



## Theoretical and Methodological Basis of Innovative Development of the Region's Industry

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### ABSTRACT

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In the conditions of transition to innovative economy radical changes in all public administration structures were required for the effective work of industrial enterprises of the region. Only by providing a favorable innovative investment environment and creating an effective mechanism for each industrial enterprise the region was able to get on the path of renewal and development. In the article the regional industrial complex and specifics of its development are described in theory. The stages of formation of theories, which hold a special position in the development of regions are highlighted. The directions of innovative-inertial development of the industrial complex are analyzed. Moreover, foreign experience and development models for the of innovative development of the regional industry are provided in detail. The conclusion presents measures for the establishment of research centers.

### KEYWORDS:

Region, economy, complex, innovation, stages, directions

### 1. INTRODUCTION

The situation steaming from coronavirus pandemic, which is a great trial for the whole world, has its influence on the economies of the countries of the world. In consequence of increasing globalization and competition between regions, each state puts emphasis upon successful functioning of all sectors of the economy for the effective development of its regions. It offers opportunities for the development of the industrial complex of these regions and improving the welfare of the population.

The industrial complex is a branch of the economy that has a major impact on the level of development of other sectors of the economy. In our opinion, the industrial complex of the region is a set of interrelated elements aimed at a specific goal and in constant contact with the external environment. The regional industrial complex is not a simple aggregate consisting of enterprises that have established a relationship. This system exists as a whole with integrative features that can offset impact of the external environment.

On the other hand, the innovative potential of the industrial complex of the region implies that the region has the necessary tangible equipment, information, financial and human resources to carry out innovative activities in order to develop a set of interrelated elements aimed at a specific goal,

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as well as to be in a constant relationship with the external environment, and using them effectively to increase the competitiveness of production and development.

It makes challenging for all industries in the region to develop at the same high level. Depending on the geographical location of the region, the population, tangible and intellectual capabilities, the availability of natural resources, one of the branches of industry with high scientific capacity, material demand or labor capacity will be developed. In some countries, labor productivity in knowledge-intensive industries is high, while in others, the productivity of labor-intensive or tangible-production industries is considered high. To determine "growth points" in the region's industry ensures its innovative development. Ultimately, innovation is a kind of force field leading to the concentration of resources around the center of the industrial complex.

### II. LITERATURE REVIEW

Since the first industrial revolution in the last 200 years, the world economy has accelerated cyclically. During this time period, a special place in the development of territories is occupied by the industry, where the following theories were formulated: "formation of the core of the region" (J.Friedman), "growth points of the region's industry" (F.Perru), "regional strategy" (M.Porter), "competitiveness strategy" (M.Porter), "economic zoning" (N.N.Kolosovsky), "economic development" (J.Schumpeter), "production placement" (V. Launhardt), "long waves" (N.D.Kondratiev),

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“territorial cluster” (M.Enright), “cumulative growth” (G.Myrdal), “path dependence”(P.A. David), “models of industrial regions” (A.Marshall).

In particular, according to the theory of long waves by N.D. Kondratiev, industrial development is due to a change in technological chains. He considers, that technological chains are interconnected production groups. Within each technological chain there is a closed production period, which includes all stages of extraction and processing of primary resources, as well as the production process of finished products (Kushlin, 2008).

Technological waves consist of several stages which indicate that they have a complex internal structure. S.Y. Glazyev presumes that the main technological units form the core of the technological wave. The technological innovations involved in the creation of such cores are called the “key factor”. In “mobile industries” there are moving industrial spheres associated with the news distribution. Therefore, such industries include those that intensively consume the “main factor”, as well as those who adapted optimally to its use. They play an important role in the spread of new technological waves and mass renewal of production.

Definitely, first of all, the purpose of creating inventions is to develop production and increase competitiveness. Currently, the world is passing through 5 technological cycles of the wave, and the process of creating the sixth period is underway (Zub, 2008). Each technological wave demonstrates in itself important factors of its time. Modern communications, robotic technologies, new technological discoveries, and others are factors of a new technological wave. In developed countries, the products of the fifth technological wave account for most of the GDP.

When the industry is not actively developing, it becomes increasingly difficult to be occurred for level 5 and 6 of a technological wave, which will become an obstacle to the competitiveness of the economy, the emergence of new technological waves, the development of all sectors of the economy will be depended on the development of the industrial sector.

