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Assessing the Role of Nano-intellectual Capital as a Factor in the Growth of High-Tech Industrial Complex of Russia

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ABSTRACT

The role of nano-intellectual capital as a factor of transition to high technologies in the development of the industrial complex (PC) is considered. The conceptual approach to the study of intellectual capital as an aggregate of relations promoting the genesis and development of knowledge (fundamental science), discoveries, inventions that later being realized through developmental work (ROC), leads to the achievement of the result in the form of innovations (product, process, Administrative, institutional and other) that have a commercial and socio-economic effect and provide prospects for large-scale development of Russia's industrial complex (PC), emphasizing the development of high technologies. It is suggested to consider intellectual capital as a forerunner of the formation of the so-called nano-intellectual capital realized in nano-technologies that substantially change the appearance of innovation activity in the PC. It is proved that the creation of high technologies can ensure sustainable development of the economy. It is emphasized that the modern models of economic growth should include a nano-intellectual component as a tool for ensuring the growth of the nano-innovation potential of the PC, contributing to the implementation of a project or a program of innovative strategic changes in the country's economy as a whole based on broad state participation. It is substantiated that on the basis of the existing world experience in the growth of high technologies it is possible to ensure the growth of the national economy for the long term. In addition, the possibility of creating innovative territorial clusters as conditions for increasing the competitiveness of PCs in the Russian economy is argued. The applicability in the Russian context of the international experience of using the innovative approach and the implementation of state policy in the formation of the strategy for the development of the industrial complex of Russia is shown.

JEL Classification: M15, E22, K23, L50.

Keywords: Intellectual capital, nano-intellectual capital, high technologies, nano-technologies, nano-innovation potential.

1. INTRODUCTION

The purpose of this article is to show how, based on the world experience of increasing the role of nano-intellectual capital (NIC) in the development of the industrial complex (PC), it is possible to ensure the growth of the economy for the long term. The world practice shows that the NIC is beginning to occupy a central place in the modern economy, a knowledge-based economy (Malhotra, 2000). K. Marx wrote: “Economic epochs differ not by what is produced, but by the way they are produced, by what means of labor.” (Marx, 1973). This postulate emphasizes the importance of science and the progress of technology. The emergence of modern means of labor is the result of the NIC, which provides a high-tech level of production.

Despite a significant number of works by both Western and domestic scientists in the field of reproduction of NIC, many aspects of this problem have been little studied. In particular, the term “nano-intellectual capital” requires specification, there is no generally accepted interpretation of it. The analysis of the socio-economic nature of the NIC is not fully presented. A holistic view of the structure of its content has not been created. Out of the field of view were questions related to the reproduction of the NIC. All this requires further comprehension, a theoretical and methodological generalization and analysis of the regularities and trends in the reproduction of the NIC.

In the Strategy for Innovative Development of the Russian Federation until 2020, emphasis is placed on the formation of high technologies. This means that special conditions should be created for research and development that contribute to the growth of competitiveness of PC enterprises. We need an innovative PC. Therefore, a characteristic feature of Russia’s modern development is the construction of an innovative economy, based primarily on the dissemination and use of NIC as an accelerator of innovation in all industries. Therefore, it is necessary to create conditions for the activation of innovation activities in the PC, whose role is to ensure large-scale development of the economy as a whole. This allows us to talk about the non-alternative development of NIC in the coming decades based on the effective development of the system of innovative management of PC enterprises and the introduction of modern economic mechanisms for public and private partnerships, long-term leases, leasing, attracting large investments, diversifying sources of financing. How correctly writes SS. Nosova: “The main trend of the new model should be in the sphere of high technology development, this is the creation of a new technological basis for material production” (Nosova, 2015).

In this aspect, it is very important that K. Marks interpreted the factor of increasing labor productivity. He wrote that such a factor is “... any general change in the process of labor, which reduces working time, socially necessary for the production of a given commodity, so that a smaller amount of labor acquires the ability to produce a greater quantity of use value.” (Marx & Engels, 1950-1981, p. 325) Hence the central factor that reduces working hours, socially necessary for the production of this product, is the qualification and quality of the workforce that arise as a result of the emergence of new knowledge, which is subsequently transformed into the formation of IC. The NIC’s conception of ideas proceeds from the fact that knowledge

is transformed into nanomaterial objects that are created as a result of the interaction of means of production and labor. Knowledge, which initially acts as non-material benefits, later contributes to the construction of nano-constructions that are applicable in the production, exchange and consumption of goods.

