide high competitiveness and sustained economic growth. In this regard, many countries are increasingly adopting a cluster approach in support of the most promising areas and forms of entrepreneurial activity, as well as in the formation and regulation of digital industrial systems (Zastupov, 2020).

Today, the creation of product companies that produce the most competitive products on the market is becoming relevant. Industrial product companies (startups) refuse to conduct research and development work at the enterprise. They also refuse to increase their production capacity in favor of partnership with contract companies. For them, partnership with contract companies is the only development option with high speed and high efficiency of using invested investments. In the new economic conditions, localization of innovative products of a large enterprise becomes possible in the only case, by and large. This is the option when a large industrial enterprise meets a specialized Russian contract company. There is no doubt that contract companies will be leaders in reducing costs and increasing productivity for the foreseeable future. Faster productivity growth allows contract companies to invest in innovative technologies and production, digitalization and robotization at an accelerated pace. We can say that contract companies are becoming locomotives of the 4.0 industry. The state, represented by federal and regional authorities, has a direct impact on the development of digital industrial cluster platforms. Institutional and legal conditions are being created for the implementation of cluster initiatives, a universal platform for dialogue and coordination of the interests of participants is being formed, including financial support for individual cluster initiatives.

It is worth citing indicators of the most successful operating clusters, for example, indicators of the oil and gas engineering cluster in Voronezh region of Russian Federation. Thus, the area of activity of the cluster of producers of oil and gas equipment of Voronezh region includes:

- casting of body parts and blanks of large sizes;
- mechanical, thermal and galvanic machining of parts;
- production of units and equipment for oil and gas industry;
- assembly and testing of final products.

14 enterprises are involved in this cluster chain, including LLC Litye, LLC Stroytorg, LLC Neftegazdetal, CJSC Intekhrost, Voronezh Machine-Building Plant - branch of FSUE SCNPC named after

M.V. Khrunichev and others. The level of production cooperation of this cluster was 54%. The volume of product orders amounted to almost 27 billion rubles in 2019. The organizational, economic and production potential of the cluster is estimated at 50 billion rubles by 2025. It is worth noting that most clusters are dependent on state funding, while such dependence can decrease over time. The state is strategically oriented and links the cluster with the development of the region's economy as a whole, assimilates it with other economic structures and focuses on solving important socio-economic problems. The role of regional authorities can be to support and initiate the activation and digital transformation of clusters. For example, this is the participation of authorities in cluster meetings and decisions related to cluster development in the implementation of targeted programs and the digital economy. The regional government can actively work to build interaction between the various actors in the cluster development, and can also deal with various cluster issues between other levels of government. The digital development of clusters reduces dependence on individual business groups. The grounds for the diversification of the regional economy and the digital transformation of the territory are being formed.

The business benefits of digital cluster regional policy are:

1. Improvement of personnel component.
2. Involving specialists and scientists in joint work with universities in the region.
3. The emergence of digital industrial infrastructure for research and development.
4. Reducing costs using digital technologies.
5. Opportunities for more successful entry into international markets for innovative products.

The formation and operation of a global information system that takes into account the cluster structure of the national economy has been an important area of providing state support through the allocation of budget funds. This system contains information about industrial clusters of the Russian Federation. The existing capabilities of this information system allow investors to assess the economic conditions for the implementation of their projects as soon as possible and without unnecessary costs. Investors will be able to choose a more preferred cluster for them, in which the cooperative scheme is best suited for localizing innovative production based on digital technologies.

7. Conclusion

The article presents the main results on the development of digital forms and approaches in the context of clustering of regional economies. Conclusions and recommendations on the problems of improving innovative forms and cluster approaches in the regional economy are presented. The solution of the main problems of increasing the competitiveness of business entities is everywhere connected with the accelerated introduction of innovative methods of organization and management of enterprises on the basis of digital technologies and wide socialization. It is shown that newly emerging super-efficient technologies, which are based mainly on the principles of project investment, platform solutions, can change traditionally implemented national reproduction models for firms of all countries. Innovator companies gain competitive advantages in the formation and operation of digital platforms, and gain quasi-monetary profits through the early start effect. With successful scaling, these companies can set standards for effective business by reducing time and resource losses in high consumer value production related to networking, international cooperation and collaboration. The scientific results of the study are fundamentally complementary to the

existing approach to the problem of increasing the digital potential of enterprises in the industrial sector and the effectiveness of regional industrial policy. The development of industrial clusters will contribute to the formation of digital innovations in the region. Digital industrial platforms will ensure the qualitative development of the cluster economy.

References

- Autio, E., Nambisan, S., Thomas, L. D., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72-95.
- Coreyinen, W., Matthyssens, P., & Van Bockhaven, W. (2017). Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management*, 60, 42-53.
- De Reuver, M., Sorensen, C., & Basole, R. C. (2018). The digital platform: A research agenda. *Journal of Information Technology*, 33(2), 124-135.
- Ghezzi, A., & Cavallo, A. (2020). Agile business model innovation in digital entrepreneurship: Lean startup approaches. *Journal of Business Research*, 110, 519-537.
- Lyytinen, K., Yoo, Y., & Boland, R. J. (2016). Digital product innovation within four classes of innovation networks. *Information Systems Journal*, 26(1), 47-75.
- Selden, P., & Fletcher, D. (2015). The entrepreneurial journey as an emergent hierarchical system of artifact-creating processes. *Journal of Business Venturing*, 30(6), 865-866.
- Zastupov, A.V. (2019). Investment development of enterprises of industrial clusters. In S. Ashmarina & M. Vochozka (Eds.), *Sustainable Growth and Development of Economic Systems. Contributions to Economics* (pp. 349-358). Springer.
- Zastupov, A. V. (2020). Innovation activities of enterprises of the industrial sector in the conditions of economy digitalization. In S. Ashmarina, A. Mesquita & M. Vochozka (Eds.), *Digital Transformation of the Economy: Challenges, Trends and New Opportunities. Advances in Intelligent Systems and Computing*, 908 (pp. 559-569). Springer.