It is planned to increase labor productivity using the achievements of science and technology in industry. This indicates the need for effective use of the achievements of innovation. Innovations are considered to be the most important factor in the development of the region's industry. The conformance of technological progress and organizational changes is the driving force of economic growth. Innovations play an important role in the economic development of the region. Innovation activity is a process of activity aimed at the development and distribution of new types and forms of goods and processes. The development of this type of activity is one of the most important conditions for increasing the competitiveness of industrial products. The concept “innovation” as a new economic category was introduced by the Austrian scientist Joseph Alois Schumpeter

in the first decade of the XX century. B.Santo defined innovation as “a technical and economic process that, based on the practical use of ideas and discoveries, leads to the production of the best products and technologies, additionally, innovation is aimed at obtaining economic profit, then the appearance of a new product on the market will lead to additional income” (Makaruk, 2016). On the other hand, B. Twiss defined innovation as a process in which an idea or discovery acquires economic meaning. According to P. Drucker, innovation is a separate tool for entrepreneurs, by the means of they try to introduce a new type of business and service (Drucker, 2009).

Despite the widespread use of the concept “innovation”, its main meaning is innovation, efficiency, effectiveness. Investment support is an important element of this process. It implies a reasonable search and use of financial resources. In the works of J.Bogan, J. K.Galbraith, M. Porter the following words, “everyone wants to be the best, but it is necessary to be unique” are currently being confirmed (Porter, 2004). A.Y.Prikhach believes that uniqueness provides a norm of superiority in competition, as well as high profits. He also believes that “the efficiency of the innovation process is much higher than the standard approach and methodology, and when achieving high efficiency, innovation should be an idea, where the implementation achieves a large amount of profit, strengthens the investment flow and increases the volume of industrial production” (Yudina, 2016).

On the other hand, L.M.Chistov divided the innovative development of industry into three categories: revolutionary (increases the efficiency of industrial production by 20% or more per year), medium (10-20%) and low (1-10%) (Chistov, 2008). The concept of “spreading innovations” has also actively penetrated the economy, i.e. a theory has been formed aimed at explaining how, why and at what speed new ideas and technologies are spreading in different cultures (Носонов, 2015).

### **III. RESULTS**

Furthermore, there is a need to to pursue a policy (technological protectionism is the most dangerous enemy of modernization) aimed at maximizing the use of resources, reforming industry, as well as at reducing the cost of technological re-equipment of production and comparing existing technical opportunities and their foreign varieties.

Special attention should be paid to the formation of innovative infrastructure in the innovative development of the region's industry. Innovation infrastructure is a bridge between science, industry and the market, public and private sectors, forming a single integrated system. Its main objects are the following structures: production and technological structure (technology transfer, technology parks, innovation and technology centers, commercial centers, business incubators); personnel structure (Universities, non-

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governmental educational institutions, business models); financial structures (budget financing, venture enterprises, business angels); information content. The establishment of an innovative infrastructure determines the task of organizing a single entire technological chain. It ensures the study of the science of the innovation cycle market (science-innovation-production-investment). This process makes possible for mutual integration of enterprises in the industry, as well as the transition of production to a higher stage.

The industrial complex of the region can be developed in two different directions, equally or immediately with large changes, that is, in innovative and inertial directions, as shown in Table.

Attributes of direction	Innovation process	Inertial process
Outcome	Reasonable satisfaction of new needs of society	Meet existing social needs
Directions for solving the problem	Much	The one that is considered as optimal is used
Risks in the development process	High	Low
Interaction of participants in the production process	Constant	May not exist
Manageability, planning capability	Low	High
Planning system	Long-term	Short-term
Implementation method	The transition of the system to a new stage of development	Keeping the existing level of progress
The level of compliance of the interests of the participants in the process	High	Low
Impact on the competitiveness of the region	Suddenly increases	Does not change

It is known from world experience that radical changes in the sphere of productive forces, rapid change of scientific and technical structure, widespread introduction of innovations are becoming commonplace. The processes of improving production at industrial enterprises, improving the quality of products, optimizing the structure of enterprises are effective due to the implementation of innovative projects.

The transformation of new scientific knowledge, ideas, discoveries, developments, as well as the improvement of existing technologies for the production of new products in accordance with market demand is an important issue in the current competitive environment. Nevertheless, the industrial enterprises of the region should have an innovative potential to achieve innovative goals.