As P. Drucker noted, in “modern society” the basic economic resource is knowledge, not natural resources or labor (Drucker, 1993, p. 271). He further stressed that “knowledge has become a key economic resource and dominant – and perhaps even the only source of competitive advantage” (Drucker, 1978). Knowledge gives priority to A. Marshall, arguing that capital is in most of the knowledge and knowledge is the most powerful engine of production. T. Stewart means under the engine of production “the sum of knowledge of all employees of the company, ensuring its competitiveness” (Stewart, 1997). Today we can talk not only about knowledge, but nanoscience, which change the face of material and non-material production.

In this regard, it can be argued that the NIC is a priority of modern economic development (Nosova, 2012). It is a key factor in economic development. Namely, it allows us to increase the consumption of goods, reduce the working week and, correspondingly, increase our free time, etc. In classical economic science, these issues are subjected to deep economic analysis. Thus, we should not think about the nature of things, but about what ideas can be born.

In the modern aspect, the NIC is becoming an organic part of PC development. You can further strengthen its role, considering the NIC as a “core” in the development of the PC. This formulation of the question gives us the right to consider the appearance in the economic analysis of the category of NIC as an objective law. If we want to, or do not want, still the economic development will take place on an ascending line. In other words, the process of improving the development of the PC is natural and it is impossible to counteract this. Therefore, today is the emergence of a new field of intellectual capital, or the so-called nano-intellectual capital, realized in nano-technology.

2. THEORETICAL ANALYSIS

In the modern period of economic development, in essence, a new resource – nano-technology (NNT) was formed, which is defined as a set of methods and techniques that enable the controlled creation and modification of objects including components with sizes less than 100 nm, at least in one dimension, and as a result This has received fundamentally new qualities that allow them to integrate into fully functioning systems of a larger scale. On the basis of the NNT, high technologies are formed that will relate to virtually all areas of the economy and, ultimately, will change the basis of the PC by introducing and using previously unknown knowledge that causes transformation, both in technical and social development.

The transformation of capitalism into mixed capitalism leads to the subordination of the development of the NIC to the consolidated capital, reflecting the interaction of public funds and private (in the modern sense of corporate) capital. Thus, there is a new form of ownership – mixed ownership. Together with this, the reproduction of the NIC is the object of mixed ownership.

Proceeding from the reproduction process, it is established that it is impossible to limit the development of the NIC only to the sphere of production, which is a set of industries (industry, agriculture, construction and other branches of material production) that produce specific real use values. In economic literature, it is called “basic” production. In modern economic development, great importance belongs to the general

conditions of production, or the so-called infrastructure. The latter is a set of industries (information support, power supply, transport networks, communications, etc.), which through services satisfy the needs of not only the main production, but the entire population. And in this aspect it can be argued that the sphere of development of the IR should cover the whole reproduction process, both the main production and the innovation infrastructure, in order to achieve a full-scale nano-innovative development of the economy as a whole.

This formulation of the question is extremely important for the Russian economy in connection with the traditional backlog in the development of the PC. NK creates and transforms the nervous structure of production, launches an impetus to activate and increase efficiency in the activities of economic entities in the PC. Nanoscience, penetrating into all segments of the production activities of the PC, binds them together, contributing to the growth of the synergetic effect in economic development, which inevitably leads to a reduction in both transformational and transaction costs, maximizing profits, increasing sales and the welfare of the country.

Consequently, the National Committee begins to act as a general condition for economic development, a kind of indicator of economic growth. Not every economy is capable of developing the NIC. Hence the economy is different nano-intellectual. The reason for this is the amount of seed capital, the long-term payback period and the degree of risk. Here a new formulation of the question is being formed: probably, the internationalization of economies in solving the problems of their nano-intellectualization is necessary.

The intellectual and nano-potential of the PC tends to grow only when new elements of the IR are created: “information and knowledge” (Inozemtsev, 2000) that generate a chain reaction in economic activity and ensure the growth of the PC innovation (Figure 1).