W. Powell thinks that special attention should be given to the personnel issue at increasing the innovation potential in industrial sectors (Уолтер, 2003). The development of the region's industry has a significant impact on the socio-economic efficiency of the territory. In such a case, the

resource content is the main creative force that has a direct impact, while the internal structure retains the features of the suitability and effectiveness of all elements. An effective structure indicates the creation of a new product as the final result of the realization of all possibilities. The best situation is the availability of free funds that can be spent on innovative developments. Taking into consideration the problems of the region's enterprises with their own finances, the most optimal option for innovative development is their integration strategy. According to G.B. Shanazarov, the production potential is the most important element of the economic potential. According to this concept, the production potential includes production assets, as well as various resources representing its potential. Also, the assessment of the innovative potential of the region's industry in terms of investment attractiveness implies the use of indicators of the current liquidity ratio, financial leverage, return on assets, gross profit, economic value added. In order for innovation to be financed with the least risk, it is necessary to pay attention to the effective use of the company's own capital in the current state. For this purpose, an indicator of economic value added is used. Calculation and analysis of the return on assets ratio enable to assess the ability of an enterprise to increase capital. Enterprises whose current activities represent high profitability are usually prepared for the implementation of innovative projects, which indicates the need for a gross profit ratio. Alternatively, in the process of analyzing the innovative development of industrial enterprises in the region, it is important to assess the innovative activity of the industrial sector in terms of various types of activities, where the contribution of innovatively active enterprises to the total number of industrial enterprises is an important indicator. At this point, the contribution of high-tech products is one of the important indicators. The advantage of this indicator is a relative indicator for analysis, as well as it can be compared. According to international practice, an increase in the volume of investments directed to the high-tech industry is higher than the growth rate of GDP, the main condition for intensive scientific and technological development, that is, high rates of GDP growth require financial support for basic innovations.

## IV. DISCUSSION

Due to the analysis, there are several difficulties in implementing the innovative development path of the industrial complex. One of them is the need to properly take into account the level of financial security and the risk of projects when implementing innovative ideas. According to developed countries experience, a wide innovation activity is carried out by large businesses. In the countries of the European Union, only 80% of large enterprises and only a third of small enterprises are actively engaged in innovation. 56% of research and development in the EU, 63% in the USA and 74% in Japan are directed at the expense of domestic

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costs. In developed countries the share of industrial enterprises implementing technological innovations in the total volume of industrial enterprises ranges from 43.7% to 69.7%. Therefore, it is advisable to study the world experience of stimulating innovation in the development of industry in the region. Particularly, the United States has been considered a world leader in industrial and innovative development for many years. It is from a regional point of view that the experience of this country in industrial development is considered as great. Silicon Valley is considered one of the prime examples. In the 1970s, an information mechanism was developed in the country to distribute new ideas and technologies. This activity was carried out by the National Center of the Consortium of Scientific, Technical, Information and Federal Laboratories. It contains data on the results of scientific research of all public institutions. This center included more than 300 federal research centers. In the 1980s, regulatory documents were adopted to search for new areas of use of discoveries and support modification by private enterprises at the expense of their own internal resources (Батирова, 2020). According to this document, each state structure with a research department had to spend at least 0.5% of its budget on expanding the sphere of technology application in other areas.

In addition, the following financial instruments were used in the regions to support innovation activities in the United States:

1. Tax benefits for large firms: the corporate income tax is reduced by 20% of the increased research costs. The size of the increase in such expenses is determined by analogy with the average level for the previous three years.

2. The basic research programs of universities are carried out under the contract with enterprises included an income tax benefit on expenses in the amount of 20%.

3. The tax rate is reduced from their income from the sale of shares.

4. Accelerated depreciation of machinery and equipment: the depreciation period is set at 5 years (3 years for R&D equipment).

The "Triple Helix" model has been widely used in the innovative development of the region's industry, a theory offered by the American scientist Henry Etzkowitz, a professor at Stanford University. It emphasizes the interaction between universities, enterprises and the state as the basis of the innovation system. He also believes that the role of universities in the innovative development of the region's industry is one of the leading ones. In this case, the "Triple Helix" model structure is based on the following basis:

1. Strengthening their function in the interaction of industry and universities with the government in a society based on science.

2. University-business-government. Efforts to interact with these three and develop innovations are carried out not

by the will of the state, but by the mutual desire of the three institutions.