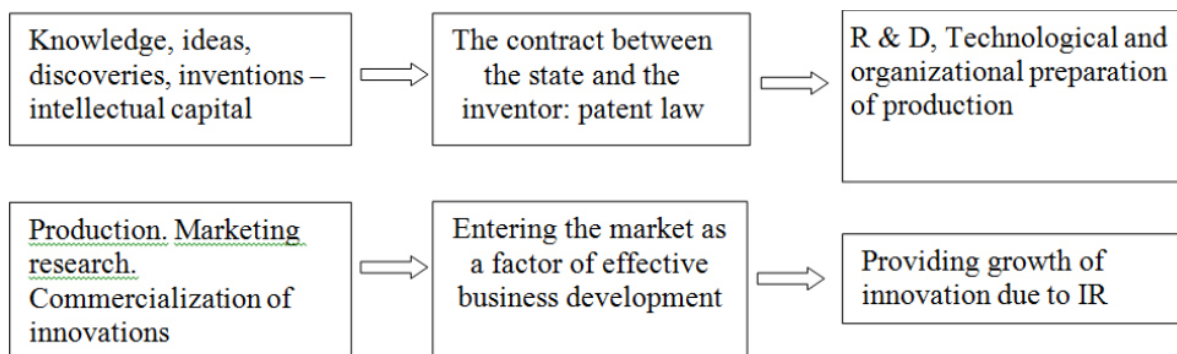


Figure 1: Conceptual approaches to the analysis of the chain reaction in the economic development of the PC under the influence of IR and NK

In our opinion, it is expedient to start considering the role of infra-red and NK, or nano-intellectual capital (NIC) in the innovation development of the PC, from the analysis of research works (R & D). The allocation of research as a special type of establishment of the NIC is necessary because it is the embodiment of the creative search for scientists. It has a special status, since in addition to independent existence, the NIC is somehow integrated into the “life cycle” of innovation, primarily at the first stages of its implementation – the stages of research work. However, very few discoveries in science become NIC. To do this, it is necessary to implement research in experimental design work (ROC), which contribute to the formation of a new product.

The goal of the state policy in the field of industrial production is the development of the Russian PC, which provides the Russian market with competitive high-tech products and the achievement of the leading positions in the world sales markets in the field of high technologies, nanomaterials and nanoservices, while respecting the standards of guaranteed security and the nonproliferation regime.

3. RESULTS

Nano's intellectual capital should be seen as an instrument for activating innovation in the PC, as the basis for the formation of high technologies, through which it is possible to increase the efficiency of industrial production. On the basis of funding NIK in the PC system, it is expedient to allocate 3 sources: budget, market and budget-market.

A budgetary source is the result of state funding, At the expense of the state budget. Most often, it is not focused on maximizing profits.

A market source arises on the basis of competition, a system of markets and prices. He acts as a commercial. It is always focused on maximizing profits. The profit obtained through the use of NIC, should be defined as intellectual rent. However, in a competitive environment, this rent is temporary.

The market-based source of financing for the NIC is based on a partnership between the state and private capital. Joint financing of nano-intellectual projects (space exploration, production of modern military weapons of an antiterrorist nature, environmental protection, creation of a global infrastructure: telecommunications equipment, satellite transmissions, interstate oil and gas pipelines, etc.) is gaining increasing importance in the modern economy, And especially in the context of growing globalization. The concept of public-private partnership (PPP) is aimed at achieving sustainable and long-term development not only of the PC, but of the country as a whole.

The nano-technological capacity of the PC contributes to the growth of: installed capacity and the number of PC objects; Integration of industrial production into the world economy; World technological leadership of the Russian PC; Research and development in the field of PC, advanced developments in high technology; Conducting research aimed at developing new methods for the use of nanomaterials, as well as ensuring the reproduction of the human and scientific base of the PC.

The value of the nano-innovative potential of the PC is determined by the availability of research, design and engineering, technology organizations, pilot plants, pilot training grounds, educational institutions, personnel and technical means of these organizations (Porter, 2002, p. 162). Often, the nano-innovation potential of the PC is perceived as a scientific and technical reserve in the form of discoveries, inventions, research, and also as a scientific and technical level of developments that allows solving new problems. In fact, the nano-innovation potential of the PC is its ability to effectively involve the NIC in the economic turnover (Belolipetsky, 2003).