3. In addition to the traditional tasks, each of the three institutions also performs each other's tasks in a certain sense. The activity was carried out from a territorial point of view and was controlled within states. A special place in the innovative development of industries of regional character in the USA was occupied by the importance of universities. Henry Etzkowitz believes that a university is not only an educational institution, but also an institution that applies the accumulated knowledge in practice. The idea of a long-term University-Production relationship, put forward by William Barton Rogers in 1846, became the urgent issue of the event.

As a result, 150 universities ranked high in the world rankings have become the basis of the US national innovation system. These are Brown, Harvard, Yale, Columbia, Pennsylvania, and Preston universities. The universities of Berkeley, Stanford, the Massachusetts Institute of Technology, and the University of Wisconsin have also become major scientific and educational centers. An important significance for the successful development of the "Triple Helix" in the United States is the introduction of amendments to the legislation on patents and trademarks in 1980, named as the Bayh-Dole Act.

According to the American Association of AUTM (Association of University Technology Managers) The cost of government funding for research in the United States in the period from 1991 to 2009 amounted to 588 billion dollars. As a result, 249 thousand discoveries were made, 51 thousand of which received patents. By 2009, 38,030 active licenses were used in practice, 6,272 startups were created, and 300,000 additional jobs were created. The interaction of the university with industry, the financing of research at the expense of industry and the commercialization of technologies were identified from the main tasks that they set themselves. Consequently, as an important element of the "Triple Helix", it can be distinguished the active participation of local (territorial) state bodies both in the development of university activities and in creating a favorable environment for innovative enterprises. From the experience of the United States, it can be seen that on the basis of state support for the innovative development of industry in the region, one of the main steps was to pay special attention to a well-established mechanism for commercialization of innovative products, transfer of advanced technologies from the state system to the private sector for secondary use and distribution.

Germany is considered to be one of the countries that has effectively used the innovation factor in the innovative development of industry on its territory. In the 80s of the XX century, the main emphasis in the development of research activities in Germany was placed on large industries in the regions. The regions were distributed in terms of high and medium innovation potential (Kuntsman, 2016). In 2006, a strategy for innovation and technological progress was



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adopted in Germany. If in the USA the basis for the formation of the “three spirals” is formed in the form of “two spirals”, that is, “University-business”, then in Europe these “two spirals” are based on the idea of “state-business”. In Germany, institutions that received state funding for scientific research were required to conduct:

- to bring research to practical economic results;
- to patent the results of research work;
- to expand the opportunities of investors in getting financial income;
- to apply the results of the project to the economy within two years (otherwise it will lose the right to do it).

At the same time, based on orders from research institutions, projects for the economic development of industrial enterprises for the short, medium and long term were developed. In particular, as a result of the implementation of such projects, the enterprises Folsvagen verk, Daimler Benz, Opel, Ford were singled out. The policy of large enterprises in the regions of Germany towards the development of an innovative model in industry has been very effective. If a large enterprise wants to implement an innovative project, the enterprise allocates an innovation group from its structure and forms a small enterprise. This company operates without complex administrative barriers, which enables to make management decisions in an operational state. Then the use of the results of the activities of a small enterprise in a large enterprise makes it possible to increase competitiveness. An example of this is the Mercedes company. A significant increase in unemployment caused a deep depression in the region. The government has identified the development of innovative technologies in the region as a way out of the problem. The regional economic policy provided for the following components:

- formation of clearly oriented clusters in the following fields: Biotechnology, Information technology, chemistry, restoration of energy and resource-saving resources;
- reformulation of the personnel training system, changing the nomenclature of specialists in accordance with the selected areas of development of the leading science;
- formation of scientific and technological centers, allocation of territories where such centers are equipped with equipment for the purpose of conducting research work for graduating students of higher educational institutions.

Currently, the North Rhine-Westphalia region is the industrial center of Germany, the main and driving force behind the development of industrial science and innovative technologies. Out of the 100 large enterprises, 37 were established in the Rhine and Ruhr, many of which are global market players. This region is not only a regional large corporation, but also a center where small and medium-sized enterprises are concentrated. The lands of this region are mainly specialized in 4 areas:

- biotechnology;
- energy and environment;

- medical research;
- chemistry and new materials.