Indeed, Russia is in a very difficult situation. Everyone understands how difficult it is for our country. But this complexity can be "reset" due to the development of the knowledge economy. Education and R & D are the most important elements, the foundation of the modern economy. In the epicenter put the implementation of national education programs, national nano-innovative projects. Only by creating a new state, a new look of Russian education and science based on the scenario offered by Russian scientists,

relying on the breakthrough directions of the emerging sixth technological order, implementing a strategic partnership between the state, business and civil society, we will be able to create, discuss, approve and implement a strategy for nano-innovation development of the PC Perspective.

In the XXI century. Reproduction of the NIC is turning into the main source of growth of the high-tech potential of the economy. The ability to use intellectual resources and create new solutions to meet human needs is beginning to take center stage in the economy based on nanoscience. Human knowledge and its capabilities have always been at the core of value creation, but this trend has become evident now that the mental component of the work is becoming more and more important. Until the middle of the twentieth century, when analyzing the reproduction of individual and social capital, special attention was paid to the reproduction of intellectual capital, more tangible assets were considered, and the knowledge component in the chain of creating economic benefits was little studied. In essence, it was removed by the prevailing tendency to define business as primarily material activity. However, the potential benefits, which are reflected in the fact that the IR generates more income, have over time changed this approach. In the modern era, the use of nanoscience to ensure the growth of innovation and competitiveness is becoming more and more important in economic strategies. Hence the interest in analyzing the role of the NIC in the growth of the innovative potential began to grow, both at micro- and macrolevels.

This, in the final analysis, determines the theoretical and practical significance of research on the reproduction process, which includes the production and dissemination of scientific research, intellectual products and their use in various fields of activity.

To use the NIC as a factor in the growth of the value of a company, its qualitative valuation is necessary as one of the most important factors of production, since it is precisely its purpose to provide management with all the necessary information for rational management. In modern models of economic growth, a nano-intellectual component should be included. And, as we have already emphasized, the main function of the reproduction of the NIC is to ensure the growth of the innovative potential of both the organization, the PC, and the country as a whole.

Nano-innovational potential of the organization is a way to implement a project or a program of innovative strategic changes. In other words, it is a set of innovations that are in different stages of the intellectual and reproductive cycle, unused reserves of equipment, technologies, personnel and organizations in the management apparatus, idle stocks of new technical and technological means, creative potential of the team. The magnitude of the nano-innovation potential is determined by the availability of research, design and engineering organizations, experimental production facilities, pilot training grounds, educational institutions, personnel and technical facilities of these organizations.

In this aspect, the nano-intellectual type of reproduction can be defined as a specific type of intensive type of reproduction characterized by high innovativeness. It is important to emphasize that only the nano-intellectual type of extended reproduction (our position) is of an innovative nature.

Nano-intellectual type of extended reproduction frees the subject, makes his work creative. This type of extended reproduction can serve as the basis for the formation of a new IR, the basis of which is always a scientific environment with a high level of competitive intellectual potential. The creation of high technologies can provide the boundless needs of mankind in conditions of sustainable development. It was stressed that innovative projects of PC participants are realized in many areas: mechanical engineering, nuclear

energy, nanomaterials production, healthcare, safety, ecology, desalination, etc. For Russia, the effective development of nano-technology is associated with the realization of the growth of PC competitiveness.

Let's try to formulate the main directions of PC growth in Russia in the context of globalization: it is necessary to increase the intellectualization of all sectors of the PC by adapting science and education in order to increase the economic returns from the IR; In the structure of R & D, proceeding from the experience of developed countries, it is necessary to achieve shifts towards the growth of NIC; It is necessary to transform the forms of intellectual activity, in particular, by moving industrial research from specialized scientific units to production, which helps overcome internal institutional barriers, reduce transaction costs and more efficiently implement nano-intellectual results in products and services; It is important to ensure a more intensive influx of nano-innovations, develop a venture investment system, support small innovative business, reduce duties on imported technological equipment, develop intellectual property rights throughout the innovation chain: from the idea to its promotion; To develop ways of growth of the NIC through public-private partnership (PPP).

4. DISCUSSION

The algorithm for the formation of the mechanism for implementing the innovation-competitive strategy of the PC should be as follows: (Figure 2).

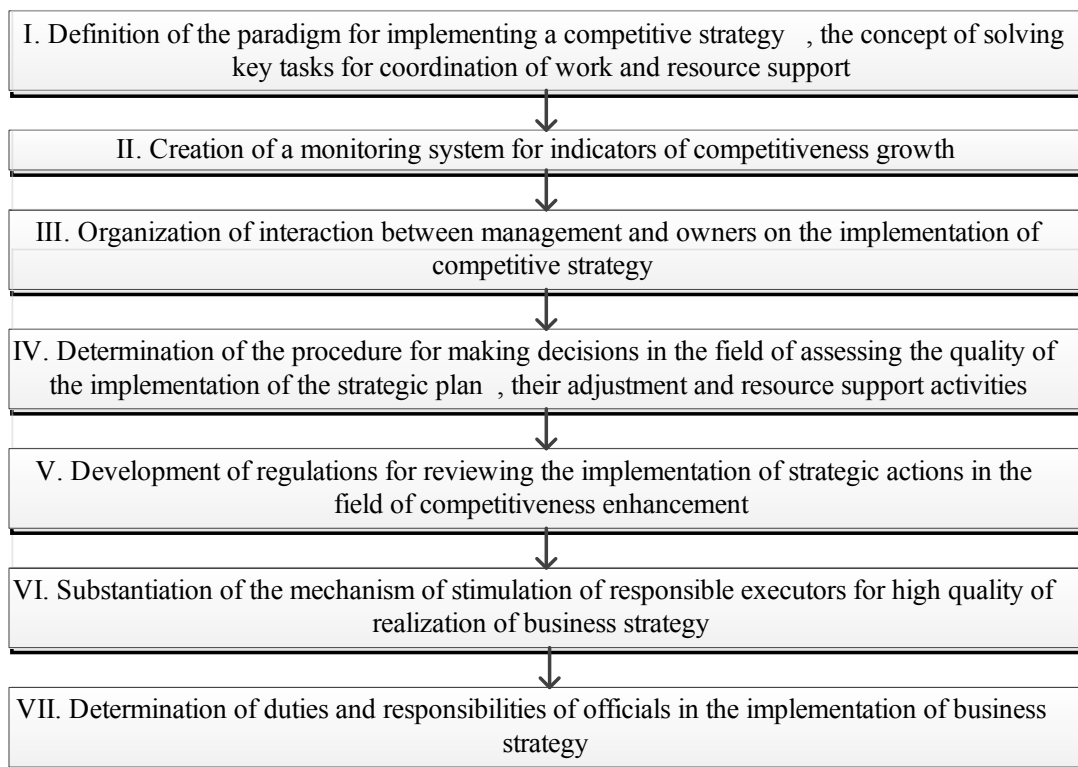


Figure 2: Stages of the mechanism for the implementation of the innovative and competitive strategy of the PC

Practical implementation of this algorithm is possible in two ways – endogenous and exogenous. The endogenous (internal) path is organic growth of the PC based on the use of internal assets. These include: sufficient qualification of the staff; The correct organization of the production process; The correct

organization of the supply of material resources to the enterprise and the sale of finished products; Effective management of the enterprise.

Exogenous (external) factors, as a rule, do not directly depend on the activities of the PC. These include: R & D; Solvency of consumers; Organization of work and the state of the infrastructure system; Organization of work and the state of the financial system; Interest rates on deposits; Socio-economic, demographic, geographical factors; Regulatory, legal, political and other factors.

The turbulence of the exogenous (external) path of development lies in the fact that highly optimistic forecasts for obtaining an effect are not always realized in the growth of competitiveness of the PC; The ability to produce products with such price parameters that would satisfy consumers (Nosova, Novichkov et. al., 2016).