A particularly noteworthy process in this area is the existence of an intellectual property protection mechanism. This mechanism allows universities to take an active place as full participants in the innovation process. A major service company in the field of protecting the integral property of the region is PROVendis, and its innovation and technical center is a subsidiary of ZENIT GmbH. In 2008, the shares of PROVendis company were acquired by a consortium of universities in the NRW region (24 universities). They identified the main purpose of the introduction of services for the support and patenting of university developments.

A special place in the policy of industrial development in Japan was occupied by the state. The state, having had a limited impact on the structure of industry, has included the following measures: stimulating investments, protecting industry from foreign competition, stimulating exports. It was believed that such measures were applicable not only to specific enterprises or enterprises of one sphere, but also to the activities of all sectors of industry. For a long time, they have been an integral part of the Japanese economy and have led to the formation of investments aimed at industrial groups. These measures have led to an acceleration in the pace of development of the industry, though at the expense of the consumer. The peculiarity of the Japanese industry is the extreme closeness of relations between enterprises manufacturing products and supplying raw materials within the same region. The creation of 3 large industrial zones in Japan (Tokyo, Nagoya, Osaka), the establishment of high-tech technopolises in the territories, the specialization of each territory in a separate industry sector led to the fact that the country's industry has become a world leader. One of the main reasons why Japanese industrial production has an advantage for competition is the existence of a “subcontracting” system. In this country, a “subcontracting” system forms a complex economic institution. That is, enterprises supplying goods of a much lower level, located in the same region, subcontract for large enterprises supplying goods. The Japanese economy is distinguished by the fact that the state is actively involved in the policy of industrialization. In Japan, the private and non-state sector occupies a dominant role. During the implementation of industrial policy in Japan, the following work was carried out: an Export Council was formed, coordinating the activities of all state bodies responsible for export policy; advertising centers were opened in foreign countries to promote Japanese trade; the production process was provided and short-term loans were granted to enterprises producing export products before the export process; a system of discounts on income tax on exports.

China has implemented a very effective industrial development policy. In 1987-91, this state established measures to stimulate regions with high-tech production and

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industrial enterprises focused on the export of domestic products by the state. The Government pursued a policy of accelerated industrialization. Nowadays, China has demonstrated to the world the effect of a clearly developed targeted policy for the development of the national industrial complex, implemented on the basis of a centralized system of planned macroeconomic regulation (Mazilov, 2015). China has taken a leading position, having built the technotron production industry from the beginning. As part of the policy pursued within the framework of the development and support of the industrial complex, the PRC has focused its foreign exchange reserve not on the purchase of goods or securities from the United States, but on the acquisition of high-tech industrial capital. These expenses were supported by an increase in export revenues. The experience of the PRC has demonstrated the necessity for large-scale investments in technology (i.e. industrial technology).

### V. CONCLUSION

The experience of the above-mentioned states has shown that one of the foundations of the system of developing and financing successful innovations is the organization of internal research centers in large firms, which contributes to the development of relations between science and production in the conditions of the region. In addition, the experience of supporting innovative small businesses, including the formation of innovative infrastructure, in particular, focusing on its stimulation in various ways, is one of the target areas for the creation of specialized non-governmental commissions on the use of financial resources for the needs of innovative development.

In conclusion, we can say that the innovative development of the region's industry should be based on science. For the innovative development of the region's industry, it is necessary to implement the following strategic goals:

- to increase the number of innovative industrial products (increasing the share of innovative products in the structure of industrial products in the gross region)

- to improve socially significant indicators measuring the standard of living of the population.

In our point of view, achieving economic growth in the strategy of innovative development of the industrial sector in the region, ensuring labor productivity and increasing capital is the crucial issue. Therefore, to ensure the innovative development of the industry, it is necessary to achieve the following goals:

- the need to improve the regulatory framework governing innovation;

- the necessity of creating new markets, that is, the market for intellectual property and innovative industrial products, to define the function of human resource management in economic processes;

- to develop information technologies and databases in all modern branches of science and various areas of innovation, to develop elements of innovation infrastructure in order to reduce the timing of scientific discoveries;

- to form a system for stimulating innovation (taxation), increasing the cost of R&D and conducting research in high-tech industries;

- recognition of the importance of state financing in ensuring innovation activity at the early stages of the innovation process, the formation of a legal culture of the use of property rights;

- creating conditions for preserving and stimulating the creative activity of scientists, inventors and innovators, creating a system of training personnel specially trained in the field of innovation.

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