The leveling of endogenous and exogenous factors requires the formation of an innovative and competitive management paradigm. This is due to a number of objective reasons: the penetration of information technology in business support, the overaccumulation of capital in the world economy, the intellectualization of business processes and the human factor that this rise in modern business. These circumstances required a rethinking of the criteria for the success of modern business, first of all, the innovative and competitive strategy of an industrial enterprise.

This strategy is based on the basic conceptual approaches to the analysis of enterprise competitiveness, among which there is: a product; Resource; Branch; Institutional. In the technology of diagnostics of the PC innovation environment, an important tool is an indicative toolkit that should reflect: the emergence of harbingers of innovation; The fact and scope of innovation, signs of their possible social significance; Signs of the features of the progress of innovation;

Methodological methods of orientation of the PC to “key” sources of the emergence of basic innovation changes include: parameters of strategic importance (the country’s constitution, state ideology, political, economic and informational bases of the state structure, etc.); Social institutions, day to day organizing and regulating the processes of life in the national community; Traditions of self-organization and self-management of individuals and their communities; Professional competence of subjects of professional activity.

In general, the innovative nature of PC management basically implies the ability and ability of state authorities, on the one hand, to direct the ongoing innovation processes to a constructive course, on the other, to adapt adequately to the real and predictable challenges of innovative technologies. Accordingly, the basic components of the model of innovative competitive PC management should be conceptually referred to: a resource approach in the management system that takes into account not only certain types of resources (for example, material or human) but their entire complex; Product approach, which determines the competitive position of the PC; An institutional approach that focuses on the ability of functioning institutions to create a competitive environment; A cluster approach that emerges on the basis of cooperation between science and education, business, development institutions and authorities, which fosters the formation of innovative territorial clusters (Nosova, Mackulyak et. al., 2016).

It is important to emphasize the importance of the integrated use of these approaches in the formation of the concept of innovative and competitive PC management. The hypertrophied orientation to this or that conceptual approach, without taking into account the multidimensionality, the multilevel nature of this problem, can hardly be justified. The strategy of increasing competitiveness can be viewed as a concept and

a plan of long-term actions for preserving and enhancing competitive PC market advantages. The principal sequence of management actions is to design a system of promising measures that ensure success in the innovative and competitive struggle of the PC. These include: selection of a set of factors critical for success in the competition in the forecast period and determining the competitive position of the PC; Establishment of the basic and target level of the most important indicators of product competitiveness and the potential of endogenous factors; The development of a system of promising measures that ensure the achievement of target values of competitiveness indicators, as well as measures to neutralize possible threats and use additional opportunities to grow the enterprise's competitiveness through nano-innovations.

5. CONCLUSION

Formation and development of the nano-innovative potential of a PC having a strategic character should be based on broad state participation, which, on the basis of the existing world experience in the formation of high technologies, can ensure the growth of the national economy for the long term. And undoubtedly an important factor for the growth of the Russian economy is the role of business in the development of nano-technology. In addition to big business, which does not always show interest in the extremely high-tech production of nanoproducts, it is obvious that it is necessary to actively engage small business in a foreign model. At the same time, if we take into account the specifics of the nano-technology business, both the employees of universities or academic institutions, as well as the organizations themselves, could act as subjects. At all levels of economic and political thinking it is necessary to understand that the future is behind high technologies as a result of the formation and development of the NIC. Its reproduction is a factor of a powerful economic breakthrough in the PC and the Russian economy as a whole. We must admit that the process of reproduction of NIC in Russia is happening to be more effective, more original and faster than that of competitors. Namely, this guarantees market success and the leading position of the Russian PC. Undoubtedly, for the speedy solution of the problems of growth of the NIC in the PC of Russia, it is expedient to use the world experience. It can be argued that nano-technology not only becomes a catalyst for the formation of innovative nano-industrialization of the economies of many countries, but also can create powerful internal and external impulses and effects. Consequently, nano-industrialization will become a powerful generator of economic growth of individual industries in short terms, large-scale structural changes in national economies and changes in their competitive positions in the world – in the medium term, will determine the development of the entire global economic system – in the long term. The practical significance of this article is due to the development of nano-technology on a global scale; The struggle of the world's largest countries for world domination in the nano-industry; Russia's interest in the development of nano-intellectual capital with the aim of strengthening its positions in the world arena.

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